2019 Thematic Evaluation: Analysis on JICA's Cooperation for Environmental Management and Infectious Disease in China

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内容

Chapter 1 Purpose and Method of Thematic Evaluation

1.1 History of ODA to China

Development assistance from Japanese government to the China (hereinafter "ODA to China") began with international cooperation centered on the development of social infrastructure supporting modernization based on the Open-Door Policy. It was set in motion in 1979 with finance and investment cooperation for the construction and expansion of railways and harbor facilities. In the 1980s, coinciding with a focus on projects for the development of economic infrastructure, technical cooperation and grant aid projects were also initiated.

In the 1990s, as China experienced rapid advances in economic development, industrialization and urbanization, especially along coast areas, development issues turned to the disparity between coastal and inland areas, poverty and global problems, and worsening environmental problems came into the limelight as a negative aspect of economic development.

In June 1992, the Japanese government's Official Development Assistance Charter was approved by the Cabinet, and policies emphasizing environmental conservation and sustainable development were incorporated into the basic philosophy of Japan's ODA policy.

In the 2000s, Japan's ODA to China was to be reviewed, reflecting China's remarkable development and Japan's tough economic and fiscal situation. The Economic Cooperation Program for China was formulated in October 2001, establishing such priority areas as: cooperation towards resolving environmental and other global issues, assistance for poverty alleviation, and support for private sector activities. In response, the breadth of sectors targeted for ODA was to be narrowed from fiscal 2001. Finance and investment cooperation was to be scaled back to environmental measures and human resources development, focused on inland areas. Grant aid too was to be cut back, apart for human resources development.

Under the banner of "resolving global issues," the areas of environmental management and infectious diseases continued to be highlighted themes. In the area of environmental management, there was an increase in finance and investment cooperation for infrastructure development targeted at improving the air and water environment. In addition, there was technical cooperation and training programs in Japan aimed at developing human resources to carry out comprehensive environmental management. In the area of infectious diseases, in the wake of the rampant severe acute respiratory syndrome (SARS) in 2003, finance and investment cooperation was used to fund public health projects and technical cooperation was provided to develop human resources, to contain the disease and to form foundations for controlling infectious diseases in China.

1.2 Purpose of This Thematic Evaluation

This thematic evaluation has been conducted for the purpose of undertaking a comprehensive analysis on this occasion of the 40th anniversary of ODA to China, with an aim of eliciting case studies and learning lessons to potentially serve as a guide for ongoing Japan-China cooperation outside of ODA and for ODA projects carried out in other countries.

1.3 Method of Study

This thematic evaluation studied ODA projects in China in the areas of environmental management and infectious disease. In addition to reviewing past evaluation reports along with other relevant documents and conducting supplemental interviews, an analysis was conducted from perspectives other than the five evaluation criteria used by the Development Assistance Committee (DAC) (relevance, efficiency, effectiveness, impact, sustainability).

During the review of projects, details of individual projects were extracted from relevant documents together with the effects and impacts generated by each project. In addition, referring to the various projects in each of the two areas, a comprehensive analysis was conducted on the question: What broad impacts[1] were created as an effect of cooperation, both at the completion of the projects and later?

The term "broad impact" here indicates the effects achieved by individual projects accumulated over the long term as a cluster of ODA projects, plus the broad cross-sectoral and sustained contribution to China across different projects. Consequently, in extracting the broad impacts, the following questions were analyzed: From a macro perspective, under what context was the relevant cluster of projects formed? What development issues were being addressed by the cluster of projects? Looking back historically at the whole picture, how did the cluster of projects influence changes in issues and initiatives in the areas of environmental management and infectious disease in China?

The following six perspectives were used in analyzing the broad impacts: (1) Influence on Chinese policy, (2) Contributions to the Chinese government, domestic companies and organizational reform, (3) Contributions to the transfer of technology, (4) Contributions to the promotion of joint research, (5) Formation and promotion of new markets and investment environments, and (6) Effects and benefits to Japan.

[1] Although not an academically accepted term, "broad impact" has been used to signify impact taken in a broader sense than that attributable to the five DAC criteria. Here, it is used as a generic term for the impacts of each project plus the impacts attributable to various related projects over the long term (broadly speaking, China's policy, organizational reform and the benefits of joint research and economic effects provided to both countries).

Chapter 2 Looking Back at ODA to China: Environment (Air Pollution Measures and Waste Management)

2.1 China's Environmental Measures and Changes in ODA to China

Japan's ODA to China began in December 1979 with the declaration of cooperation for China's modernization by Masayoshi Ohira, Japan's prime minister at the time, following China's adoption of its economic reform program in 1978.[2] Cooperation in the 1980s focused on the development of transportation infrastructure and the development of civilian infrastructure in urban development bases. In the 1990s, the emphasis of cooperation shifted from coastal areas to inland areas, and from the development of economic infrastructure to environmental conservation. In the fourth round of Japanese ODA loans (FY 1996–FY 2000), the development of inland areas and environmental conservation were included in the areas of focus, and in the Economic Cooperation Program for China of 2001, there was a decisive shift in focus toward the environment, with projects for the control of air pollution and water quality becoming pivotal.

In the August 2006 final report of the Ministry of the Environment's Review of Japan-China Environmental Cooperation for Building a Sustainable Society, it was proposed that there needed to be a switch in cooperation, from the conventional form of cooperation centered on assistance, to a partnership-type cooperation with Japan and China working together and the private sector at the center.[3] In the Joint Statement by Japan and the People's Republic of China on the Further Enhancement of Cooperation for Environmental Protection, which was issued at a Japan-China summit meeting in April 2007, ten areas of cooperation were identified for further enhancement, including the control of air pollution, promotion of a circular economy, water pollution prevention measures, monitoring and management of hazardous chemicals, including persistent organic pollutants (POPs), and measures to combat global warming.[4] Since then, technical cooperation projects have been implemented that address a wide range of environmental issues.

This section looks at changes in Japan's cooperation over the past 40 years regarding air pollution measures and waste management, two topics covered by environmental management in this thematic evaluation.

(1) Air pollution measures

Figure 1 below shows the changes in air pollution measures. In the 1990s, air pollution caused by soot and dust became more serious, and cooperation was promoted centered on modifying boilers and measures for removing smoke. From the middle of the 1990s, infrastructure development projects, such as gas supply facilities and flue-gas desulfurization equipment, were implemented via finance and investment cooperation in 39 inland urban areas, thereby contributing to improvements in air quality. At the same time, development studies on improving the atmospheric environment and technical cooperation projects for factories and other sources of pollution were also carried out. Since then, cooperation addressing air pollutants has continued to be implemented, including against PM10 and yellow sand in the 2000s, and against PM2.5 in the 2010s.

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[2] *Overview of Official Development Assistance (ODA) to China*, JICA China Office (October 2015)
Until fiscal 2000, projects were adopted by agreeing in advance the amount of grants and an outline of target projects for a period of 5–6 years. Since fiscal 2001, projects have been selected on a single fiscal year basis from a long list.

[3] *Environmental Support for China: Current Situation and Issues*, Kunihiro Nakamura (December 2007)

[4] https://www.mofa.go.jp/mofaj/area/china/visit/0704_kankyo_s.html (accessed December 10, 2019)

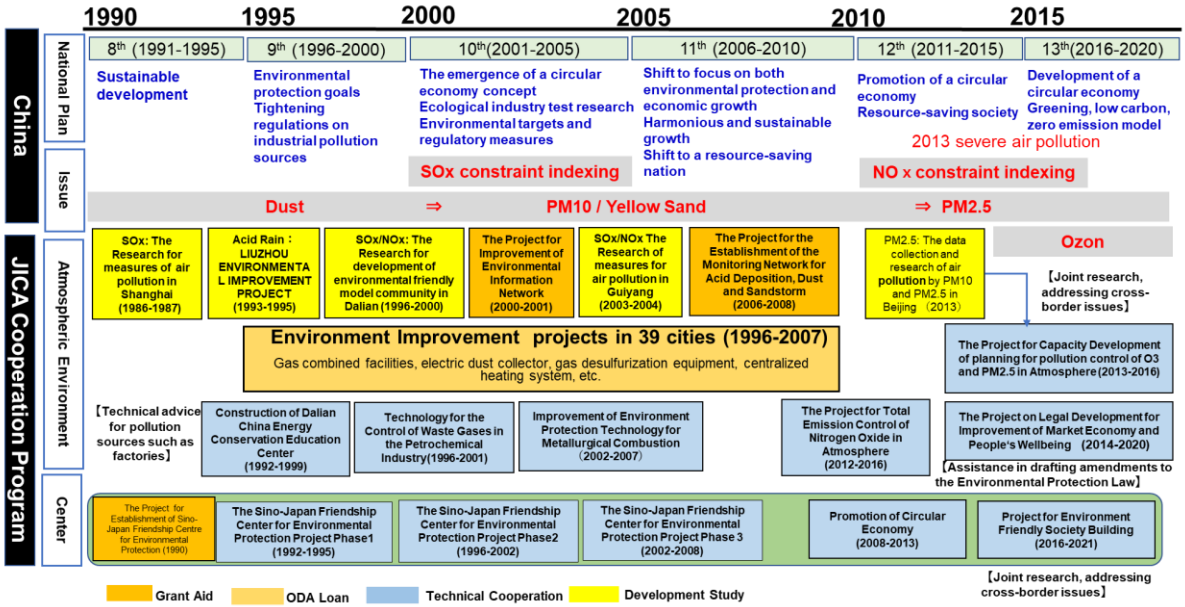


Figure 1 : Five-Year Plan and changes in ODA projects to China (air pollution measures)

Source: Produced by the Evaluation Team

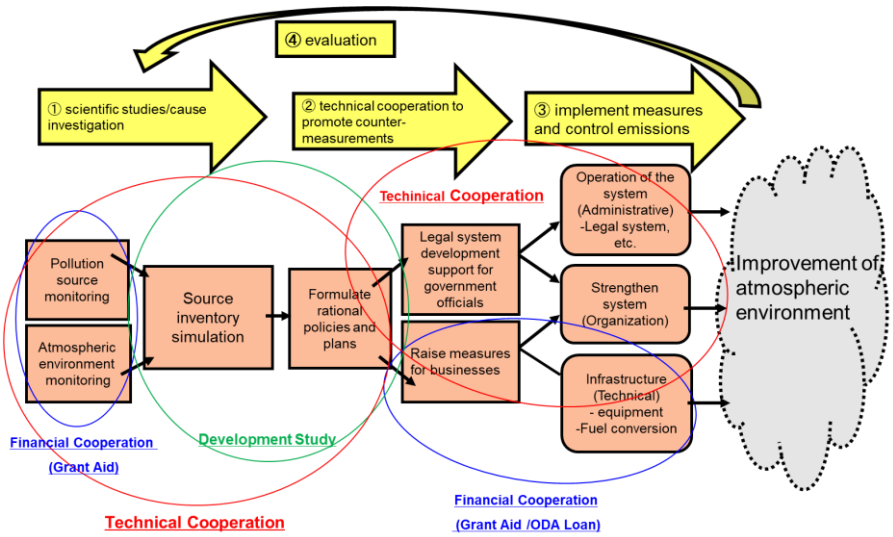


Figure 2: JICA's cooperation based on the atmospheric environmental management cycle

Source: Produced by JICA

JICA's cooperation in the area of air pollution can be broadly classified into four phases: (1) scientific inquiry and investigation into the causes of pollution ⇒ (2) technical support for the promotion of measures ⇒ (3) implementation of measures and reduction of emissions ⇒ (4) evaluation.[5] JICA has been carrying out cooperation projects with China through the whole cycle of phases, using technical cooperation, financial cooperation and other such schemes.

The first phase to implement when considering measures is (1) scientific inquiry and investigation into the

[5] "Current State of Air Pollution Control Measures in China and JICA's International Contribution" presentation materials at the 56th Annual Meeting of the Japan Society for Atmospheric Environment (September 2015)

causes of pollution. This includes monitoring of pollution sources, monitoring of air quality, and clarifying the pollution structure based on this scientific data (creating emission inventories and running dispersion simulations). In the case of China, development studies were carried out for the purpose of clarifying the pollution structure of acid rain, yellow sand, NOx, SOx and PM10/2.5, grant aid was provided for equipment and materials for the purpose of monitoring air quality and building networks, and technical cooperation was provided designed to strengthen China's capacity.

However, strengthening the capacity of technicians alone is not enough. Developing countries often lack the systems for formulating rational policies and plans based on scientific evidence. For this reason, through (2) technical support for the promotion of measures, systems need to be developed, such as establishing an environmental advisory committee in government agencies, and information needs to be consolidated. Other cooperation included capacity building for administrative personnel responsible for developing and executing policies and legal systems; establishment of training centers designed to promote measures against emissions sources, and development of human resources and extension programs for the development and adoption of emissions reduction technologies; and stimulation of measures for factories and other business operators, such as through technical consultations and advice for reducing emissions.

Examples of cooperation in phase (3) implementation of measures and reduction of emissions, include administrative aspects for managing systems, organizational and structural aspects for expanding measures, and technical aspects for actually implementing measures such as infrastructure development. In the case of China, finance and investment cooperation was used to support the development of infrastructure, such as gas cogeneration systems, electrostatic precipitators, flue gas desulfurization systems and centralized heat supply facilities.

Furthermore, reviewing the effectiveness of measures through phase (4) evaluation is also important, and requires continuous monitoring.

(2) Waste management

Figure 3 shows the changes in ODA to China regarding waste management. Japan's cooperation for China's solid waste issues began in 1989 with the Study on the Project for Improvement of Solid Waste Management in Xian City. It involved an analysis of the present situation of household waste in the tourist city of Xian in Shaanxi Province, as well as a waste management plan, feasibility study and transfer of analytical technology. Based on this, a waste management system was later developed in Xian with grant aid. From the mid-1990s, as part of the comprehensive environmental measures through finance and investment cooperation, basic infrastructure was later developed, including construction of waste disposal facilities. In the 2000s, finance and investment cooperation was specifically provided with an aim of improving the rate of harmless treatment of municipal solid waste. Loans were focused on inland areas in order to eliminate the regional disparities with coastal areas. From the viewpoint of using processing facilities and waste effectively, on top of rendering solid waste harmless, there was also an increasing need for waste recycling and reduction. This helped elevate municipal solid waste management to the next level, including the (trial) introduction of waste separation. Soon after, successive cooperation projects were implemented with a focus on technical cooperation for putting the circular economy into practice with an aim of achieving both economic growth

and environmental preservation.

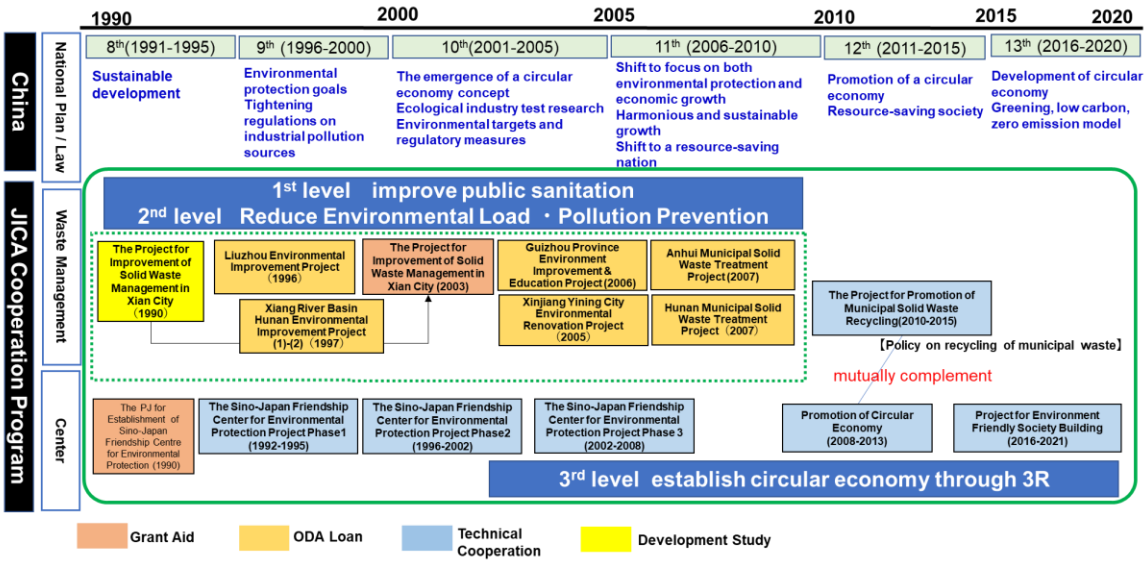


Figure 3: Five-Year Plan and changes in ODA projects to China (waste management)

Source: Produced by the Evaluation Team

Aiming to realize sustainable development, JICA's basic policies for cooperation are as follows: achievement of comprehensive waste management aimed at the 3Rs (reduce, reuse, recycle), which encompasses all waste management; and support accommodating specific stages of development, which matches the conditions in each country.[6] The reason for this is, as economic development progresses, the problems to address and the goals to pursue will be different. As shown in Figure 4, the first stage is "improvement of public health." This refers to supporting the appropriate collection and disposal of waste, with priority given to increasing collection rates. The second stage refers to a stage where industrialization has progressed and secondary industries in particular have developed. In addition to municipal waste management, the aim of this stage is to reduce environmental impact and prevent pollution through the proper processing and management of hazardous waste. The third stage is when economic development has progressed and the consciousness of civil society matures. As people's awareness for the environment heightens, there is a gradual shift toward promoting waste reduction and recycling, and wanting to reduce environmental impact, including the emission of greenhouse gases, and to build a recycling-based society.

As for ODA to China, on the basis of the category of support according to the country's stage of development, cooperation up until the mid-2000s was targeted at the first stage of improving public health and the second stage of reducing environmental impact and preventing pollution. Compared to developed countries like Japan, industrialization and urbanization had progressed rapidly in China. This had resulted in complex environmental problems, such as industrial pollution and domestic pollution, and meant that the two stages were almost synchronous. Overlapping this was the third stage of support, which gradually began from the early 2000s. From about the end of the 2000s, support was being provided for building a full-fledged

[6] JICA's Approach to International Cooperation in Waste Management (Position Paper on Solid Waste Management), Japan International Cooperation Agency (JICA) (June 2017)

circular economy.

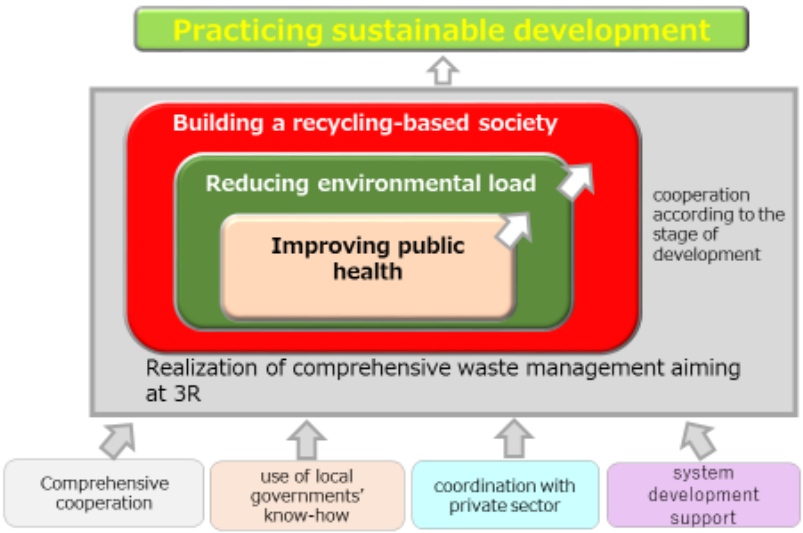


Figure 4: Concept of JICA's cooperation for waste management

Source: *JICA's Approach to International Cooperation in Waste Management (Position Paper on Solid Waste Management)*, Japan International Cooperation Agency (JICA) (June 2017)

(3) ODA to China consistent with China's five-year plan for economic and social development

The following describes the plans and targets of each of China's five-year plans for economic and social development since 1990, and how ODA to China has been provided for air pollution measures and waste management in response to these plans. Over the past 40 years, ODA to China has been provided to 37 projects for air pollution measures, six projects for waste management, and another six projects for comprehensive environmental measures that incorporate one or the other. It shows how a wide range of ODA cooperation to China has been provided according to the environmental problems and social changes in China.

8th Five-Year Plan (1991–1995) ● Demonstrate ambition for the harmonious advancement of economic development and environmental protection. Slow the progress of pollution by improving the environment in key cities. ● Development of urban infrastructure (waste disposal facilities, gas supply facilities, sewage treatment plants) ● Reduction of wastewater and dust emissions		
Air Pollution Measurement	The Research for measures of air pollution in Shanghai（1986-1987）	Development Study
	Construction of Dalian China Energy Conservation Education Center （1992-1999）	Technical Cooperation
	The Monitoring research of acid fallout in wide range area and research of comprehensive measures for air pollution in Liu province（1993-1995）	Development Study
	Tianjin No.3 Gas Works Project（FY1995）	ODA Loan
Waste Management	The Project for Improvement of Solid Waste Management in Xian City（FY1989）	Development Study
Comprehensive Environmental Measurement	The Project for establishement of Sino-Japan Friendship Centre for Environmental Protection （1990-1995）	Grant Aid
	The Sino-Japan Friendship Center for Environmental Protection Project Phase 1 (1992-1995）	Technical Cooperation

9th Five-Year Plan (1996–2000)

- Demonstrated policy to incorporate the environmental protection plan into the national development plan, and within that, set environmental protection targets for the first time.
- Set a goal of developing model cities and districts for economic development, environmental conservation and ecosystem conservation, by establishing environmental management systems and an environmental legal structure appropriate for the actual situation in China, curbing environmental pollution and ecosystem degradation, and improving the environment in certain cities and districts.
- The Five-Year Environmental Protection Plan highlighted developing environmental law, placing specific controls on total allowable pollutants, and concentrated efforts for priority areas for pollution control through the Trans-Century Green Project. The plan also indicated two control areas (Acid Rain Control Area, Sulfur Dioxide Control Area) for intensive air pollution measures. Other provisions included increasing the amount of environmental investment and prioritizing water and air quality in pollution measures.

Air Pollution Measurement	The Research for development of environmental friendly model community in Dalian（1996-2000）	Development Study
	Technology for the Control of Waste Gases in the Petrochemical Industry（1996-2001）	Technical Cooperation
	Environmental Protection and Safety Training Center of Coal Industry（1997-2002）	Technical Cooperation
	The project for Improvement of Environmental Information Network（2000-2001）	Grant Aid
	Lanzhou Environmental Improvement Project（FY1996）	ODA Loan
	Shenyang Environmental Improvement Project（FY1996, FY2000）	ODA Loan
	Hohhot and Baotou Environmental Improvement Project（FY1996, FY1997）	ODA Loan
	Benxi Environmental Improvement Project（FY1997, FY1998, FY1999）	ODA Loan
	Heilongjiang Songhua River Basin Environmental Improvement Project（FY1998）	ODA Loan
	Guiyang Environmental Model City Project（FY1999, FY2000）	ODA Loan
	Dalian Environmental Model City Project（FY1999, FY2000）	ODA Loan
	Chongqing Environmental Model City Project（FY1999, FY2000）	ODA Loan
Comprehensive Environmental Measurement	Liuzhou Environmental Improvement Project（FY1996, FY1997, FY1998）	ODA Loan
	Xiang River Basin Hunan Environmental Improvement Project（FY1997, FY1998）	ODA Loan
	The Sino-Japan Friendship Center for Environmental Protection Project Phase 2（1996-2002）	Technical Cooperation

10th Five-Year Plan (2001–2005)

- For the purpose of eliminating regional disparities, the Great Western Development Strategy was incorporated into the plan, promoting infrastructure development in inland areas.
- Specific numerical targets were indicated from 2000, including a 10% reduction in SOx emissions and a 20% reduction in two control areas. As part of China's air pollution measures, the West-East Gas Pipeline Project was initiated to construct a natural gas pipeline.
- In the National Environmental Protection Plan, the resolution of waste problems was positioned as a priority area for sustainable development.
- Strengthening China's capacity for environmental decontamination and protecting the ecological environment were highlighted as key issues.
- Improving the quality of drinking water in urban and rural areas, and appropriately resolving environmental problems affecting the sustainable development of society were clearly stated in the plan, with the highest priority being given to the prevention and treatment of pollution. Goals were set to improve the water environment by reducing chemical oxygen demand (COD) emissions, mitigate air pollution by reducing sulfur dioxide emissions, and promote the recycling and detoxification of solid waste.
- The plan promotes the detoxification of municipal solid waste, prioritizing the construction of efficient waste processing systems (collection of sorted trash, storage and transportation, processing) along with the reduction and recycling of solid waste.

Air Pollution Measurement	The Project for Improvement of Environmental Information Network Phase 2（2001-2002）	Grant Aid
	The Research of Measures for Air Pollution in Guiyang（2003-2004）	Development Study
	Improvement of Environment Protection Technology for Metallurgical Combustion（2002-2007）	Technical Cooperation

	Anshan Environmental Improvement Project (FY2001)	ODA Loan
	Taiyuan Environmental Improvement Project (FY2001)	ODA Loan
	Beijing Environmental Improvement Project (FY2001)	ODA Loan
	Hennan Environmental Improvement Project（FY2002）	ODA Loan
	Anhui Environmental Improvement Project（FY2002）	ODA Loan
	Xinjiang Yining City Environmental Renovation Project（FY2004）	ODA Loan
	Baotou Atomospheric Environmental Improvement Project（FY2004）	ODA Loan
	Guizhou Province Environment Improvement & Education Project（FY2005, FY2006）	ODA Loan
	Atomospheric Environment Improvement Project（FY2005, FY2006）	ODA Loan
	Jilin Province Jilin City Comprehensive Environment Improvement Project （FY2005）	ODA Loan
Waste Management	The Project for Improvement of Solid Waste Management in Xian City（FY2003）	Grant Aid
Comprehensive Environmental Measurement	The Sino-Japan Friendship Center for Environmental Protection Project Phase3（2003-2008）	Technical Cooperation

11th Five-Year Plan (2006–2010)

- With an aim of harmonious and sustainable development, this plan sought a shift to focusing on both environmental protection and economic growth, as well as a shift to a resource-saving society.
- Switch from extensive growth, setting targets for energy conservation and environmental conservation
- Set goal of achieving pollutant emissions within standard.
- Indicated numerical target of reducing SOx emissions and COD by 10% each, and positioned stopping the spread of acid rain as one of the priority areas.
- Emphasized enhancing the construction of waste disposal facilities, building an efficient processing system (comprised of the collection of sorted trash, storage and transportation, and processing), and increasing the rate of harmless treatment of municipal solid waste.

Air Pollution Measurement	The Project for the Establishment of the Monitoring Network for Acid Deposition, Dust and Sandstorm（2006-2008）	Grant Aid
	Xinjiang Environmental Improvement Project （FY2006、FY2007）	ODA Loan
	Gansu Province Lanzhou City Atmospheric Environmental Improvement Project （FY2007）	ODA Loan
	Nanyang City Environmental Improvement Project（FY2007）	ODA Loan
Waste Management	Anhui Municipal Solid Waste Treatment Project（FY2007）	ODA Loan
	Hunan Municipal Solid Waste Treatment Project（FY2007）	ODA Loan

12th Five-Year Plan (2011–2015)

- Appealing for a shift to a resource-saving and environmentally-effective use society, this plan indicated strengthening circulr economic development.
- The plan suggested promoting model factories for cleaner production, developing collection systems for recyclable resources, expanding green procurement by government, and developing laws, regulations and standards.
- In addition to air quality targets for SOx, a binding indicator for NOx was added, namely, to reduce emissions by 10% compared to 2010.
- Resolving issues related to the safety of drinking water was designated a priority issue, along with resolving environmental problems that pose a danger to human health, such as air pollution and soil contamination. Goals for urban areas were set, namely, to increase the percentage of cities with air quality at or above Grade II standard to 80%, to raise the sewage treatment rate in cities to 5%, and to raise the rate of harmless treatment of household waste to 80%.

Air Pollution Measurement	The Project for Total Emission Control of Nitrogen Oxide in Atmosphere（2012-2016）	Technical Cooperation
	The Data Collection and Research of Air Pollution by PM10 and PM2.5 in Beijing （FY2013）	Technical Cooperation
	The Project for Capacity Development of planning for pollution control of O3 and PM2.5 in Atmosphere (2013-2016）	Technical Cooperation
Waste Management	The Project for Promotion of Municipal Solid Waste Recycling （2010-2015）	Technical Cooperation
Comprehensive Environmental Measurement	The Project for Promotion of Circular Economy （2008-2015）	Technical Cooperation

13th Five-Year Plan (2016–2020) ● Strengthen initiatives for promoting a higher standard of municipal solid waste disposal, such as further increasing the rate of harmless treatment, developing technologies and enhancing facilities in relation to incineration, biological treatment, power generation from urban waste and waste separation, realizing a high level of waste reduction and recycling, and promoting the disclosure of information on waste disposal ● Low carbon, clean, zero-emissions model		
Comprehensive Environmental Measurement	Project for Environment Friendly Society Building（2016-2021）	Technical Cooperation

2.2 Broad impact generated by projects in environmental management

How have 40 years of ODA projects contributed to environmental management in China? In addition, what "broad impact" have they had? The results of analyzing these questions are presented below along with a number of case studies.

A feature of ODA to China in the field of environmental management has been sustained efforts to improve the comprehensive management capacity of the Chinese government and businesses in relation to environmental issues—such as human resources development, policy recommendations and infrastructure construction—making full use of such schemes as finance and investment cooperation, technical cooperation, grant aid and training programs in Japan, according to environmental issues in Chinese society.

With regard to the broad impacts derived from these efforts, analysis confirmed that there have been improvements in the environmental management capacity of government and business, contributions have been made to environmental management legislation and policies that form the basis of environmental measures in China, and there have also been benefits to Japan. Concrete examples of these are presented below. In analyzing the examples, information derived from materials and interviews has been collated on the questions of: *Under what circumstances has there been a broad impact?* and *How did that impact spread?*

2.2.1 Impact on the Chinese government, businesses and other organizations

In relation to the broad impact that the various ODA initiatives to China had on the Chinese government (central and local), the following examples were examined.

(1) Contributions to developing the environmental management capacity of government

1) Air pollution measures

Studies on yellow sand by the Centre for Environmental Protection led domestic research, contributed to the launch of afforestation and erosion control projects, and expanded to cross-border studies and research

Since opening in May 1996, the Centre for Environmental Protection had been strengthening basic skills with respect to environmental conservation. Through the Sino-Japan Friendship Center for Environmental Protection Project Phase 3 (2002–2008), it promoted analytical research on sources of airborne particulate matter in urban areas, including yellow sand which was having far-reaching impacts.

At the time, the source of yellow sand and the diffusion mechanism were unknown. JICA provided grant aid for the installation of equipment, and transferred technology via experts. The results of aerosol observations made using measuring instruments donated to the Centre for Environmental Protection through grant aid were recognized by Chinese leaders and by the Environmental Protection Leading Group. This led to joint Japan-China studies proceeding at full swing and to China participating in research at the global level.

In June 2000, damage caused by yellow sand had spread and social interest had grown. At the request of the State Environmental Protection Administration (SEPA),[7]Premier Zhu Rongji inspected the desertification

[7] Elevated to the State Environmental Protection Administration, an organ under the direct control of the State Council, in 1998. Elevated to the Ministry of Environmental Protection in 2008. Integrated with the departments of environmental

in Inner Mongolia, which was to lead to realization of the Study on the Effects of Yellow Sand on Airborne Particulate Matter in Beijing (2001–2003)—a proposal for joint research by the Centre for Environmental Protection.[8] In January 2001, Premier Zhu visited the Centre for Environmental Protection and was briefed on the yellow sand phenomenon.

The impacts of yellow sand extended beyond national borders to places like South Korea and Japan. It became a matter of concern raised at a tripartite ministers meeting between Japan, China and South Korea in 2001, and developments in international research and monitoring were promoted.

Guidance on sand analysis to identify the source of yellow sand
(photo：material provided by

Targeting these joint research endeavors, JICA developed research and monitoring systems in China and promoted human resources development. China's first lidar (laser radar) for observing yellow sand was installed on the roof of the Centre for Environmental Protection. Instead of the conventional ground-based sampling and monitoring system, lidar allowed for continuous observations of yellow sand in the skies above Beijing, and provided data for projects. The data helped clarify the source of the yellow sand, the route it followed and the degree of impact on particulate matter in Beijing. It provided scientific evidence for establishing national policies and strategies on erosion control, and allowed for technical data to be provided to SEPA for environmental conservation planning in the Great Western Development Strategy. A report by the Centre for Environmental Protection was submitted from the State Council to the China Meteorological Administration, the State Forestry Administration, the Government of Inner Mongolia and the provincial governments of Hebei and Shanxi, and would also lead to yellow sand forecasting and to enforcement of the Prevention and Control of Desertification Law (established in 2001) by the Chinese government. The study findings also had a considerable impact on local governments, and led to the construction of a network system of dust observation at ground surface points along the route followed by yellow sand, in Inner Mongolia, Beijing, Hebei, Shaanxi and Shanxi.[9] The Centre for Environmental Protection is said to have developed into an important base in China for research and studies on measures to combat yellow sand.[10]

Premier Zhu would also petition the United Nations for a research project on yellow sand, and in January 2003, Prevention and Control of Dust and Sandstorms in Northeast Asia—a project funded by the Global Environment Facility (GEF)—was formed.[11]

protection of the National Development and Reform Commission and the Ministry of Natural Resources in 2018 to form the new Ministry of Ecology and Environment. The names current at the time of writing are used in this report.

[8] *Basic Survey Report on Environmental Policy Support, People's Republic of China* (April 2012)

[9] ibid

[10] ibid

[11] ibid

Projects funded by loan aid helped improve air quality, and supported the evolution into model cities through the dispatch of experts in circular economy

Of the ODA by JICA to China, 25 projects funded by loan aid were implemented between 1996 and 2007 for air pollution measures, totaling approximately 260 billion yen. As a result of these projects, gas cogeneration systems, electrostatic precipitators, flue gas desulfurization systems, centralized heat supply facilities and other air pollution control equipment was installed in 39 cities nationwide, contributing to a reduction in air pollutants (SOx, PM, etc.). A study by Kyoto University estimates that projects granted through loan aid between 1996 and 2000 had resulted in a reduction in SOx of 190,000 tons as of 2003 (equivalent to 4.9% of China's total reduction).[12]

The case project examined here is that of Guiyang, where model urbanization was achieved not only by constructing infrastructure, but also by strengthening so-called soft aspects.

Infrastructure construction supported by loan aid in Guiyang came about because of the Japan-China Environmental Cooperation toward the 21st Century—an agreement that was reached between Ryutaro Hashimoto, the Japanese prime minister at the time, and Li Peng, then China's premier, at a Japan-China summit meeting held in Beijing in 1997. The concept consisted of two pillars. One of them was the Japan-China Environmental Development Model Cities Plan. This involved implementing measures to combat air pollution and acid rain, forming recycling-based industrial and social systems and implementing measures to tackle global warming, based on the idea of "special environmental zones," taking the idea of "special economic zones" which supported China's economic growth under the Open Door Policy and applying it to the environment.[13] Affected by severe air pollution, Chongqing and Guiyang were selected as model cities to realize the concept. Dalian, where efforts for environmental technical cooperation were already underway with Kitakyushu,[14] was also selected,[15] and the Guiyang/Chongqing/Dalian Environment Model City Projects (loan aid) were initiated in 2000.[16]

Guiyang is located in a basin surrounded by mountains on all four sides. Here, exhaust gases from power plants, steel mills, cement factories and other facilities situated in the city area tended to accumulate. Guiyang had therefore been designated as a sulfur dioxide control area and an acid rain control area. Targeting factories in seven locations, the project involved switching fuel to city gas, installing dust collectors and desulfurization equipment, and developing an automatic air quality monitoring system. As a consequence of working directly on the source of pollution, remarkable outcomes have been achieved in the improvement of air quality, including that acid rain is no longer seen,[17] SOx emissions have been reduced by 168,000 tons,[18]

[12] Survey regarding the Contribution Evaluation of Environmental Loan Projects for China, Graduate School of Economics, Kyoto University (November 2005)
[13] https://www.mofa.go.jp/mofaj/kaidan/kiroku/s_hashi/arc_97/china97/hyoka.html (accessed December 10, 2019)
[14] Kitakyushu City conducted a survey of businesses in Dalian on the introduction of energy-saving, resource-saving production technologies capable of reducing environmental pollution without compromising business profit, and held a seminar for technicians.
[15] In terms of priority regions for implementation of pollution control measures pursuant to the Prevention and Control of Atmospheric Pollution Law (revised 1995), the urban areas and some districts of Chongqing were designated as "acid rain control areas," the urban areas of Dalian were designated as "sulfur dioxide control areas," and Guiyang was designated as both.
[16] www.clair.or.jp/j/forum/c_report/pdf/213.pdf (accessed December 10, 2019)
[17] http://www.eic.or.jp/library/pickup/pu050804.html (accessed December 10, 2019)
[18] *China, a Department Store of Environmental Issues*, Koyanagi Hideaki (March 2010)

and carbon dioxide (CO_2)—a greenhouse gas—has also been reduced by about 1 million tons.[19] A 24-hour continuous monitoring system connecting the Environment Protection Bureau with sources of pollution was also installed in companies, enabling the constant observation of major pollutant emissions. Analysis, which had previously been performed manually in the laboratory, was automated, meaning that real-time pollution data could now be measured. Since 2008, air pollution indices and forecasts have been released on the radio, TV and other media, which has also helped with the disclosure of information to citizens.[20]

In conjunction with the development of infrastructure through the model city project, Guiyang City's Environment Protection Bureau also took on the challenge of developing so-called soft aspects. The city put its name forward as a trial city for establishing a recycling-based society. In November 2004, it enacted China's first ordinance for establishing a recycling-based society. As a result, Guiyang has also been held in high regard as an "eco-civilized city" endorsed by the current regime. Regarded as a "remote provincial city" prior to the project, Guiyang has become a model city, hosting important environmental conferences, and visited by a stream of inspection missions from other cities across China.[21]

Comparing the ex-post evaluation results of the three model city projects, while the overall rating of the Guiyang project was not high,[22] as a model city pursued by the Japan-China Environmental Cooperation program through loan aid, it has become a model for the whole of China, working on enacting China's first related ordinance. A JICA expert on promoting environmental model cities has suggested the following as factors that gave impetus to the project: (1) In the case of Guiyang, the Environment Protection Bureau took the lead[23] and continuously monitored the project management, (2) The same responsible person[24] was involved in the monitoring and management of the project, (3) As a consequence of implementing the project through loan aid, there was a strong awareness and confidence among top management to address environmental issues, which facilitated the decision-making of the city, and (4) the project was blessed with good personal connections.

[19] https://www.tkfd.or.jp/research/detail.php?id=798 (accessed December 10, 2019)

[20] FY2012 Ex-Post Evaluation Report

[21] Interview with Mr. Hideaki Koyanagi (December 4, 2019)

[22] During an ex-post evaluation, a study is undertaken two to three years after the project completion from the perspective of five DAC criteria (relevance, efficiency, effectiveness, impact and sustainability), and an overall rating is determined, with A being "highly satisfactory," B being "satisfactory," C being "partially satisfactory," and D being "unsatisfactory." Whereas the Chongqingand Dalian projects received an overall rating of A and B respectively, the rating for Guiyang was C. Of the seven factories targeted by subprojects in the Guiyang project, four of them had closed or suspended operations after running for five to six years because of stricter environmental standards or changing market needs. At the time of the ex-post evaluation in 2013, only three factories were still operating—less than half the original number. For this reason, as the expected effects of the project were less than half, effectiveness, efficiency and sustainability could only be rated as "fair."

[23] Ordinarily, a city's Finance Bureau is the point of contact for ODA loans (loan aid), and the Environment Protection Bureau has only limited involvement. However, Guiyang was a special case. Because the Environment Protection Bureau took an active role in the project, it helped Guiyang become a model city for the whole of China.

[24] Mr. Xǔ Shìguó, the deputy director of Guiyang's Environment Protection Bureau, had been in charge of the model city project on the Guiyang side since 1997. He subsequently held the post of assistant director at Guizhou Province's Office for Environmental Model City Promotion, and had retired at the time of this review.

Steel plant before the project
(photo: Ex-Post Evaluation Report)

Same steel plant after the project
(photo: Ex-Post Evaluation Report)

JICA established the Environmental Information Network, which carries out environmental monitoring, in 100 cities throughout China

The "Establishment of an Environmental Information Network" was one of the pillars of the Japan-China Environmental Cooperation toward the 21st Century that was agreed upon at a summit meeting in 1997. For this, the Environmental Information Network was established in 100 major cities throughout China, thus setting in place an environmental monitoring structure throughout the country which is being used to provide information for environmental assessments. This was achieved through grant aid in the form of the Project for Improvement of Environmental Information Network (2000–2001; 940 million yen; target regions: the cities of Chongqing, Dalian, and Changchun), as well as the Project for Improvement of Environmental Information Network (Phase 2) (2001–2002; 1.051 billion yen; target regions: 89 cities throughout China).

JICA verified countermeasures through a demonstration experiment on technologies to curb NOx emissions, and the results of this were used as inputs for establishing policies and laws

China's 12th Five-Year Plan (2011–2015) added binding indicators for reducing emissions of NOx in addition to SOx by 10% versus 2010 levels by way of indicators pertaining to the atmospheric environment. While it had set indicators for this, the majority of the technology for curbing emissions of NOx in China was in the introductory stage, and it had not adequately set in place policies and laws related to curbing this.

To this end, technical cooperation in the form of the Project for Total Emission Control of Nitrogen Oxide in Atmosphere (March 2013–March 2016) was implemented. The goal of the project was to prepare guidelines and manuals for emissions-control technologies based on a demonstration experiment in Xiangtan City, Hunan Province together with the Office of Atmospheric Emissions, Department of Pollution Controls, Ministry of Environmental Protection, as well as the Environmental Law Institute and a committee of experts. The emissions-control techniques, technologies, and data demonstrated through this are being used in the drafting of the 13th Five-Year Plan, related documents, and sector-specific manuals.[25]

With regard to business impact, businesses have been appraised as having harnessed experiences learned from Japan and strengthened their initiatives for enforcement with respect to a number of issues. These include their lack of enforcement capabilities, lack of environmental control capabilities, and lack of human

[25] Material provided by JICA

resources with respect to curbing atmospheric pollutants, which had posed challenges on the Chinese side when it came to environmental management.[26]

Intensive training was held for working-level officials / government officials in the aim of promptly responding to new challenges

In January 2013, severe air pollution centered around the city of Beijing occurred. During this period, joint research was being carried out with Tsinghua University related to PM10 and PM2.5 monitoring and component analysis for Beijing and its surrounding cities. In addition, the Japan-China Seminar on Combating Atmospheric Pollution was held in April at the Centre for Environmental Protection. Here, officials from the national and regional governments, research institutions, and companies offered responses such as sharing their latest initiatives related to preventing air pollution.

In addition, the Project for Capacity Development of Planning for Pollution Control of O3 and PM2.5 in Atmosphere (November 2013–November 2016) began with the goal of improving fundamental capabilities related to PM2.5 and ozone. Through this project, efforts were made to transfer technologies related to survey and research techniques, technologies for combating pollution, and more. This was done through training in Japan for Chinese government officials, researchers, and engineers on issues that included Japan's countermeasures for ozone and PM2.5, diagnosing complex pollutants, analyzing the sources of pollution, and curbing pollutants. Those deemed eligible for the training included working-level government officials and engineers in the first and second years of the project, and researchers and engineers at related institutions in its third year. Through this, it aimed to contribute to related policies and laws by means of harnessing outcomes from the project in practical work in a direct manner. Curbing ozone and PM2.5 requires reducing emissions of the Volatile Organic Compounds (VOC) that are their precursors, and so combating VOC was made the central theme of the training in the second year. As such, the project reviewed policies and legal frameworks related to combating VOC, and contributed to reviewing major policies and legal frameworks such as the revisions to the Air Pollution Prevention and Control Law (August 2015).

2) Waste management

JICA established a leading position for research within China through the first dioxin studies within the country

The Sino-Japan Friendship Center for Environmental Protection Project Phase 3 (2002–2008) was initiated with the goal of playing a leading role in determining important challenges for environmental conservation. In the latter half of the project from June 2004 onward, it also came to provide support for the circular economy that SEPA had begun to emphasize, as well as a corporate environmental supervisor system and waste management for dioxins and POPs. Pursuant to the Law of the People's Republic of China on the Prevention and Control of Environmental Pollution by Solid Waste enacted in 1995, most of the general waste (household waste) in China was being disposed of via the sanitary landfill method, which is easy to manage. However, the volume of this waste continued to increase year by year, resulting in a matter of time

[26] Material provided by JICA

before waste disposal facilities filled up and disposal by incineration increased. In particular, once the debris of agricultural films known as “white pollution” that is endemic in rural and agricultural areas began being incinerated, it became clear that it was generating and emitting dioxins and other toxic substances. Based on the conjecture that the dioxin problem from the disposal of waste by incineration that Japan experienced would probably occur in China at some point, support related to establishing structures for analyzing and measuring dioxins was initiated under the judgment of a member of SEPA’s leadership, who had personally studied and performed research abroad in Japan. Seminars by experts were held and instruction in practical skills and training in Japan were provided in an effort to improve the capabilities of the personnel to analyze dioxins. The Centre for Environmental Protection was the first research institute in the country to conduct studies on dioxins. As such, it came to play a leading role in this area, as evidenced by the fact that its six dioxin research labs in China took up the mantle of training the personnel at each research lab. The claim could be made that having Japanese experts offer timely indications of the environmental problems they assumed China would be likely to face in the near future based on Japan’s own experiences led to fostering an awareness of the problems and sincere initiatives to address them on the Chinese side.

JICA provided financing support for implementing waste disposal measures by local governments and enhanced the waste management capabilities needed for the prompt treatment and proper final disposal of waste

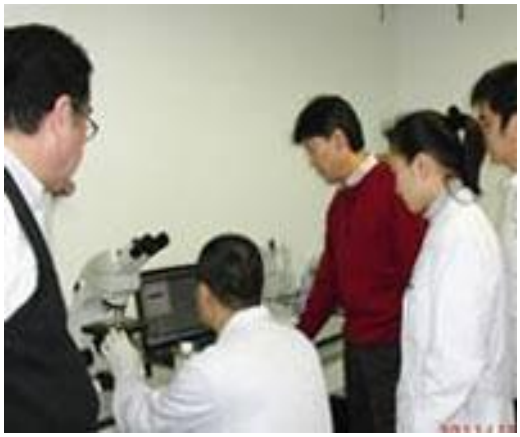
Through ODA loans, JICA built facilities such as final waste disposal sites and transfer and transit stations, and procured materials such as those for the transfer stations and transport vehicles in Guangxi Zhuang Autonomous Region, Hunan Province, Guizhou Province, Anhui Province, and Xinjiang Uygur Autonomous Region. It also provided training in Japan where officials studied topics such as waste collection and transportation systems. Through a combination of cooperation on both “hard” and “soft” aspects, ODA loans contributed to improving the detoxification treatment rate. In addition, they led to improving waste management capabilities in the form of preparing management rules for the transfer stations and keeping records on the volumes of waste they treated, as well as improving the management capabilities of the environmental protection departments of local governments with regard to improving downstream technologies for waste management and the acquisition of know-how on waste measures for rural regions.

Transfer station (Xinjiang Uygur Autonomous Region)
（photo : Ex-Post Evaluation Report）

Leachate treatment facility (Guizhou Province)
（photo : Ex-Post Evaluation Report）

In the city of Ghulja in the Xinjiang Uygur Autonomous Region, it is said that based on lessons from Japan, initiatives have begun to improve the level of mechanization at facilities, and detoxify waste and introduce systems for recycling and sorting in rural regions. With the case in Hunan Province, through training in Japan trainees were brought into contact with the actual conditions by which waste is disposed of in Japan without distinction between urban and rural regions. The trainees also enacted disposal plans for both villages and towns to serve as waste measures for not just urban areas, but rural regions as well, and engaged in organization and the establishment of facilities. This has been praised as an example of an advanced initiative. This has also brought about a number of other effects in addition to these. Examples of these include the fact that reviews have been conducted on introducing incineration facilities from a long-term perspective by gaining an understanding of the present conditions in Japan, Japanese-style sorting of waste has been adopted, and awareness-raising and educational centers have been created to raise the environmental awareness of the citizenry. In Anhui Province, there was a case where officials learned that it was growing increasingly difficult to secure land for final disposal sites as a result of urbanization. Thus, based on their training in Japan, they built an incineration facility that generated electricity via the Built, Operate, and Transfer (BOT) method via domestic enterprises that served as a forerunner to policies in China. As this indicates, giving people the opportunity to witness examples of Japanese initiatives through training in Japan and to become aware of them as problems for their own country carries a strong possibility of generating enormous impacts.

The household waste incineration facility that was built (Anhui Province)
(photo: Ex-Post Evaluation Report)



A scene of guidance provided on dioxin analysis
(photo: JICA homepage)

JICA has been conducive to improving the management capabilities needed to institute a circular economy

The Promotion of Circular Economy Project (2008–2013) was a technical cooperation project that was begun after the conclusion of the Sino-Japan Friendship Center for Environmental Protection Project Phase 3. It represented a shift away from the capacity building in various sectors carried out to that point towards a new stage of cooperation in which Japan and China worked together to address their respective, important environmental challenges, with the Centre for Environmental Protection serving as a central hub for this. This is meant as a response to the waste management and 3R area stipulated in the Joint Statement by Japan and the People's Republic of China on the Further Enhancement of Cooperation for Environmental Protection

signed by the Japanese and Chinese governments in April 2007 and the Joint Communiqué by Japan and the People's Republic of China on Promoting Cooperation in Environmental and Energy Sectors announced in December 2007. The project's aim was to enhance cooperation among environmental protection departments while responding to the needs of the time through five major frameworks. These were: (1) Setting in place a corporate environmental supervisor system and implementing governmental green purchasing, (2) Environmental teaching materials, (3) Formulating a nationwide basic vision for setting in place eco-industrial zones for arterial industries, (4) Improving waste management systems centered on industry, and (5) Promoting circular economic measures between Japan and China.

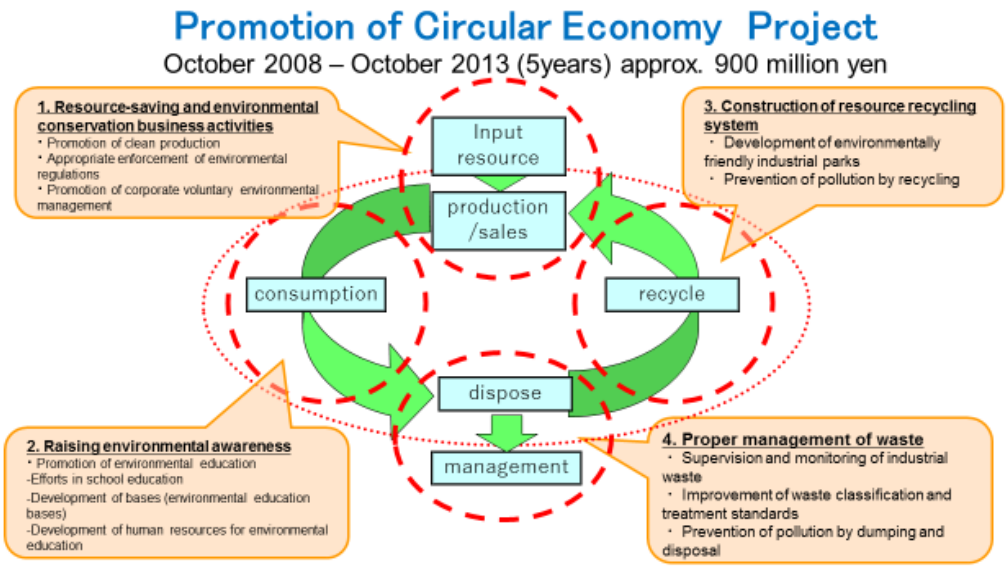


Figure 5: Image of Promotion of Circular Economy Project

Source: Prepared by JICA

(1) As part of a trial-run of training for corporate environmental supervisors, it was decided that 15 counterparts to whom technical transfers had been performed through training in Japan and the dispatch of experts would take the lead in serving as teachers. With respect to green purchasing by the government, efforts for capacity building for this were carried out through a number of initiatives. These included recommendations related to setting in place and legislating laws, surveys on the current state of green purchasing in China, and analyzing the environmental results from deploying green purchasing. (2) For environmental education, evaluation indicator systems and operating guidelines were prepared, and a proposed evaluation system was established in order to certify national-level environmental education bases jointly together with the Ministry of Education. It set in place national environmental education facilities and a database of human resources, while simultaneously developing programs for 12 environmental education facilities throughout the country and fostering human resources in local environmental departments through environmental commentary. (3) Based on the implementation status regarding eco-towns in Japan and the challenges for these, the Chinese side performed reviews and analyses on the matter in an independent manner. Developmental factors and governmental studies for China's arterial industries were compiled in the

form of the Proposed Nationwide Basic Vision for Setting in Place Eco-industrial Zones for Arterial Industries. This is a result of officials effectively using the know-how on implementing political, technical, and corporate management learned from observations from their training in Japan. (4) Trainees learned efficient management capabilities for areas like managing information on solid waste, training legally-qualified human resources, and administrative organizations and structures for solid waste. In addition, counterparts at a solid waste center achieved results such as publishing a book entitled "Japan's Solid Waste Management and Recycling Technology." This offered an introduction to people in China to Japan's legal system and technologies related to waste disposal and recycling based on knowledge and information acquired through Japanese cooperation.

Under the Project for Environment Friendly Society Building (2016–2021), activities were carried out geared towards offering proposals for promoting the management of electronic waste, waste automobiles, and more, with a solid waste management center serving as the counterpart. It organized information, policies, and know-how related to the management of and technologies for solid waste in Japan and China, and provided cooperation to promote the proper management of solid waste.

(2) Impact on Companies

Through ODA to China, Japanese technologies such as production technologies, recycling technologies, and disposal technologies were adopted at Chinese companies. Cases where these had an impact with regard to changing the companies' organizations will be introduced here by dividing them up into the topics of air pollution countermeasures and waste management.

1) Air Pollution Countermeasures

JICA strengthened the environmental management capabilities of companies by establishing training centers and training teaching personnel

By way of technical cooperation aimed at improving environmental management capabilities, JICA established four educational institutions specializing in environmental management. Through the dispatch of Japanese experts, technical transfers were performed to foster teachers, who in turn held training in an effort to disseminate this knowledge to engineers at factories and companies.

(i) Dalian Energy Education Center (July 1992–January 1999)

Since around the 1980s, the Chinese government had been establishing energy-saving countermeasures to serve as priority challenges for promoting various modernization projects. The China Dalian Energy Education Center was established to embody these challenges. Its objectives were to foster technical experts in energy conservation and to disseminate advanced energy technologies for Japan and other countries from around the world all throughout China as a center for highly-specialized energy education. The center has trained a total of 2,500 experts in energy-saving technologies in areas such as metallurgy, the chemical industry, and machinery. The center has continued to train experts even after the conclusion of the project, and has even begun offering second-country training based on technical cooperation from the Japanese

government.[27] In addition, the center performs examinations for conserving energy at companies within Dalian City, thus contributing to technical reforms, technological innovations, and cutting costs for the companies and factories that have undergone these examinations. A number of positive impacts have been confirmed from this, including demonstrating the effects of promoting reductions of CO_2 and SOx emissions from reducing the amount of coal consumed has on environmental conservation.

(ii) Technology for the Control of Waste Gases in the Petrochemical Industry (November 1996–October 2001)

As part of its measures for air pollution, JICA provided training to engineers at the SINOPEC Dalian Research Institute of Petroleum and Petrochemicals, which is a research institute under the direct affiliation of the China Petroleum and Chemical Corporation. This training was for expert personnel related to technologies for properly treating the waste gases (waste gas analysis, catalytic combustion, hazardous mist, absorption of foul-smelling gases) from petroleum and chemical engineering plants, for which it had been slow in taking countermeasures. The SINOPEC Dalian Research Institute of Petroleum and Petrochemicals established a specialized dissemination institute for its science and technology management divisions. It proactively promoted the dissemination of technologies transferred through the project to affiliate companies of the China Petroleum and Chemical Corporation, with the waste gas treatment facilities of ten such affiliate companies having been improved through this.

(iii) Environmental Protection and Safety Training Center of Coal Industry (March 1997–February 2002)

As China had been dependent on coal for 70% of its primary energy, improving its safety technologies and structures regarding the impact this was having on air quality and the frequent disasters at coal mines had become a pressing challenge. This project established the Environmental Protection and Safety Training Center of Coal Industry in Qingdao City. Here, support was provided for the training of human resources through efforts like establishing and operating training courses related to environmental protection technologies and safety targets related to coal, setting in place a structure to provide consulting to the surrounding coal mines, and more.

Through training at the center that was established, 200 teaching personnel at safety and environmental protection training institutes within the province and approximately 17,000 safety and environmental protection personnel within the province were fostered. This has provided 100% coverage for the mines affiliated with the Yankuang Group, which is the responsible organization for the project, as well as 70% coverage for the other state-owned coal mines located in this district of Shandong Province. Through this, it has played a major role in disseminating coal environmental protection and safety technologies in Shandong Province.

(iv) Project for Improvement of Environmental Protection Technology for Metallurgical Combustion (September 2002–August 2007)

Given the steel industry's desulphurization rates, delay in taking countermeasure to SOx, and high energy

[27] Summary of evaluation results (FY 2001)

consumption rates, its burning of fossil fuels and inadequate anti-pollution measures have been leading to increased emissions of atmospheric pollutants. Accordingly, reducing energy consumption by improving combustion efficiency has come to pose a pressing challenge.

In its 10th Five-Year Plan, the Chinese government set forth a specific, quantitative target of reducing emissions of major pollutants by 10% versus 2000-levels as a guideline for the steel industry. It also set forth the specific, quantitative target of lowering the amount of standard coal equivalent energy consumed per ton of crude steel produced from 920 kg to 800 kg with a target date of 2005. To achieve these targets, the Technology Center of Environmental Protection and Energy Saving of Metallurgical Combustion was established and human resource development was carried out. This was done with the goal of transferring technologies for environmental protection to the steel industry, which has particularly poor thermal efficiency, developing human resources in this sector, and disseminating environmental protection technologies to steel plants within the country.

Demonstration experiments for environmental management were carried out at companies that led to low-NOx combustion technologies and curbing net emissions

The Project for Total Emission Control of Nitrogen Oxide in Atmosphere (March 2013–March 2016) was a project that worked to improve techniques for curbing NOx through a number of initiatives, with the goal of thereby ensuring widespread use of advanced technologies and techniques for curbing NOx throughout urban areas in China. These initiatives included preparing technical guidelines related to curbing NOx, making use of technical guidelines, and improving techniques for determining the effects of curbing NOx by performing simulations on the dissemination of air pollutants.

Xiangtan City in Hunan Province was selected as the city to perform the simulation, and a demonstration experiment was performed at various companies serving as emission sources of NOx (coal-fired power generation / thermal supply facilities, cement manufacturing facilities, steelworks sintering / coke furnaces, industrial boilers) as model companies within the city. An analysis was performed based on the data from this experiment, and the results were reflected in policies.

The technologies for and experiences with things like low-NOx combustion reviewed through the project were introduced when considering technologies for improving air pollution in other provinces, such as at companies that manufacture boilers and kilns (both state-owned and privately-owned).

Furthermore, with this project techniques were used to perform trial calculations of the air quality and volume of pollutants using dispersal simulations from Japan in an effort to compile the techniques for determining this into a handbook and disseminate them.[28]

2) Waste Management

The implementation of countermeasure via ODA loans led to environmental measures and the promotion of industry from subsequent business activities

The Liuzhou Environmental Improvement Project promoted environmental measures for Liuzhou Iron & Steel (Group) Corp. and Liuzhou Chemical Industry Co., Ltd., which are representative companies from the

[28] Material provided by JICA

city, in its initial stage. This led to subsequently enhancing environmental measures for these companies. The Liuzhou city government has used ODA loans to address environmental countermeasures in an aggressive manner by closing ten small and medium-sized enterprises like a spun yarn dyeing factory and others that had been major sources of pollution in 2007. At the same time, it had been working to foster model companies with the goal of promoting initiatives for environmental measures at major companies that consumed large quantities of energy. Based on a request from Liuzhou City, Liuzhou Iron & Steel (Group) Corp. began making full-scale investments in environmental measures starting from 2001, and has come to be regarded as one of the model companies for a circular economy.

The Hunan Municipal Solid Waste Treatment Project and Anhui Municipal Solid Waste Treatment Project entrusted the operation of the final disposal site, leachate treatment facility, as well as the collection and transportation services necessary for the implementation of the projects to private companies. This was partially borne from the Chinese government's policy of proactively promoting the use of the private sector for public services by the departments currently handling them so that governmental agencies could focus on administration. Higher-level household waste disposal was promoted through efforts like incineration treatment, methane gas generation, and food waste disposal. The majority of these were carried out by public-private cooperation, making this a case where the provision of ODA loans led to fostering related industries.

Cleaning done by a staff member
(Shuangpai County, Hunan Province)
(photo : Ex-Post Evaluation Report)

A household waste collection and transport service provider (Anhui Province)
(photo : Ex-Post Evaluation Report)

JICA has carried out initiatives with companies aimed at conserving the resource inputs in production processes and properly treating waste as well as for its effective use and recycling

The (1) corporate environmental supervisor system addressed via the Promotion of Circular Economy Project was an attempt to establish organizations comprising corporate environmental supervisors and general monitors. These are people furnished with knowledge of laws and regulations related to environmental conservation and skills related to technologies for environmental conservation, with the move designed to have them undertake independent environmental management within companies. Over three years starting from FY 2008, 42 rounds of trial-run training sessions were held that were mainly aimed at officials from national-level priority companies for pollution prevention. A total of more than 6,700 engineers took part in these, earning qualifications as provisional corporate environmental supervisors and setting about

their professional duties as said supervisors in their respective posts. The trial-run training from FY 2010 onward began introducing case examples from companies in addition to the subject matter on solid waste. The aim had been to institutionalize this and mandate said qualifications for national occupations. However, based on a directive from the State Council, the trial-runs that had begun in 2008 were disbanded via a decision by the Ministry of Environmental Protection in December 2015. Reforms of the qualifications for skilled occupations were carried out throughout the country, and a policy was set forth whereby the government would not provide certification for said qualifications. As a result, it is believed that the decision was reached that it would be difficult to mandate these qualifications and institutionalize them. With respect to improving the environmental management capabilities of companies, such efforts were passed down to the activities to review wider-ranging corporate management policies, such as for green supply chains, carried out through the Project for Environment Friendly Society Building. The corporate environmental supervisor system received continuous support ever since it was introduced in China in 1998 up until 2013. However, the fact that it could not be promptly instantiated into law has been pointed to as a factor behind why it turned out the way it did.[29]

Furthermore, regarding the government's green purchasing from this project, technical reports were prepared related to promotion plans for technical support, methods for assessing the results, and the likelihood of passing legislation for governmental green purchasing in partnership with private companies in China. The green purchasing mentality is taking root among Chinese companies and throughout society, as evidenced by the rising awareness when it comes to green purchasing by companies. Efforts such as the rising participation of Chinese companies and shift to products that comply with green purchasing have contributed to promoting and developing green purchasing in China. When it comes to promoting the installation of model eco-industrial zones for arterial industries from (3), the construction of eco-industrial models for arterial industries was promoted based on the Standards for Eco-Industrial Zones for Arterial Industries (Trial Run). The project succeeded in enhancing the capabilities of the relevant officials, such as by promoting understanding of policies and programs and by taking in know-how from the Japanese-Chinese Eco-town Policy Research Society and short-term experts. As for promoting the proper management of waste from (4), standardized methods were established for taking simple measurements of dioxins, and simple measurements of dioxins were adopted that kept costs in check at the incineration facilities of cement companies and the like. This led to improving the awareness and understanding of the techniques used by dioxin researchers throughout China.

[29] Interview with Mr.Hideaki Koyanagi (December 4, 2019)


A plastic recycling factory operating in the Shenyang Eco-Industry Zone for Resource Recycling and its products

(photo: Report on the Survey to Determine a Cooperative Framework for Promoting the Establishment of Eco-Industrial Zones for Arterial Industries)

2.2.2 Contributing to the Development of Laws and Policies regarding Environmental Management

Taking an overhead look at China's legal structures for the environment reveals that it set in place environmental policies regarding the following sorts of legal aspects from relatively early on. These incorporated advanced content, and the claim can even be made that China has environmental policies that put it at the head of the class among developing countries.[30] This can be attributed to China's unique characteristics that it has a comparatively large environmental impact as a result of its rapid economic development and production processes that have a heavy impact on the environment. However, although the country has excellent environmental policies, one point that warrants attention when it comes to improving the environment is that its laws do not exert any control over subordinate regulations, but rather the government scrupulously handles everything from enacting to executing regulations. In particular, as the thinking in local governments gives priority to economic development, there are cases where environmental policies according to the legal stipulations are considered secondary, or are not even implemented. The challenge has been one in which resolving environmental problems will require furnishing environmental administrative personnel with the ability to execute legal structures and changing the implementation structures at environmental administrative agencies.

The 10th Five-Year Plan (2001–2005) posited that energy consumption would grow by 3.26% on average per year, and planned to lower consumption per gross domestic product (GDP) unit by 15–17% versus the levels at the end of the 9th Five-Year Plan. However, this actually grew by 10% on average per year, with the consumption per unit of GDP rising 7% and rising 27% versus the planned targets as well. SOx emissions were supposed to be kept down to 7.49 million tons, but rose to 25.49 million tons in 2005 for a 27% increase versus 2000 levels.[31] This rapid economic growth fueled by such energy consumption has brought about tightening supply and demand conditions for electricity, resources, energy, and transportation, as well as environmental devastation. The fact of the matter is that the model by which the Chinese economy is growing is still a careless one that entails an enormous impact on the environment. It has also become clear that it cannot hope to achieve sustainable economic development with its traditional society geared towards mass

[30] "China's environmental problems and the future of Japanese-Chinese environmental cooperation," Katsunori Sugimoto (September 2008)

[31] http://www.esri.go.jp/jp/archive/e_dis/e_dis170/e_dis170i.pdf (accessed December 12, 2019)

production, mass consumption, and mass disposal. Based on a reflection on this, the 11th Five-Year Plan aimed to conserve resources and energy, and try to shift to a growth model that emphasized environmental and ecological protection. For this purpose, the Chinese government set forth the specific targets of reducing its consumption per unit of energy by around 20% and cutting net emissions of major pollutants by 10%. It has recognized the need to balance environmental and economic concerns, and has begun initiatives to establish a recycling-oriented society.

The next section will discuss what sort of support Japan has provided for setting in place laws and policies in response to the aforementioned environmental measures in China, and what sort of impact this has brought about, based on a review of documents and interviews with those involved.

(1) Japan's Environmental Cooperation and its Impact

Japan provided support for creating the Environmental Protection Law and revising the Air Pollution Control Law as the foundation of environmental protection in China

China, which launched its reform and open-door policy in 1978, achieved rapid economic growth while upholding a socialist market economy in the 1990s. On the other hand, legislation that guaranteed fair and free socioeconomic activities was not sufficiently drawn up. Accession to the World Trade Organization (WTO) in 2001 led to an urgent requirement for relevant legislation in accordance with international standards. The Chinese government established a goal to move forward with the legislation required for a market economy by 2010.[32] Under such circumstances, the focus of the Official Development Assistance (ODA) provided to China became governance and legal infrastructure development support. Prior to providing assistance in this field, JICA conducted a hearing on the requirements for economy-related legal infrastructure development support to confirm its requirements with both the Chinese and Japanese Economic Associations. During the period from November 2004 to November 2009, it launched the first legal infrastructure development project in China, the Economic Law and Company Law Development Project, which contributed to a revision of the Company Law and the Anti-monopoly Law legislation.

During the training in Japan in 2010, the advisors on Civil Procedure Law and other laws related to civil affairs (2010–2013) had an impact on environmental management being incorporated into the legal infrastructure development project as part of the ODA provided to China. During the training, relief for the victims of four major pollution lawsuits and the government's responses were shared by the Japan Federation of Bar Associations (JFBA) and Non-Governmental Organizations. Using these as a reference, a public interest litigation system was established for the purpose of providing relief for environmental pollution victims under the new Civil Procedure Law in August 2012.

The country-focused training of its follow-up project, the "Administrative Litigation Act and Other Administrative Laws" (FY 2012–2015) was the training project, as it was called, being implemented with the goal of revising the Administrative Litigation Act. However, in the autumn of the first fiscal year, the Chinese regime changed, and one of the goals under the new regime was to incorporate Beautiful China, which resulted in the environment being added as one of the focus areas for the legal infrastructure

[32] Japan International Cooperation Agency "Japanese Methods That Change the World "Establishment of Laws" Legal Infrastructure Development Support Together with Developing Countries" (June 2018)

development program in the National People's Congress. Moreover, as the issue of PM2.5 air pollution was being globally addressed during the period from the end of 2012 to January through March 2013, a revision to the Environmental Protection Law became a priority issue. Therefore, from January 2013, through a series of exchanges of opinions and training in Japan taken as steps toward the revision to the Environmental Protection Law, a law reform proposal was brought forth. As a result, the revision was established on April 24, 2014. In the amended Environmental Protection Law, administrative supervisory responsibilities and environmental monitoring systems were stipulated. In addition, as a specific measure that could lead to compliance, information disclosure on the corporate environment was stipulated, which put any companies in violation on a disclosure blacklist.

When revising the Environmental Protection Law, the Japanese experiences that China used as a reference included the "concept of sustainable development" which was provided in a lecture by Tokyo Keizai University during the training in Japan, as well as "environmental public interest litigation" which was also launched in Japan by the JFBA and referenced Germany and the United States.[33] These represent the latest information for Japan, and this data was provided to the National People's Congress.[34]

Because the Environmental Protection Law is a basic law, for the next phase, revisions to the control laws in individual fields such as air, water, and soil became the challenge. From the perspective of benefits to Japan, the revision to the Air Pollution Control Law was selected as the next challenge. While implementing the project, an exchange of opinions was conducted from May 2015, and drafting support was provided during the training in Japan, which resulted in establishing the revision on August 29, 2015. Although the new law was thoroughly amended, the project made special contributions to air pollution control standards, goal setting, responses to pollution beyond the ministries, and added portions for monitoring and legal responsibilities.

Japan provided legislative support for drafting a revision that reflects socioeconomic conditions and today's international standards

"The Project on Legal Development for Improvement of Market Economy and People's Wellbeing" (2014–2020) is aimed at improving people's well-being (consumer protection, strengthening environmental protection, improving people's livelihoods, etc.) and supporting Japanese companies' activities. In response to China's rapid socioeconomic growth, new types of challenges that could not be solved by existing laws and regulations were increasing. Therefore, owing to the urgent need for revisions to laws that reflect socioeconomic conditions and today's international standards, JICA has provided support for legislation and revision within the socioeconomic field using Japan's legislative experience as a reference.

According to Japanese experts, while Japan had overcome its pollution problems, urban environment, resource problems, and global issues in phases of about 10 years, China is facing the need to respond to these challenges almost simultaneously. As stated by Shirade,[35] only if JICA's environmental project and its legal infrastructure development project collaborates as two halves of the whole, can truly enforceable

[33]Report on investigations into the implementation of the Environmental Protection Law (November 2016)
[34] Interview with Mr. Hiroyuki Shirade (September 25, 2019)
[35] Ibid.

environment law regulation tailored to the actual state of affairs in China be established.

Launched in 2004, the provision of law infrastructure development support covered the establishment and revision of laws and regulations concerning, not only the field of economics but also environmental control, and contributed to the formulation of a revised draft for the Environmental Protection Law which served as its foundation.

(2) Circular Economy Promotion Law

Japan's wide range of reliable collaboration areas moved Chinese government officials, leading to the establishment of the Circular Economy Promotion Law

The Circular Economy Promotion Law (adopted in August 2008 and made effective in January 2009) was enacted for the purpose of promoting the development of a circular economy, which enhances the efficient use of resources, protects and improves the environment, and realizes sustainable development by reducing, reusing and recycling waste. During the process by which this law was enacted, Japan provided full cooperation.

During the Ministerial Conference on Environment and Development in Asia and the Pacific held in Kitakyushu in September 2000, the Director of SEPA, who attended the conference, showed an interest in the Basic Act on Establishing a Sound Material-Cycle Society that was promulgated in Japan in 2000. In October 2002, a speech by then President Jiang Zemin resulted in a rapid movement forward toward a circular economic policy, which became emphasized among the other national policies. SEPA pointed out that moving forward toward a circular economy is critical to economic development in China, and as a measure to balance between environmental and economic growth, China was in the process of shifting toward a circular economy.

At that time, an expert was dispatched to Guiyang, one of the model cities in the Environmental Model City Projects (2001–2002), to establish the foundation for a circular economy. Moreover, during the Sino-Japan Friendship Center for the Environmental Protection Project Phase 3 (2002–2008), at the request of SEPA, addressing a circular economy as a propriety issue in 2003, through joint research, Japan and China began to search for a circular economic development model tailored to the actual state of affairs in China. Since those days, full-fledged activities have been initiated while taking into consideration the establishment of the Circular Economy Promotion Law. In June 2003, based on Japan's Basic Act on Establishing a Sound Material-Cycle Society, one expert created a textbook in Chinese on the circular economy, titled "Introduction to the Japanese Circular Economy Legal System. "Centering on Guiyang, Japan conducted training, advertisements and educational activities, which were later broadly introduced throughout China. In 2003, SEPA determined Guiyang to be the first circular economy city in China, and Japanese experts participated in building the framework for the first Chinese regulations on the circular economy, "Guiyang's Regulations on Promoting Circular Economy City Development." In Guiyang in 2005, the Deputy Director of SEPA had participated in training in Japan on the circular economy, and based on this Japanese experience, execution of the regulations was crystallized.

As for the central government, President Hu Jintao announced during a speech that a resource-saving society would be built. Once the regulations were enacted in July 2004, those concerned from all over the

country came to visit Guiyang. In 2005, with the goal of enacting a law which followed Japan and Germany, the National People's Congress undertook building a draft of the Circular Economy Promotion Law. In July 2005, the State Council proposed "certain views on the development and acceleration of a circular economy" to indicate the government's specific goals. The National 11th Five-Year Plan, approved at the 10th Session of the National People's Congress in March 2006, demonstrated a shift in economic growth methods and placed an emphasis on the circular economy.[36]

Meanwhile, at the request of SEPA, the Center for Environmental Protection Project jointly launched "research on the Chinese circular economy development model and policy framework" and developed human resources for a circular economy with the goal of pursuing a circular economy development model tailored to the actual state of affairs in China. In addition, to promote a circular economy, JICA dispatched experts to the Center for Environmental Protection (2006–2008), and developed both central and local administrative officials in the field of the environment through training in Japan and domestic training in China. The training in Japan, "Training on promoting the establishment of a circular society," made detailed preparations which included lectures on Japan's experiences and policies on the circular economy, and comparisons with China. With participation from 250 people over five sessions, the training in China provided opportunities to learn about Japan's experiences, ways of thinking, and major policies on establishing a circular society. Moreover, JICA gave lectures on Japan's ways of thinking, the current legal system, the organization of concepts regarding Japan's circular economic promotion policies to those concerned in the Economy Law Office who were responsible for assessing the Circular Economy Law (draft) in the National People's Congress. It also planned and coordinated training in Japan for those in charge, and cooperated with China to support investigations into the circular economy law system. JICA also provided ongoing cooperation for the ongoing shift toward a circular economy society, such as the "Circular Economy Promotion Project," the "Project for Promotion of Municipal Solid Waste Recycling," and the "Project for Environment Friendly Society Building."

In this way, ranging from proposing the requirements for establishing a circular economy to popularizing the concept of a circular economy, research on the circular economy tailored specifically to China, and indirect support for formulating the circular economy law, Japanese cooperation has had an enormous impact on the whole process until the establishment of the Circular Economy Law. Because merely improving the emissions source at terminals will not achieve sustainable development, JICA has conveyed the requirements for a circular economy to its counterparts from the early stages, involving all those concerned at the central and local governments. Japan's ongoing support tailored to these requirements has resulted in having such an enormous impact.

(3) Urban Waste Disposal

A plan based on detailed surveys on the current situation of urban waste disposal and policy recommendations produced from the roadmap lead to the formation of a circular economy in China

Under the ODA to China, with the goal of contributing to an improvement in the local detoxification rate

[36]Chikashi Kishimoto "Development of a Circular Economy in China" (June 2012)

through loans, a project for improving the urban waste disposal systems has been implemented in inland areas, such as Guizhou Province, Hunan Province, and Anhui Province. While the need to establish an efficient disposal system and improve the detoxification rate have been consistently displayed, waste disposal issues were brought to the fore, such as the discharge of pollutants to surrounding areas, and the inappropriate reuse of urban waste due to delays in development of a comprehensive circular usage system and an appropriate disposal system for urban waste. In 2007, per-capita GDP reached 2,694 dollars.[37] At the phase of a decline in the primary sector and an abrupt acceleration of industrialization, it became a requirement to aim for sustainable development while using natural resources efficiently by reducing, reusing and recycling.

The Sino-Japan Friendship Center for Environmental Protection Projects provided cooperation on the theme of solid waste, which included sharing the legal system and technology involved in Japan's waste disposal and recycling, and conducting a seminar on solid waste categorization and management methods, which the Solid Waste Management Center had been investigating. In 2008, during policy dialogue on Japan-China waste recycling, Japan received a request from China to develop human resources for a local solid waste management center. Receiving this request, through the experts dispatched to the Center for Environmental Protection, opinions were exchanged on the future of circular economic policies and waste management with the Ministry of Housing and Urban-Rural Development, which has jurisdiction over waste disposal,[38] and the National Development and Reform Commission (and Academy of Social Sciences). Later, JICA provided a variety of support that included giving a lecture to share the experiences of general waste disposal in Japan.

Against this background, the Project for Promotion of Municipal Solid Waste Recycling (2010–2015) was launched with the National Development and Reform Commission under the jurisdiction of the State Council as the counterpart. It was aimed at developing both a national policy structure and legal system through implementing policy research and pilot projects based on information collected both domestically and abroad concerning the circular utilization of urban waste. The National 12th Five-Year Plan (2011–2015) set the goal of "Environmentally-friendly resource-recycling social development," and establishment of a circular utilization system of urban waste tailored specifically to China, which was a top priority issue for developing a circular economy in China. Although this project involved technical cooperation, it also supported policy formulation by dispatching an expert team without providing any equipment. Cooperation with the National Development and Reform Commission involved the establishment of laws, regulations, policies and standards as a counterpart and was highly influential. It was a successful case that made an immediate impact on the environmental policies in China.

With the cooperation of a team of Japanese experts, this project began with implementing detailed surveys on the current situation of disposal and circular utilization of urban waste, food waste, wrapping waste, and waste tires in the target cities of Jiaxing, Qingdao, Guiyang, and Xining. Based on accurate data gained from these surveys, the current situation was assessed. Following the results, the "flow of waste material" was created as a summary for the strategic plan and roadmap for the area's waste circular utilization. The outcomes of the reliable surveys and assessments were made possible with Japan's cooperation and were

[37]https://www.ceicdata.com/ja/indicator/china/gdp-per-capita (accessed December 17, 2019)
[38]Established after reorganizing the Ministry of Construction in 2008.

highly evaluated as a progressive approach to waste management. JICA received much feedback from the field which clarified both the activities required and the priorities when promoting waste circular utilization and measures, and these measures then became easily implemented by demonstrating specific directions in the activities and their processes.

Jiaxing: survey at a collection area
(photo: Project Compretion Report)

Guiyang: separation containers and bulletin board with separation guidance
(photo: Project Compretion Report)

With Japan's cooperation, proposals tailored to the specific current situation in China were submitted to the National People's Congress by the counterpart for establishment as regulations and laws. It demonstrated increasingly observable results. In response to the requirements that China was experiencing at that point, such as how to build a waste treatment plant without opposition from residents and how to dispose of automobiles, Japanese experts made sincere efforts and had them learn about the Japanese experience through training in Japan. In many cases, using the Japanese experience as a reference led to the establishment of regulations and laws.

Based on the flows of waste material in the field of urban waste, the National Development and Reform Commission, the Ministry of Finance, the Ministry of Environmental Protection, and the National Bureau of Statistics jointly promulgated the Evaluation Indicator System of Circular Economy Development (2017 Edition) in December 2016, a macro evaluation method, and it was decided that the evaluation indicator and method for evaluating circular economy development at the regional level would be developed in the future.

2.2.3 Impact and benefits for Japan

(1) Effects on the transboundary movement of pollutants

It has been confirmed that China's recent improvements in air quality have resulted in an improving trend for Japan's air quality

Data that verifies quantitatively the effects of providing ODA to China on air quality control is difficult to gain using current technology. In this section, we will share the report, "4th Stage of the Project for Long–range Transboundary Air Pollutants in Northeast Asia (2013–2017)"[39] (Ministry of the Environment), which indicates the overall air quality is showing an improving trend in both Japan and China.

The report concluded that regarding changes in air quality, the annual average concentrations of SO_2, NO_2,

[39]https://www.env.go.jp/press/107451.html (accessed December 10, 2019)

PM2.5, and PM10 have shown a decreasing trend in recent years at monitoring sites in Japan, China and South Korea, and significant improvements have been demonstrated for each of these materials, especially in China (refer figure 6 to 9).

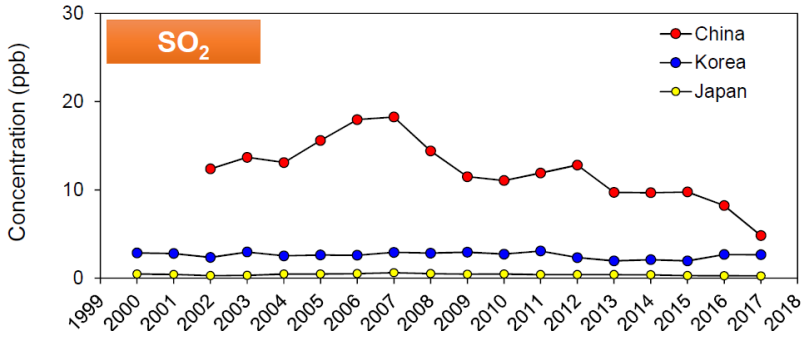


Figure 6 : Yearly mean oncentrations of SO2 in long–term monitoring period in China, Korea and Japan. Concentrations at the individual sampling sites were averaged

Source: "4th Stage of the Project for Long–range Transboundary Air Pollutants in Northeast Asia (2013–2017)"[40] (Ministry of the Environment)

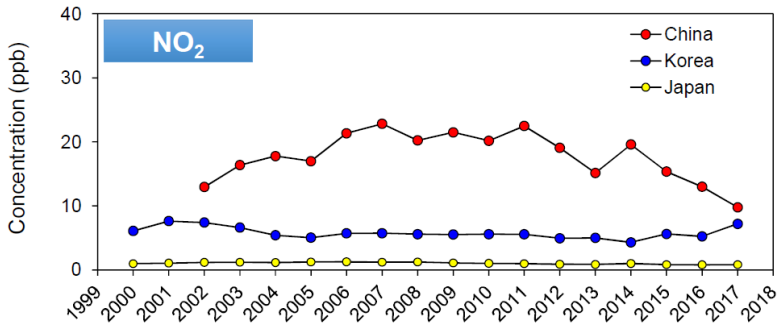


Figure 7 : Yearly mean concentrations of NO2 in long–term monitoring period in China, Korea and Japan. Concentrations at the individual sampling sites were averaged.

Source: "4th Stage of the Project for Long–range Transboundary Air Pollutants in Northeast Asia (2013–2017)"[41] (Ministry of the Environment)

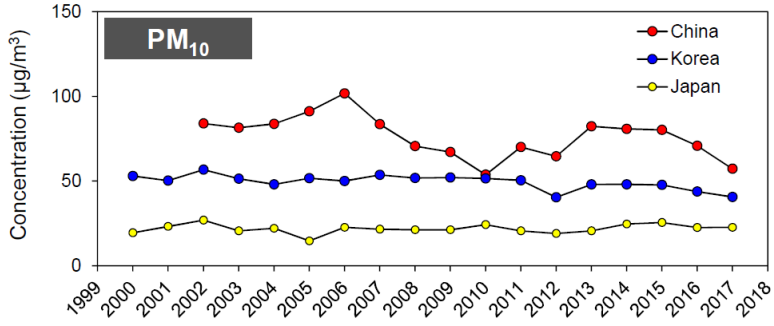


Figure 8: Yearly mean concentrations of PM10 in long–term monitoring period in China, Korea and Japan. Concentrations at the individual sampling sites were averaged.

Source: "4th Stage of the Project for Long–range Transboundary Air Pollutants in Northeast Asia (2013–2017)"[42] (Ministry of the Environment),

[40]https://www.env.go.jp/press/107451.html (accessed December 10, 2019)

[41]https://www.env.go.jp/press/107451.html (accessed December 10, 2019)

[42]https://www.env.go.jp/press/107451.html (accessed December 10, 2019)

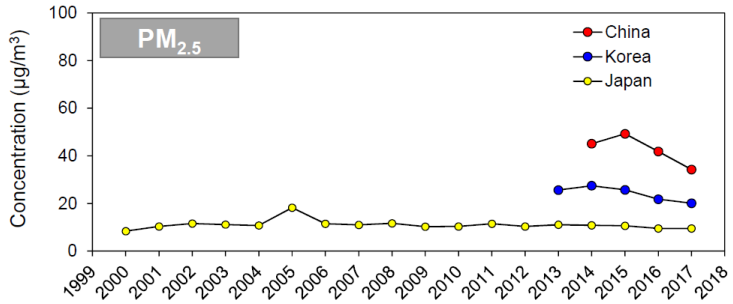


Figure 9: Yearly mean concentrations of PM2.5 in long–term monitoring period in China, Korea and Japan. Concentrations at the individual sampling sites were averaged.

Source: "4th Stage of the Project for Long–range Transboundary Air Pollutants in Northeast Asia (2013–2017)"[43] (Ministry of the Environment),

In the research study, transboundary PM2.5 was simulated for 2017. Based on the results, a Source-Receptor relationship for PM2.5 was shown in the report. The self-contributions to the PM2.5 concentrations in China, South Korea and Japan are 91.0%, 51.2% and 55.4%, respectively, and domestic emissions dominate the PM2.5 concentrations. On the other hand, the report indicated that the influences of PM2.5 are mutual between China, South Korea and Japan. China's contributions to major cities in South Korea are 32.1%, and to major cities in Japan are 24.6%. South Korea's contributions to major cities in Japan are 8.2%, and to major cities in China are 1.9%. Japan's contributions to major cities in China are 0.8%, and to major cities in South Korea are 1.5%.

As for the impact on Japan, if air pollutant emissions are reduced in China, it is expected that this will reduce the levels of air pollutants in Japan proportionally. Therefore, contributions to air quality improvements in China through the ODA provided to China partially play a role in the reduction of air pollutants.

(2) Case of Japanese-affiliated companies expanding business into China

Using Japanese equipment for the ODA to China led to an increased number of inquiries to Japanese-affiliated companies

A Japanese private company received an order for a garbage transfer facility in Xian through the grant aid scheme, the "Project for Improvement of Solid Waste Management in Xian City." This served as an opportunity for it to expand its business into China and to establish a joint venture, which led to more than 160 inquiries on the manufacturing and sales of transfer facilities.

A garbage transfer facility is one of the more effective waste disposal systems with the goal of streamlining collection and transfer, as well as reducing costs. Along with urbanization, the number of waste collection areas increases with the expansion of urban areas. In cities with a wide collection area, the installation of a garbage transfer facility can result in streamlining collection and transport work, and reducing costs, which enables garbage to be loaded into large carriers from small-medium carriers. As a transfer facility is capable of accepting any type of garbage, this is beneficial, especially in areas where systems for waste separation,

[43]https://www.env.go.jp/press/107451.html (accessed December 10, 2019)

reuse and recycling are not sufficiently developed.

Xian was the first city that implemented garbage transport using a transfer in China and demonstrated the effectiveness of waste transfer. Representatives from many other cities visited Xian, which came to be highly evaluated as a use case for developing environmental protection education. Representatives from Chongqing, who visited Xian to see its effects, earnestly requested a Japanese company to expand its business into Chongqing. In 2006, a joint venture with China was established to construct a transfer facility through this company. Based on the results, this joint venture achieved impressive performance domestically and is now engaged in the sales of garbage transfer facilities and garbage trucks, both domestically and abroad.

(3) Collaboration and personnel exchange with local governments

Connections between local government friendship cities developed into collaboration in the field of environment management.

While the Japanese and Chinese governments have been deepening their exchanges, exchanges have also been promoted between local governments and Chinese cities that have entered into friendship city agreements. There are several examples where friendship city relationships have developed into collaborative relationships including in the field of the environment.

A representative example is Kitakyushu City. In 1996, Kitakyushu City implemented a development research project for the "Dalian City Environment Model District Development Plan" with its sister city, Dalian City in Liaoning Province.[44] This is the first example where a local government participated in an ODA business, as Kitakyushu City cooperated in the fields of environmental administration (legal system and organization system) where they have experience and technology, environment monitoring, sewage treatment, and low-emission production technology for plants (cleaner production), and dispatched a total of 67 experts into the field for development research. The results have contributed to the formation of the "Environment Model City Project (Dalian)" through the loan assistance. Moreover, Kitakyushu City has been engaged in a recycle promotion project aiming for a recycling society and cooperated with the recycling economy promotion projects of Dalian City, Tianjin City, and Qingdao City. The implementation of providing assistance in the field of environmental technology to China was recognized and Kitakyushu City won the "Global 500"[45] award from the UN Environment Program (UNEP) in 1990 while the mayor of Kitakyushu City won the Chinese National Friendship Award in 2001. The Friendship Award is given by the Chinese Government to foreign nationals who have contributed to the development of China's culture, economy, etc., and it was for the first time that the head of a Japanese local government was recognized.

In Kitakyushu City, through the initiative of its citizens in 1980, the Kitakyushu International Techno-cooperative Association was established in order to promote the development of Kitakyushu City into an international workshop city as well as an industrial trade city by transferring overseas the environmental technology and industrial technology that have been acquired through the process of industrialization and

[44] Implemented from December 1996 to March 2000 in collaboration with UNICO INTERNATIONAL CORPORATION.
[45] The system where UNEP recognizes an individual or a group that has contributed to the protection or improvement of the environment, which is a foundation for sustainable development. The ceremony is held on June 5, World Environment Day, every year.

overcoming pollution. The Association has proactively dispatched experts to China and implemented a project to receive trainees. In 1998, the Kitakyushu Interdependent Business Consortium for Sustainable Development was established for the purpose of using both tangible and intangible technologies related to the environment, along with the energy industries of Kitakyushu City in order to promote the creation of new businesses and the development of overseas business through international cooperation. The Consortium, which has 52 member companies (as of July 2019), has planned and implemented observation groups made up of local companies and business matching, and has accomplished results such as some member companies having entered the Chinese market. This is how Kitakyushu City has strategically established several organizations to develop cooperation with the private sector centering on environmental cooperation, and become popular as an environment city both at home and abroad through the synergy of private-public cooperation. In 2018, the "Sustainable Development Goals (hereafter SDGs) Future City Plan" was formulated and ambitious efforts were set as policies such as increasing the amount of renewable energy introduced and amount of household waste emissions reduced, etc. They have also set the goal of increasing the number of trainees they receive for the development of environmental human resources in Asia to 10,000 in total. Thus, continued provision of assistance to various countries including China is expected.

Some examples have been observed where the fields involved in using and developing human resources were provided as an example of a benefit to Japan through cooperation between local governments. For instance, some examples have been reported such as sewage treatment engineers who were employed in Kitakyushu City but had no field to apply their design and construction technologies as the number of new constructions had decreased, and were able to have their experience used in the field of new construction businesses in China. With regard to the development of younger human resources, younger engineers from the Yokohama City Waterworks Bureau, etc. who had not been able to acquire practical experience of planning and designing because the number of new businesses had decreased, were able to accumulate experience by being engaged in businesses in China.

(4) Cooperation businesses between Japanese and Chinese cities

Sister-city relationships between Japan and China are used for cooperative efforts toward improving the atmospheric environment in China

At the beginning of 2013, air pollution occurred where the major pollutant was PM2.5. Yellow sand also appeared at the end of February while the density of PM10 increased, creating a combined pollution situation. Taking matters seriously, the Chinese government accelerated the development, etc. of a monitoring system and initiated the formulation of an air pollution prevention action plan.

On the other hand, anxiety about the transboundary movement of air pollutants also spread in Japan, and the Japanese government dispatched a joint mission that consisted of the relevant ministries, agencies, etc. to China, held meetings with the environmental conservation department and the like, and exchanged opinions on air pollution collaboration. The "Collaborative Project between Japanese and Chinese Cities to Improve the Chinese Atmospheric Environment" centering on cooperation between Japanese local governments and Chinese cities was decided to be implemented focusing on the fact that the Japanese experience and know-how of countermeasures against air pollution had been accumulated in the local governments. The project

forms the framework of interaction and collaboration mainly among administration officials in each city. The platform institution in Japan is the Institute for Global Environmental Strategies while the corresponding institution in China is the Environmental Protection Center.

(5) Exchange promotion between Japan and China at the private level

The Japanese and Chinese NGOs worked together to contribute to environmental conservation activities and environmental education.

Exchanges at the private level on environmental education between Japan and China are also being promoted. For instance, when the "MTA Tianmo Music Festival 2018" was held, the "No waste navigation" activity was conducted during the festival period. This is one of the environmental conservation activities of "iPledge,"[46] the Japanese non-profit organization (hereafter "NPO") and is an effort to improve the environment by approaching both the "awareness" of people, and the "system" of events, from the angle of waste. Japan Overseas Cooperation Volunteers (environmental education team) had been dispatched to "Friends of nature"[47]and planned the activity at the festival. There were 7 Japanese people who participated as volunteer coordinators, 8 people participated from the "Friends of nature," while 64 general volunteers and 7 interpreters joined for awareness-raising activities on environmental conservation, which was covered in both the Japanese and Chinese media. This is how the environmental conservation activities in which Japan Overseas Cooperation Volunteers are involved are developed, and how the voluntary efforts of Japanese young people tackling environmental issues are seen in recent years.

[46] An NPO established in 2014 whose major businesses are outdoor event environmental measure businesses, seminars on decision making for young people, and the provision of fields to share learning.

[47] The most historic organization that performs environmental protection activities in China, established in 1994. It has over 30,000 members nationwide and is promoting the reconstruction of interactions between people and nature, ecosystem maintenance, and the birth and development of green citizens from various aspects like environmental education and eco life. Major businesses are citizen-participating environmental conservation activities, the operation of nature schools, etc.

2.3 History and roles of the Sino-Japan Friendship Center for Environmental Protection

In 1988, celebrating the 10th anniversary of the "Japan-China Treaty of Peace and Friendship," Noboru Takeshita, Japan's Prime Minister at the time, and Li Peng, then Prime Minister of China, entered into an agreement that the Environmental Protection Center be established for Japan to support the environmental conservation of China.

China offered 66.3 million yuan (1.26 billion yen at the then exchange rate) and Japan invested 10.5 billion yen in total as a voluntary financial cooperation project from 1990 to 1995, and the Environmental Protection Center was built with equipment being provided. In 1996, the completion ceremony for the Environmental Protection Center was held and Song Jian, member of the Chinese State Council, and Prime Minister Noboru Takeshita took part in the ceremony.

The Environmental Protection Center
(photo: taken by the Evaluation Team)

Afterwards, successive leaders of China, Japanese Prime Ministers, Ministers of the Environment, Ministers of Foreign Affairs, Ambassadors to China, VIPs in the political community, etc. visited the center, which has contributed to the development of the Environmental Protection Center through exchanges at the national level. As a result, the Environmental Protection Center has played the role of a window into the research and technology exchanges in the field of the environment between Japan and China for as long as 20 years, and is now striving to fulfill its duty as a platform for the environmental sector which is helping to solve environmental issues not only between Japan and China but also across the whole of East Asia.

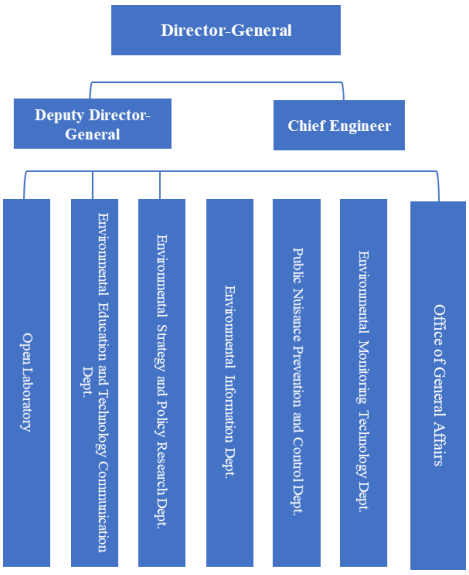


Figure 10 An early organization chart of the Center

Under the Director General, the Deputy Director and the ChiefEngineer were assigned to the Environmental Protection Center in its early days, and there were seven departments:[48]the Open Laboratory, Environmental Education and Technology Communication Department, the Environmental Strategy and Policy Research Department, the Environmental Information Department, the Public Nuisance Prevention and Control Department, the Environmental Monitoring Technology Department, and the Office of General Affairs. There were 160 employees in total (95 of these were full-time expert staff members).

[48] "The Sino-Japan Friendship Center for Environmental Protection r Technical Cooperation Annual Report (FY 1992 - FY1995）", and "Report on the 20th Anniversary of the Establishment of the J Sino-Japan Friendship Center for Environmental Protection" (June 2016)

Table 1: Histry of the Sino-Japan Friendship Center for Environmental Protection

Month / Year	Contents
August 1988	Celebrating the 10th anniversary of the "Japan-China Treaty of Peace and Friendship," Noboru Takeshita, the Prime Minister (at the time) and Li Peng, the Prime Minister (at the time) entered into an agreement that they jointly establish the Environment Protection Center.
1990 -1995	Voluntary financial cooperation: construction of the Environmental Protection Center building and provision of equipment. 10.5 billion yen in total (building: approx. 6 billion yen, equipment: approx. 4 billion yen)
1992-1995	Technical cooperation project phase 1: operation and management methods, and fundamental technology related to environmental monitoring, etc. are transferred to technical staff.
May 1996	The completion ceremony for the Environmental Protection Center was held.
1996- 2002	Technical cooperation project phase 2: to play a leading role in the field of the environment in China, research, training (human resource development) and monitoring functions were enhanced. Equipment was developed through voluntary financial cooperation during the same period.
January 2001	Zhu Rongji, the Prime Minister (at the time) observed the environmental conservation operation of the center.
2002 -2006	Technical cooperation project phase3: cooperation results were developed in China as well as fields being set so that new environmental issues can be handled, and sophisticated knowledge and technology can be transferred.
April 2005	Xie Zhenhua, the Director of the State Environmental Protection Administration (at the time) had a meeting with Mr. Nobutaka Machimura, the Foreign Minister (at the time).
2006 -2008	Extension of the technical cooperation project phase 3: efforts were made to develop the Environmental Protection Center into a Japan-China Environmental Cooperation Base setting the goal that the Environmental Protection Center plays a leading role in solving important issues for the environmental conservation of China, and develops results domestically in order to help improve environmental problems in each district.
2008 - 2013	Promotion of Circular Economy project (technical cooperation project phase 4): to promote circular economy policies from the viewpoint of environmental conservation, capabilities were enhanced to execute the policies related to improving environmental consideration during each material recycling process (resource input, production, sales, consumption, disposal, recycling, treatment, etc.).
June 2010	Li Keqiang, the Prime Minister (at the time), observed the displayed results of environmental conservation.
2016 - 2021	Project for Environment Friendly Society Building (technical cooperation project phase 5): to realize the construction of an environmentally-friendly society, the goal was set that a base for these efforts be developed in the Environmental Protection Center with a view to sharing them nationwide.

Source: prepared by an Evaluation Team based on the "Report on the 20th Anniversary of the Establishment of the Sino-Japan Friendship Center for Environmental Protectionr" (June 2016)

Since its establishment, the Environmental Protection Center has conducted a variety of collaborations with China in the fields of countermeasures against water and atmospheric pollution, solid waste treatment, environment monitoring, persistent organic pollutants, dioxin measurement and analysis technology, yellow sand source analysis, environmental education and environmental information technology, International Organization for Standardization (ISO) 14001 environment management, climate change, etc. In addition, since 2008 when they started tackling individual environmental issues, with a view to collaborating in promising fields, exchanges on environmental technology have been promoted that specialize more in the policies and legal developments between Japan and China. For instance, it included a study of the circular economy based on the experience of Japan, the enactment of the Circular Economy Promotion Law and the promotion of practice, and the promotion of a revision to the Environmental Protection Act, which means they have also helped achieve these results as a major player in the trial of the corporate environment manager

system.[49]

A total of 377 Japanese experts (42 long-term experts and 335 short-term experts) have been dispatched to projects centered on the Environmental Protection Center from 1992 to 2013, and 274 Chinese administrative officials participated in training sessions held in Japan. In China, training was provided to over 3,000 environmental management and technology staff members.[50]

The Environmental Protection Center is developing steadily as an organization. There are 568 staff members (as of 2016) and the organizational configuration has been expanded to six departments in charge of managing human affairs, finance, etc., and four departments in charge of external service operations. These specialized divisions are as follows: Education and Communication Center, National Research Centre of Environmental Analysis and Measurements, Center for Science and Technology Achievement Transformation and Industrial Promotion, Environmental Development Center, Institute for Environmental Reference Materials, Beijing Huanbiaokechuang Environmental S&T Development Co. Ltd. Institute of Environmental Governance, Environmental Development Center, Beijing Guohuantiandi Environmental Technology Development Center Co. Ltd., Environmental Certification Center, and China Environmental United Certification Center. . The development of the organization that has become capable of controlling departments in charge of the wide variety of environmental technology and environmental education listed above seems to be the standout result of the environmental technology exchanges between Japan and China over 20 years.

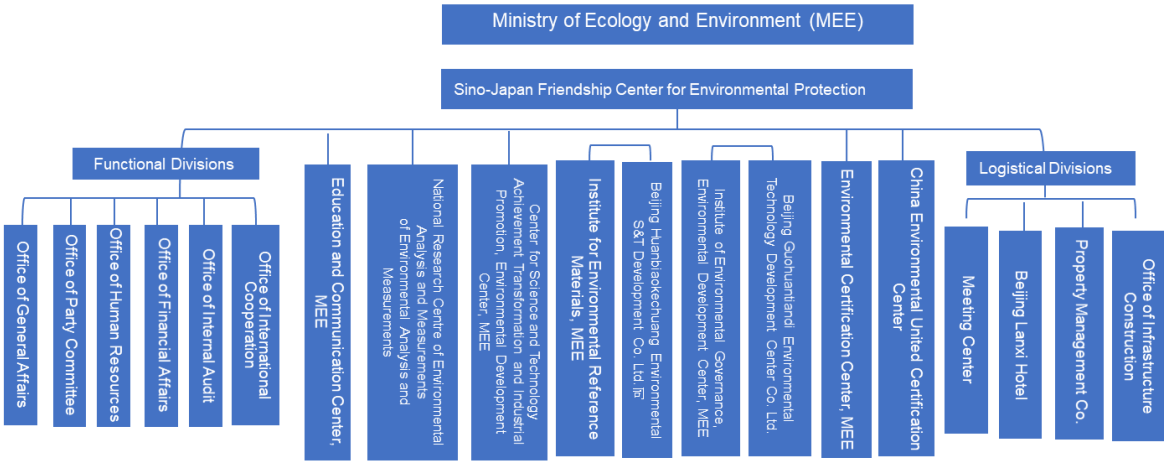


Figure 11 Today's organization chart of the Sino-Japan Friendship Center

Source: ODA to China 40th Anniversary General Symposium materials published by the Sino-Japan Friendship Center for Environmental Protection (December 11, 2019)

The departments and centers underpinning the Center, whose implementation of activities since the Environmental Protection Center was established up until the present day has been appreciated and whose importance as a research field has been confirmed, have become independent as specialized institutions of the Chinese government or have been incorporated into other more specialized institutions. For instance, the

[49]"Report on the 20th Anniversary of the Establishment of the J Sino-Japan Friendship Center for Environmental Protection" (June 2016)
[50] Ibid.

Pollution Prevention Technology Department and the Environment Observation Technology Department, departments from the early days, transferred to the Environmental Science Institute. The "Health and Environment Application Center" separated and became independent from the Environmental Protection Center and started operations in 2009, and the "Environment and Economic Policy Research Center" and the "Solid Waste and Chemical Goods Management Technology Center" did likewise in 2013. One factor behind the independence of the organization and the expansion of its functionality seems to be that the staff who were trained in Japan brought back the knowledge and findings to China, and continued studying under Japanese experts after returning home in order to reflect this knowledge in policies and utilize it in their research activities. Today, including exchanges at the private level, environmental technology research, human resource development, and environmental education are all being promoted proactively. The role the Environmental Protection Center played as a platform for environmental technology and human resource exchanges between Japan and China seems to be very significant.

Examples of the implementation of human resource exchanges between Japan and China centered on the Environmental Protection Center are shown below.

Environmental issue research efforts that started from training in Japan –Contributions to preventing dioxin pollution–

It was around 1998 that the environmental problem involving dioxin, a chemical substance, became prominent in Japan. In the ODA provided to China, assistance for the development of a dioxin analysis measurement system that had been promoted by the Environmental Protection Center started because the dioxin problem that had started from a waste incineration problem became prominent as a countermeasure against the environmental pollutions which developed.

In the technical cooperation project phases 2and 3 (including the extension phase), the first research into the dioxin problem in Japan was initiated using the Open Laboratory at the Center as a base in efforts to promote the circular economy. During the project implementation periods, both short-term and long-term Japanese experts were dispatched, and instructions were given not only on the acquisition of technology but also on the operation of technology such as seminars that included the introduction of Japanese examples, technical instruction, and domestic dissemination of the instructed technology, etc. Furthermore, regarding laboratory management methods, a manual was prepared referring to the methods used in Japan. In the extension period of phase 3 from 2006 to 2008, assistance was provided to: 1) prepare an analysis manual for the acquisition and establishment of dioxin and POPs analysis technology, 2) prepare an analysis precision management manual, 3) prepare precision management specimens for dioxin POPs analysis, 4) implement human resource development and share dioxin analysis laboratory training from a local environmental bureau, and 5) prepare an environmental database and a laboratory management manual.[51] The results above were appreciated at the Dioxin Intensive Laboratory Specialist Examination Meeting held in 2007, and the Open Laboratory was certified as a "National Environmental Protection Dioxin Pollution Control Intensive Laboratory" by SEPA in February 2008.

[51] "The People's Republic of China Environmental Policy Support Basic Research Report" (April 2012)

During the project, training in Japan was held several times planned by the Japanese experts involved, and staff at the level of division chief of the Open Laboratory participated in the training. The following is feedback from Environmental Protection Center staff on findings during the dioxin pollution prevention training in Japan.

Feedback from an Environmental Protection Center executive on training in Japan[52]

The staff who participated in the training in Japan, based on findings from the training, strived after returning home as central members for the establishment of the Environment Standard Sample Center within the Environmental Protection Center, and this center became the base for human resource development and technology sharing of six open laboratories under the Ecology Environment Department. The training did not only place emphasis on the input of knowledge but also provided instructions on specific technology instruction, technology sharing methods, as well as management plans and operations for countermeasures against dioxin so that management capabilities could be comprehensively improved regarding countermeasures against dioxin. Japanese experts, instead of simply applying the environmental technology model of Japan to China, understood in detail the environmental issues China is facing, examined what specific technologies applied to this approach would benefit China, and provided appropriate technical assistance to make great contributions to improving environmental management capabilities.

The Sample Center that was established became the base for dioxin pollution prevention management and waste incinerator monitoring. Research institutions like Qinghua University, where many of the relevant people involved had been trained at the Environmental Protection Center, are undertaking dioxin analysis operations at private corporations, and their training results are actually being used.

Why is the environmental technology of Japan useful as opposed to that from other environmental technology developed countries?[53]

While efforts to control environmental pollution were becoming increasingly urgent, considering the importance of learning from developed countries, the efforts of Japan, the U.S., and countries in Europe such as Germany were referred to in China when studying specific efforts. One of the reasons why the Chinese government determined it was best to study Japanese efforts to solve the various environmental issues was that certain results had already been confirmed through the knowledge and research of Japanese environmental technology, and the implementation of environmental countermeasures through the activities of the Environmental Protection Center, at a time when treatments were needed for environmental issues that required more sophisticated expertise. Another reason was that the Japanese environmental technology based on geographical characteristics were relatively easily applicable, especially in rural areas of China. For instance, with regard to production methods, China and Japan both

[52] Interviews with Mr. Ou Yang Na, Mr. Zhang Kun, Mr. Ren Yong (October 15, 2019)
[53] Interview with Mr. Dong Xu Hui (November 12, 2019)

have small agriculture-type economies that differed from the machinery-type agriculture of Europe, meaning the compact environmental technology of Japan could be easily applied. Moreover, with regard to waste water treatment, the septic tank, a diversified technology of Japan, is so versatile that it can also be used in rural areas of China. These are the reasons why Japanese technology was referred to instead of European and U.S. technology when promoting the circular economy including countermeasures against waste water.

Awareness-raising activities for citizens through environmental education -Contributions to environmental issues using a bottom-up approach-

Environmental education is one of the major themes that the Environmental Protection Center has been engaged in since its establishment, and it has also been referred to in the government's five-year plan.

The Promotion Education Center at the Environmental Protection Center (the Environmental Promotion Education and Technical Exchange Department at the time of establishment) has been in charge of the major environmental education activities. Promotion of environmental education was one of its duties, but was originally no more than photography for the displays and recording because human resources were insufficient at the time. Since the start of the Project for Promotion of Circular Economy (technical cooperation project phase 4), they have come to develop activities which boost the improvement of citizens' awareness of the environment. Staff at Japanese local governments, the Miyako Ecology Center,[54] and KEEP, Inc., [55] which are cooperative organizations, visited China, developed human resources engaged in environmental education and held seminars in various areas of China, and proactively exchanged opinions with general participants during the training in Japan. Moreover, activities to boost the improvement of citizens' awareness of the environment were developed such as the "Project to Promote Countermeasures against Climate Change in which Citizens Participate" and grassroots technical assistance, such as the "Human Resource Development and Network Formation Project for the Development of Community-Based Nature Schools." This series of projects seems to have gradually spread the idea that awareness-raising activities on environmental improvement through the Environmental Protection Center are essential, and has contributed to the implementation of environmental education efforts.

An example of learning during the training in Japan is that ways to improve and solve environmental issues were considered by using a bottom-up approach whereby the actual victims of the pollution complain to the government (including local governments) and companies. Moreover, there was also feedback that a suggestion was made that each citizen who fulfills their waste sorting obligations may be contributing to improving the environment. This learning reflected in the activities of the Environmental Protection Center seems to have contributed to increasing citizens' awareness of the environment and countermeasures against environmental issues by using a bottom-up approach.

[54] Miyako Ecology Center (official name: Kyoto City Environmental Conservation Activity Center) is implementing projects such as the development of human resources in charge of environmental conservation activities, public relations and information transmission, development and practice of environmental learning programs, and holding workshops toward the realization of a sustainable local society.

[55] Since the establishment in 1956, KEEP Association has implemented the projects whose major themes are health, food, environmental education, and international cooperation, etc. toward the realization of a sustainable society.

Enhancement of Chinese government efforts and changes in citizens' awareness of the environment[56]

Some changes have been observed such as Chinese citizens today have come to recognize countermeasures against pollution that was regarded as the "responsibility of companies/other people" as an issue that they should address for themselves. For instance, residents in urban areas check the smog conditions with their cell phone every day and make a complaint to the company (plant) through a claim hotline when the smog is severe and demand appropriate countermeasures. They do the same when the environment in the area around a plant is deteriorating because of sewage and unusual odors, or when they find the unauthorized dumping of construction waste. Changes have been observed such as companies have come to be required to take countermeasures in response to the bottom-up approach such as complaints from residents, while many companies have taken countermeasures against environmental issues in response to the policies and the enactment of central government regulation (top-down).

The central government leader's awareness of the environment has increased further since the inauguration of Xi Jinping, the president, and environmental protection has been positioned as ecological civilization and has become unified with national policies. Organizations related to environmental management have developed both in the central and rural areas. The heads of each province are said to have "One post and two responsibilities," which means they are responsible for both the development of the region and for environmental management. Proposals that contribute to environmental management are incorporated into policy proposals in the National People's Congress every year and the budget has also been increased.

In June 2008, when the Circular Economy Promotion Project (technical cooperation project phase 4) was held at the Environmental Protection Center, the Japan-China Citizen Environment Exchange Exhibition was held at the Chinese Science Technology Museum for the purpose of deepening Chinese citizens' understanding of environmental problems and leading them to practice environmental behaviors. The exhibition was hosted by the Environmental Protection Center, JICA China Office, Japan Environmental Exchange, 3R Test Execution Committee, and "Bikkuri Eco 100 Selection" Execution Committee. Mr. Hiroshi Takatsuki, one of the collaborators from Japan, is the director of the Miyako Ecology Center and a single-frame manga artist whose pen name is High Moon. Displays of original manga drawings that represented environmental problems assisted by Mr. Takatsuki, workshops on 3R to reduce waste, quizzes that simulated certification examinations, manga lectures, etc. were all held. Over 1,000 people in total participated and according to reports they were favorably reviewed.

There had also been a regular environmental education exhibition at the Environmental Protection Center at the time, but the Miyako Ecology Center who excelled at promoting environmental education had also collaborated regarding points that needed to improve for more interesting content. The exhibition above was not held as a single event but was held with the purpose of specifically acquiring the experience of promoting

[56] Interviews with Mr. Zhang Kun (October 15, 2019), and interview with Mr. Dong Xu Hui (November 12, 2019)

environmental education and becoming able to develop these activities independently by trying to implement projects through collaboration between the Environmental Protection Center and private organizations in Japan and China, keeping in mind the "improvement of citizens' awareness of the environment," which was a sub project of the Circular Economy Promotion project.

The Environmental Exchange Exhibition was held successfully largely because of the abundant network of Japanese experts. The Environmental Protection Center and the Japanese experts who were involved in the projects implemented by the center used their networks to hold training sessions in Japan along with local seminars, and implemented various events and arranged them elaboratively with a strong will to provide high-end fields for learning which would benefit China even if just a little. Participants in a training session in Japan who have also been trained in other countries have described the characteristics of Japanese trainings as follows: 1) Training content meets specific requirements and can be applied at a high level, 2) They are well-prepared and the schedules are well-planned, 3) Content not only on technology but also on society and culture is incorporated, 4) Life while staying in Japan is carefully supported. As seen from these comments, it is not an exaggeration to say that the Environmental Center developed to its current state today because of the strong sense of mission and management, and the arrangement capabilities of Japanese experts.

The "Sino-Japan Environmental Technology Information Plaza[57]" that opened in the Environmental Protection Center in December 2015 has become the base for environmental education promotion which over 10,000 people come to every year. On "June 5, Environment Day," government organizations, research institutions, and social organizations hold joint events and widely share information on the environment with citizens, which has contributed to increasing the profile of awareness-raising activities for environmental protection. In the future, it is expected to help develop environmental education materials and programs, develop human resources engaged in environmental education, environmental technology exchanges between the Japanese and Chinese governments and companies, and the implementation of training in third countries, further enhancing the significance of its existence.

Exhibition of the government's environment-related efforts
(photo: taken by the Evaluation Team)

Exhibition of water resource conservation-related efforts
(photo: taken by the Evaluation Team)

[57] Agreement was reached on the establishment in the Japan-China Joint Communiqué at the time of the summit in 2007. Since the agreement, JICA has continued the collaboration by the development of environmental education materials and programs, request for NGOs and volunteers, and human resource development in the environmental education model bases throughout China, etc.

2.4 Conclusion

This chapter reviewed the ODA provided to China in the fields of atmospheric environment and waste management that JICA has developed since the 1990s to address issues in the field of the environment in China which have changed following their rapid development, and discussed what "broad impacts" the ODA from JICA has had on China over 40 years.

The first broad impact is that the capabilities of the Chinese government and companies to perform environmental management based on comprehensive scientific analysis were enhanced. These effects included contributions from the Environmental Protection Center to research and studies on yellow sand and dioxin, formation of the circular economy model cities, and improving the waste management capabilities of local cities as examples of government, and then promotion not only of a company's environmental measures but also of its corporate activities as an example of companies.

The second broad impact is the contribution to the development of laws in China. More specifically, it was assistance for the draft formulation in preparation for the revision to the Environmental Protection Act and the Atmospheric Pollution Prevention Act that are foundations of environmental protection in China, the enactment of the Circular Economy Promotion Law, and the development of relevant regulations, etc. Moreover, assistance from Japan enhanced the abilities of environmental administrative officials and developed the systems of environmental administrative organizations to support law enforcement specifically. For instance, to promote the circular economy, the requirements for a recycling economy in China were proposed, the concept of a circular economy was promoted, a study was conducted on the type of circular economy appropriate to the reality of China, promotion-related legal systems were developed, and a pilot project was executed. Moreover, the scientific analysis mentioned in the first impact seems to have contributed to providing scientific evidence for the development of legal systems on reducing the emission of pollutants and enacting rational laws, for instance.

The third broad impact is a benefit for Japan. In a study on the transboundary movement of atmospheric pollutants,[58] the contribution of China to the PM2.5 density in major cities of Japan was recognized to a certain extent and the emission control of atmospheric pollutants in China was having relative effects on Japan. Thus, the emission control project that was part of the ODA provided to China is presumed to have also had a relative benefit to Japan. There were some examples of enhanced connections with Japanese companies due to the ODA and the mutually beneficial effects of exchanges between local governments, collaborative projects, and exchanges at the private level. Moreover, it is known that the Japanese atmospheric environment has been influenced by the one in China to a certain degree. Thus, the emission control project that was part of the ODA to China is presumed to have had a relative benefit for Japan.

The Environmental Protection Center, established as a base for environmental protection in China, is an organization that has led research and study on the manifestation of the broad impacts above, and has contributed as a platform for training and exchanges.

[58] 4th Stage of the Project for Long–range Transboundary Air Pollutants in Northeast Asia (2013–2017) (Ministry of the Environment)

Chapter 3. Review of the ODA provided to China in the field of infection

3.1. Worldwide countermeasures against infection, and changes in the policies of China and the ODA provided to China

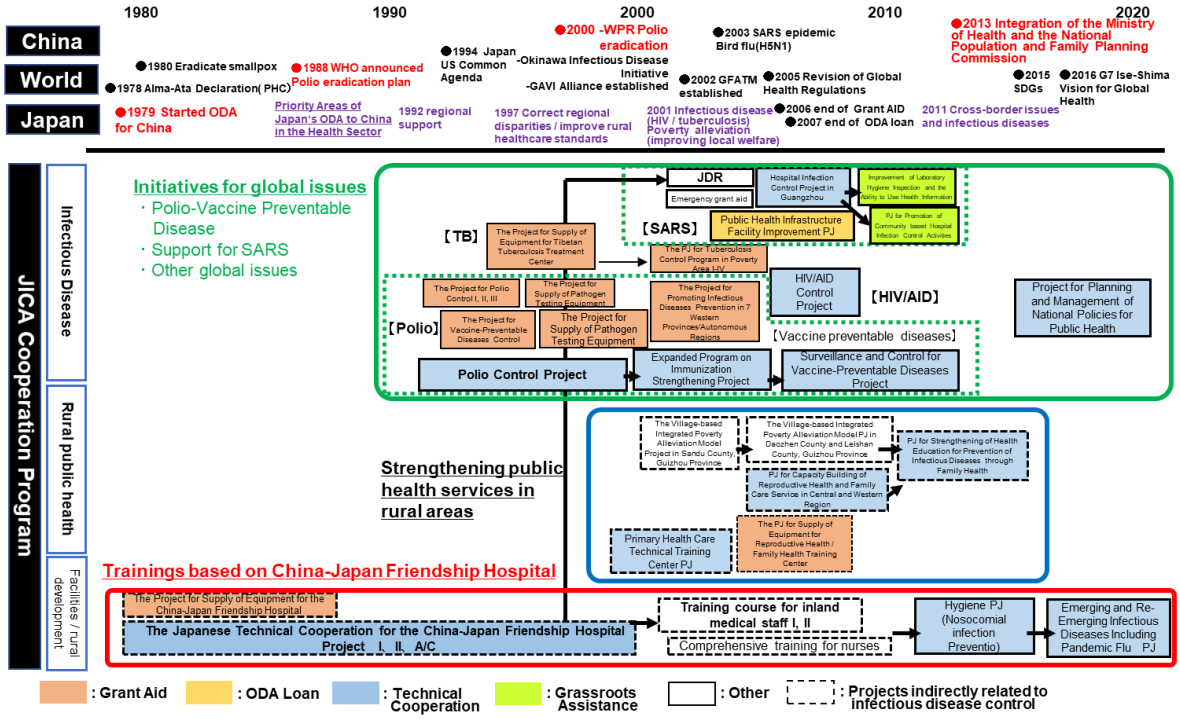


Figure 12: Infection-related global movements and changes in ODA projects to China
Source: produced by the Evaluation Team

Smallpox had been a threatening disease that was highly infectious and mortal until its eradication from the earth was proclaimed by the World Health Organization (WHO) on May 8, 1980. A smallpox vaccine released in 1796 functioned effectively in controlling the smallpox epidemic and it no longer occurred in Japan after 1956, but smallpox existed in 33 countries at the time when the Global Smallpox Eradication Program was approved in 1958. Under the eradication program, vaccine quality was controlled, inoculum doses were secured, and funds were procured as part of work toward the goal of a 100% vaccination rate in the initial strategy. However, the incidence did not decline as expected just by increasing the vaccination rate, so the strategy was switched to the surveillance[59]of "finding patients and performing vaccinations around them" and containment. It had a prominent effect and smallpox was eradicated from the earth in 1980 with the last patient in Somalia in 1977.[60] As the financial burden had been reduced by the eradication of smallpox, the WHO approved a polio eradication program in 1988 targeting the polio that could be prevented with vaccines and expected similar effects by using the same strategy. Outbreaks of polio occurred in 1989 and 1990 in Shandong Province in China where polio patients accounted for 85% of all those that occurred in the

[59] The WHO defines public health surveillance as the "continuous and systematic collection, analysis, and interpretation of the health-related data necessary for planning, implementation and evaluation of the practice of public health." https://www.who.int/topics/public_health_surveillance/en/ (accessed January 21, 2020)
[60] The National Infection Institute Website, what is smallpox? https://www.niid.go.jp/niid/ja/kansennohanashi/445-smallpox-intro.html（accessed December 1, 2019）

WHO Western Pacific Region.[61] Japan, which had built connections with key figures in the Chinese government after JICA had dispatched their infection countermeasure collaborative investigation team in December 1987, decided to support the Chinese countermeasures against polio in response to a request from China.[62]

In Japan, infection was no longer a threat because of the eradication of smallpox along with a reduced prevalence of tuberculosis that had been the top cause of death until the mid-1900s, and the major theme of countermeasures against diseases was shifting to chronic diseases such as myocardial infarction, stroke, and diabetes. Therefore, the numbers of infection researchers and clinicians were declining in the fields of research and medical care. Fortunately, the National Institute of Health, the predecessor of the National Institute of Infectious Diseases, had inherited and maintained the polio-related inspection technology for polio vaccine specimen operations. Against this background, to help eradicate polio from China, a support system was decided to be built in Japan before the JICA technical assistance project was implemented.

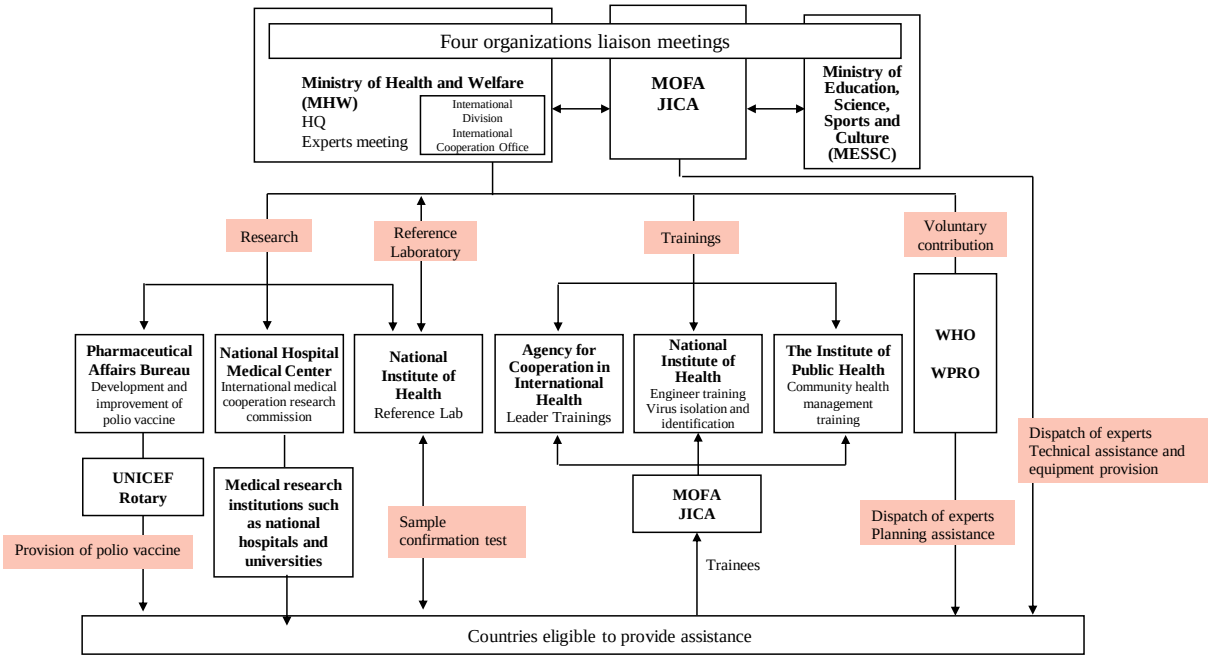


Figure 13: Domestic support system at the time when polio countermeasure support was initiated in Japan

Source: Polio eradication plan flow chart[63]

The Ministry of Health and Welfare (the Ministry of Health, Labour and Welfare today), the Ministry of Foreign Affairs, JICA, and the Ministry of Education (the Ministry of Education, Culture, Sports, Science and Technology today)[64] established the Four Organization Liaison Conference and developed the domestic

[61] Information provided by National Institute of Infectious Diseases experts engaged in the collaboration (January 27, 2020)
[62] Minoru Okada "Polio disappeared from our village" (February 2014)
[63] From the National Institute of Infectious Diseases experts engaged in collaboration and collaboration plan materials at the time (polio eradication flow chart, training related to the polio eradication plan, and the polio eradication plan promotion project (the National Institute of Health))
[64] One of the presumed reasons why the Ministry of Education was included in the support system is that support from researchers at universities was necessary other than research institutes under the Ministry of Health and Welfare. Therefore, experts at national universities under the Ministry of Education at the time provided support for polio countermeasures.

support systems of the Ministry of Health, the National Hospital Medical Center (the National Center for Global Health and Medicine today), and the National Institute of Health, while the polio laboratory of the National Institute of Health functioned as a reference lab for the WHO Western Pacific Region and established a training system which targeted China and developing countries. As a comprehensive training system, the system was built as shown in Figure 9 where a task force was established in the Health Service Bureau of the Ministry of Health and Welfare, and the National Institute of Health, the Institute of Public Health (the National Institute of Public Health today), and the Agency for Cooperation in International Health collaborated to provide the training.

The National Institute of Health set a budget of around 70 million yen to conduct investigation studies of virus diagnosis technology, vaccine improvement, etc., and provide training for engineers and enhanced the polio eradication promotion project. This is how infection countermeasure-related organizations in Japan launched full-scale efforts as all Japan became engaged in countermeasures against polio related to vaccination fields and diagnosticians in examination rooms across all provinces of China including Shandong Province.

On the other hand, in China, importance was placed on the monitoring of serious diseases, the enhancement of preventive care, and healthcare projects in rural areas during the 8th and 9th five-year plans, and the polio eradication policy was also manifested in China under the initiative of the Global Polio Eradication Initiative of the WHO. This is how both tangible and intangible synergetic support were provided by Japan in collaboration with international organizations under the global initiative and the manifested policy of the Chinese government, and the goal of polio eradication in the WHO Western Pacific Region was achieved in 2000. After 2000, polio-free status in China was maintained and the scope for support of diseases which can be prevented by vaccination was expanded to include hepatitis B and measles. Projects were implemented with the aim of enhancing prevention and care.

Table 2: Five-year plans for the national economy and social development in China (1991 to 2020)

Plan	Contents related to infection and public health
8th five-year plan (1991–1995)	● Monitoring of serious diseases and enhancement of preventive care ● Emphasis on healthcare projects in rural areas ● Enhancement of Primary Health Care: PHC
9th five-year plan (1996–2000)	● Control of infections and enhancement of vaccinations ● Improvement of PHC service systems in farming villages and realization of PHC available to all people
10th five-year plan (2001–2005)	● Emphasis on preventive healthcare ● Enhancement of the prevention and control of infections
11th five-year plan (2006–2010)	● Improvement of public health and medical services (development of disease preventive controls, improvement of emergency medical care abilities, and community healthcare) ● Development of community healthcare
12th five-year plan (2011 − 2015)	● Establishment of public health service systems (improvement of abilities to handle serious emergency public health issues and expansion of basic public health services)
13th five-year plan (2016–2020)	●Preventive care for serious diseases and enhancement of basic public health services ●Promotion of a healthy China

Source: State Council of the People's Republic of China.

The era when infectious diseases were threatening had temporarily been assumed to have ended, but

Source: Information provided by the National Institute of Infectious Diseases experts engaged in the assistance (January 27, 2020).

emerging infectious diseases caused by newly discovered viruses came to occur such as Ebola hemorrhagic fever in 1976, acquired immune deficiency syndrome (AIDS) in 1981, and SARS and highly pathogenic avian influenza after 2000. Moreover, some old infectious diseases like tuberculosis were on the increase again although it had been assumed they would be overcome in the near future. These are referred to as re-emerging infectious diseases, and not only tuberculosis but also various other infectious diseases like malaria and cholera are once again becoming threatening. Against such a background, the Okinawa Infectious Diseases Initiative was announced in 2000, which championed the importance of countermeasures against infectious diseases in global society and led to the establishment of the Global Fund for AIDS, Tuberculosis and Malaria in 2002. According to the Okinawa Infectious Diseases Initiative, the policy of providing assistance for countermeasures against such diseases as AIDS, tuberculosis, malaria, and polio was launched in Japan, and in the policy of ODA to China that was announced in 2001, whereby support was manifested centering on countermeasures against the infectious diseases of human immunodeficiency virus (HIV)/AIDS and tuberculosis in the field of health. Moreover, the 10th five-year plan of China included the prevention and control of infectious diseases. After the 2000s, in response to the worldwide initiative and the status in China, Japan implemented the project to support the diagnosis and treatment of tuberculosis and the prevention of HIV/AIDS.

In particular, when SARS, an emerging infectious disease, occurred in China in 2003, the China-Japan Friendship Hospital that Japan had supported through providing grant aid and technical assistance for many years was designated by the Chinese government as the special hospital against SARS.[65] Thus, Japan dispatched experts to the hospital as an Japan Disaster Relief Team (JDR) and provided instruments immediately. The China-Japan Friendship Hospital at the time had established itself as a top referral hospital which was the leading advanced treatment hospital in China owing to long-time support from Japan and the efforts of China themselves, and the hospital had been disseminating both diagnosis technology and nursing skills that were the results of the project to local hospitals through training projects. Since the countermeasures against SARS in 2003, the China-Japan Friendship Hospital has incorporated these countermeasures against hospital infection for local areas into its support content and played a central role in the projects against emerging and re-emerging infectious diseases like pandemic influenza that still last to the present day. Moreover, they enhanced the countermeasures against infectious diseases in 10 internal provinces by providing instruments to and by developing human resources at fundamental facilities related to public health at both the province and city levels in the provinces through loan assistance (refer to "(2) Countermeasures against severe acute respiratory syndrome (SARS)" of "3.2.1 Efforts for global issues" for details). In Guangzhou City where SARS broke out, they provided technical assistance for countermeasures against hospital infection. This project was a collaboration between Hyogo Prefecture and Fukuoka City that are sister cities of Guangzhou Province and Guangzhou City, and collaboration systems at the level of community-like grassroot technical assistance continued after the project was terminated.

As a global trend, traditional international health rules targeted the three diseases of yellow fever, cholera,

[65] In Beijing, over 10 hospitals such as Xuanwu Hospital, Ditan Hospital, and Kyowa-Nishi Hospital in addition to the China-Japan Friendship Hospital were designated as hospitals for accepting SARS patients. Source: Report by the international emergency aid group expert team on the infection expansion of severe acute respiratory syndrome in China.

and the plague, but these international health rules were decided to be revised in 2005 owing to the reasons pointed out such as their inability to handle the health crises at the time of outbreaks of emerging and re-emerging infectious diseases like SARS and avian influenza, the absence of a mechanism to secure compliance in each country, and the lack of collaborative systems between the WHO and each country. A significant change of direction was made and all kinds of health damage cases which may have threatened global public health became the target of reports taking into consideration the severity of their impact on regional public health, the potential of a global pandemic, and the need for global traffic regulations, etc. without being limited to specific diseases. The revised international health rules came into effect in 2007, after which further emphasis came to be placed on the requirement for global collaboration in countermeasures against infectious diseases. Moreover, in China, plans after the 11th five-year plan included the establishment of countermeasure systems against abrupt and severe public health issues, and the improvement of disease prevention control and medical emergency medical care capabilities. This meant that importance came to be placed on the need for countermeasures against emerging and re-emerging infectious diseases and collaboration with global society. Regarding the Japanese policy of ODA to China, the new provision of grant assistance was terminated in 2006, and the new provision of loan assistance was also terminated in 2007. After that, assistance came to be provided mainly in the form of constructing a platform for collaboration between Japan and China through technical assistance. Furthermore, since 2011, emphasis in the area of health in the ODA provided to China came to be limited to infectious diseases that created a cross-border issue. Against this background, at a national level, the National-Level Public Health Policy Plan Management Project has been implemented since 2011, and focusing on tuberculosis, vaccination projects, as well as abrupt and severe public health issues that are common health issues between Japan and China, the project was implemented in the new form of promoting information exchange on health administration and the construction of human networks between Japan and China.

In countermeasures against infectious diseases, it is important to enhance primary health care (PHC) like health education and life environment development for residents as “preparation during peace time when there is no infectious disease epidemic” in addition to “countermeasures at the time of an infectious disease outbreak health crisis” to achieve early containment of infectious diseases that will become an epidemic rapidly like SARS. The enhancement of public health services is an important approach to countermeasures against infectious diseases. In China in the 1990s, the goals of the 8th five-year plan were to place emphasis on healthcare projects in farming villages and to enhance PHC, and the goal of the 9th five-year plan was also to realize PHC available to all people. The Japanese policy of ODA to China also involved assistance to local areas and correcting any gaps between urban and rural in the 1990s. Against that background, the assistance of training centers to develop PHC service providers was provided in Anhui Province. Moreover, the old National Population Family Planning Commission had implemented the “Family Planning, Maternal and Child Health and Prevention of Parasitic Diseases Integration Project (IP)” by JOICFP since the 1980s, and family health projects were implemented as a way to enhance health services like health education, health checkup, and health consultations as a derivation from this project. The provision of health education and health checkup at the first level contributed to disease prevention in the countermeasures against infectious diseases.

This is how the Japanese ODA to China in the field of infectious diseases, combining schemes of technical assistance, grant assistance, loan assistance, etc. in response to conditions in China and worldwide, has been provided for 40 years, not only countermeasures against infectious diseases through the surveillance of hospitals and laboratories, and the containment of viruses, but also a variety of assistance such as preventing infectious diseases by enhancing public health services and creating an information sharing platform between the Japanese and Chinese health administrations.

3.2 Transition of project groups in the field of infectious diseases and their broad impacts

In this report, as a result of reviewing the past assistance policies and projects in the field of health in China to summarize the ODA to China, the infectious disease-related projects have been classified into a “project group toward countermeasures against infectious diseases” and a “project group that partially contains countermeasures against infectious diseases.” The former consolidates countermeasure projects against infectious diseases such as infectious diseases that can be prevented with vaccines like polio, SARS, tuberculosis, and HIV/AIDS, and summarizes the project results as “efforts toward global issues.” The latter is classified again into two project groups, one of which summarizes the project group which developed the systems against infectious diseases through improving the farming village residents’ knowledge as a countermeasure against poverty and enhancing the PHC-like life environment development as an “enhancement of public health services in farming village areas.” The other group summarizes the series of infectious disease-related project groups which implemented training projects using both tangible and intangible resources that the China-Japan Friendship Hospital Japan had supported for a long time, and eventually developed into countermeasure projects against emerging and re-emerging infectious diseases which are currently being implemented as “training projects based on the China-Japan Friendship Hospital.” As a constitution of this section, the accomplishments of major projects are described as “project contents” and then the “results” and “impacts” of the project group are described.

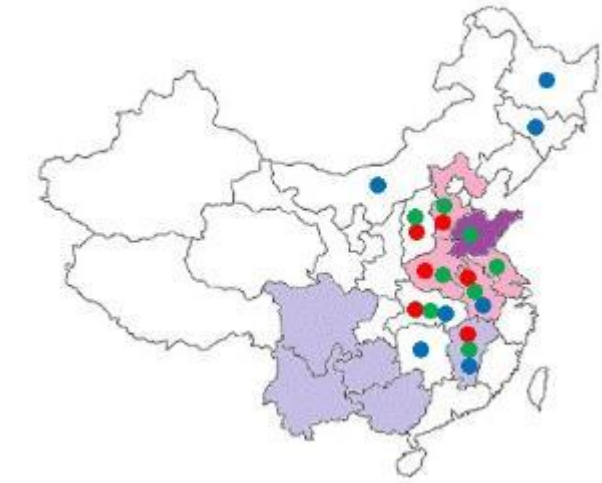
3.2.1 Efforts to address global issues

(1) Countermeasures against diseases that can be prevented with vaccines that started from the countermeasures against polio

The following are major accomplishments. Assistance had been provided for countermeasures against polio by 2000 and the projects shown in Table 3 are the accomplishments.

Table 3: Projects related to countermeasures against polio by 2000

Project Title (Project Period)	Scheme
Polio Control Project (1990 -1999)	Technical Cooperation
The Project for Polio Control (FY 1993-FY 1995)	Grant Aid
The Project for Vaccine-Preventable Diseases Control (FY 1994)	Grant Aid
The Project for Supply of Pathogen Testing Equipment (FY 1997)	Grant Aid
The Project for Expantion of Immunization Strengthening (FY1998)	Grant Aid



Technical assistance (polio control projects)
■: Shandong ■: Hebei, Henan, Anhui, Jiangsu
■: Sichuan, Yunnan, Jiangxi, Guangxi Zhuang Autonomous Region, Guizhou

Grant Aid
- Project for Polio Control : Hebei, Anhui, Henan, Shanxi, Hubei, Jiangxi
- Project for Vaccine-Preventable Diseases Control : Hebei, Anhui, Henan, Shanxi, Hubei, Jiangxi, Shandong, Jiangsu
- Project for Supply of Pathogen Testing Equipment : Autonomous regions and municipalities in 31 provinces in China
- Project for Expantion of Immunization Strengthening : Jiangxi, Hubei, Hunan, Anhui, Heilongjiang, Jiling, Inner Mongolia Autonomous Region

[Countermeasure projects against polio]

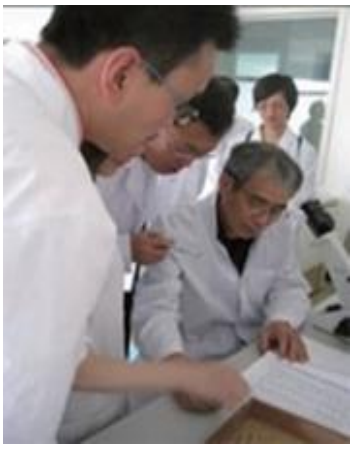
In 1977, the WHO set the goal of "providing vaccinations to all children by 1990" through the Expanded Programme on Immunization (EPI). In the 1980s, China implemented vaccinations of BCG, and for measles, polio, etc. nationwide on a planned and integrated schedule. Japan launched its "Polio Control Project" (1991 to 1999) as assistance to China which had launched its polio eradication program along with the WHO resolution in 1988, "Eradication of Polio Worldwide by 2000." In this project, working toward the eradication of polio, the activities were developed based on the three articulated strategies of: (1) vaccination activity, (2) acute flaccid paralysis (AFP) surveillance, and (3) virus laboratory diagnosis proposed by the WHO. JICA project experts conducted detailed investigations of the current status of each area in China and then implemented the three strategies according to the status, launching the project in Shandong Province first. Particularly in the vaccination promotion activities, the simultaneous administration of polio vaccine was conducted in all areas of the province considering the status of China, and the polio epidemic in the province was terminated immediately. This success became an important trigger for the introduction of nationwide simultaneous administration of polio vaccine that started in 1993. In the AFP surveillance, the activity known as activity surveillance was

launched, where the Prefectural Epidemic Prevention Center (the Center for Disease Control and Prevention (CDC) today) proactively investigated an outbreak and constantly monitored the emergence of patients in order to identify polio patients and take prompt measures instead of waiting for reports of the incidence of patients from medical facilities. Moreover, technology related to experiments was improved through the development of laboratories in 31 provinces through the grant assistance described later and detailed technical assistance provided by Japanese experts to laboratory staff.

Nationwide simultaneous vaccine administration
(Image: JICA website)

Technical instruction related to AFP diagnosis
(Image: JICA website)

Moreover, they worked with the WHO and the UN Children's Fund (UNICEF) to periodically share information and combined the grant assistance that mainly involved the provision of vaccines necessary for countermeasures and technical assistance such as understanding the status and enhancing the abilities of medical workers to provide more effective assistance. When providing the grant assistance, assistance was provided to target areas for technical assistance and surrounding areas according to the activity period, selecting provinces with low levels of economic development. In the "Project for Polio Control," the "Project for Vaccine-Preventable Diseases Control," and the "Project for Expantion of Immunization Strengthening," all of which were technically grant aid, polio vaccines, cold chains, etc. were input, and vaccines over the level of grant assistance were provided as technical assistance classified as medical special equipment provision. In the "Project for Supply of Pathogen Testing Equipment," laboratories were developed in 31 provinces and laboratory capabilities throughout China were enhanced. Long-term and short-term technical assistance experts also visited the laboratories developed through grant assistance in the provinces other than the technical assistance targets and provided technical instruction.[66] This is how laboratory functions were effectively improved by using a skilled combination of technical assistance and grant assistance, and using many experts.



Technical instruction related to
laboratory diagnosis
(Image: JICA website)

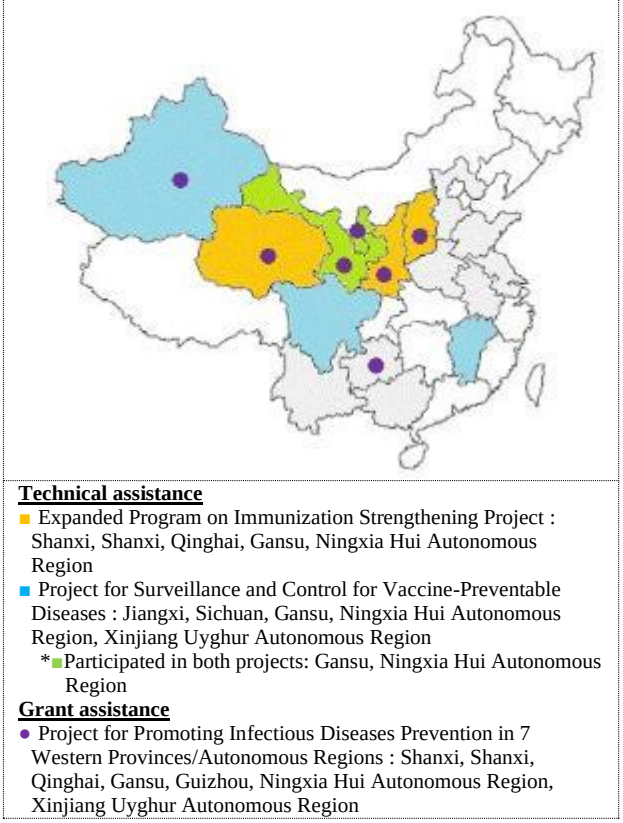
Moreover, emphasis has been placed on maintaining the polio-free status and support for the control of other infectious diseases which can be prevented with vaccines after 2000, meaning the projects in Table 4 were implemented.

Table 4: Projects related to countermeasures against infectious diseases which can be prevented

[66] Interview with Dr. Hiroshi Yoshikura（November 7, 2019）

with vaccines after 2000

Project Title (Project Period)	Scheme
Expanded Program on Immunization Strengthening Project (2000 - 2005)	Technical Cooperation
The Project for Promoting Infectious Diseases Prevention in 7 Western Provinces/Autonomous Regions (FY2001)	Grant Aid
Project for Surveillance and Control for Vaccine-Preventable Diseases (2006 - 2011)	Technical Cooperation



Technical assistance

- Expanded Program on Immunization Strengthening Project : Shanxi, Shanxi, Qinghai, Gansu, Ningxia Hui Autonomous Region
- Project for Surveillance and Control for Vaccine-Preventable Diseases : Jiangxi, Sichuan, Gansu, Ningxia Hui Autonomous Region, Xinjiang Uyghur Autonomous Region
  - *Participated in both projects: Gansu, Ningxia Hui Autonomous Region

Grant assistance

- Project for Promoting Infectious Diseases Prevention in 7 Western Provinces/Autonomous Regions : Shanxi, Shanxi, Qinghai, Gansu, Guizhou, Ningxia Hui Autonomous Region, Xinjiang Uyghur Autonomous Region

[Expanded Program on Immunization Strengthening Project]

Since 2000, EPI services have not reached a sufficient level in poor areas of the inland, and have often been managed inadequately. The safety of vaccination injections emerged as a global issue at that time; it was also a problem in China because it had not been secured sufficiently, mainly in poor areas. As a way to address these issues, technical assistance was provided consisting of implementing safe injections, improving EPI vaccination services, and enhanced surveillance of EPI diseases such as polio in five provinces of the northwest inland area.

Investigation of vaccine storage conditions
(Image: JICA website)

Collection of used syringes
(Image: JICA website)

[Project for Promoting Infectious Diseases Prevention in 7 Western Provinces/Autonomous Regions]

To improve the vaccination rate, cold chain development was performed in seven provinces in the western part and autonomous regions such as pre-engineered freezing chambers, refrigerating chambers, refrigerator trucks, and cold boxes.

[Project for Surveillance and Control for Vaccine-Preventable Diseases]

The vaccination project enhancement project shared the safe injection method for using disposable syringes and the intensive treatment of used syringes. Safe injections came to be performed securely, but countermeasures against other EPI diseases emerged as an issue as polio had been eradicated. On the other hand, the WHO proposed the need for measles control and there actually remained issues like local measles epidemics and viral hepatitis epidemics in China. Therefore, with a view to maintaining the polio-free status and reducing the incidence rate of measles, technical assistance was provided in five provinces in the northwest inland area for the purpose of improving the levels of infectious disease surveillance and vaccination service quality. In the latter half of the project, vaccination certificate inspections and supplementary vaccination projects were implemented for children before they were admitted to kindergartens and elementary schools, and measures were taken for those children who had not been vaccinated through collaboration with schools.

Vaccination knowledge promotion bulletin board in a health room of a village
(Image: JICA website)

Vaccination certificate inspection materials in an elementary school
(Image: JICA website)

The three technical assistance projects, the "Polio Control Project," the "Expanded Program on Immunization Strengthening Project," and the "Project for Surveillance and Control for Vaccine-Preventable Diseases" have all developed in an ongoing manner the achievement of polio eradication, the subsequent maintaining of the polio-free status, and countermeasures against other infectious diseases that can be prevented with vaccines, with the National Institute of Infectious Diseases and the National Center for Global Health and Medicine as domestic support organizations.

Figure 14 summarizes the series of projects related to diseases that can be prevented with vaccines and the relationships with the organizations involved in these projects.

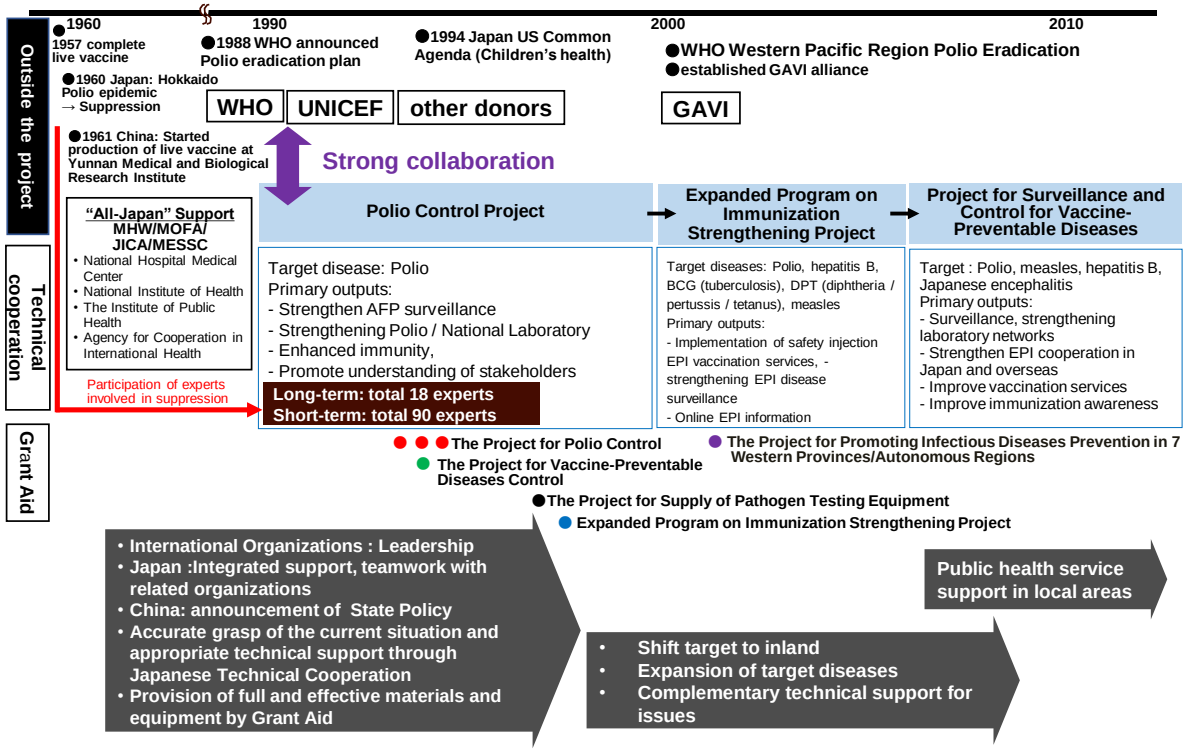


Figure 14 : Pojects related to the diseases that can be prevented with vaccines and surrounding situations

Source: Produced by the Evaluation Team

The following four points represent the broad impacts of implementing the project groups.

1) Eradication of polio in China in 2000

As shown inFigure 14, the WHO's polio eradication initiative and (1) vaccination promotion activities and (2) AFP surveillance had been established as polio countermeasures. Moreover, countermeasures were implemented all across Japan that involved collecting all the resources of organizations related to countermeasures against infectious diseases in Japan, having Japanese experts fully understand the detailed status in the field, and information sharing with relevant organizations using the (3) methodology of virus laboratory diagnosis. Intensive and effective technical assistance was implemented in the work toward practicing the methodology, provision of instruments and vaccines with timely grant assistance, collaboration between technical assistance and grant aid, manifestation of the polio eradication policy by the Chinese government, and manufacturing of live oral vaccines in the Biomedical Research Laboratory in Yunnan Province in China. These were implemented intensively through coordination with the relevant organizations, which eradicated polio in China that had accounted for 85% of polio patients in the Western Pacific Region and subsequently led to maintaining the polio-free status.

2) Early containment of viruses by enhancing laboratory capabilities

When a polio import case occurred in Xinjiang in 2011, early detection of infected patients was performed and prompt countermeasures were taken, meaning containment was performed successfully. Surveillance from the detection, examination and analysis of polio patients, to feedback and appropriate virus inspection

in laboratories are necessary to prevent polio expansion. The clinical diagnosis technology improved through the project groups enabled (1) laboratories to function sufficiently and play their required roles as well as (2) collaboration between the surveillance and laboratories to function sufficiently as a system, which is presumed to have contributed significantly to preventing the expansion of polio.[67] In (1), the sufficient functionality of instruments provided to laboratories has also been confirmed in recent years, one reason suggested for which was that the inspection restoration of instruments provided to laboratories in the past worked effectively.[68] These instruments had been provided as follow-up collaboration at the end of a series of assistance projects for countermeasures against diseases that can be prevented with vaccines by JICA. The fact that viruses can be contained securely in China means that viruses can be prevented from being imported into Japan. Thus, enhancing the laboratory capabilities in a neighboring country is presumed to have also contributed significantly to countermeasures against infectious diseases in Japan.

3) Exchanges between the National Institute of Infectious Diseases and the Chinese Center for Disease Control and Prevention

Tangible aspects of the laboratory instruments provided to 31 provinces and intangible aspects of the human resources engaged in the experiments were enhanced through polio countermeasure projects by 2000. Relationships were built between people through this assistance, and personal and organizational exchanges continued even after the project was completed. Recognizing that collaboration at an organizational level is essential, in addition to continuing the more traditional exchanges at the researcher level, the "Memorandum of Collaboration on Infectious Diseases Between National Institute of Infectious Diseases, Japan And Chinese Center for Disease Control and Prevention, the People's Republic of China[69]" between the National Institute of Infectious Diseases and the Chinese Center for Disease Control and Prevention was signed in 2006 and this exchange has lasted to the present day. The National Institute of Infectious Diseases, in addition to the memorandum with China, also signed a memorandum with South Korea, with the "Japan-China-Korea Forum on Communicable Disease Control and Prevention" having been held every year and was held for the 12th time in 2018. Infectious diseases were no longer limited to a domestic issue and had become an issue that society needed to address globally. Thus, the memorandum signed became the foundation for building a valuable information exchange platform for both sides. In recent years, severe fever with thrombocytopenia syndrome (SFTS) which is a tick-borne infectious disease has also become a problem in Japan, but the SFTS found that the first instance was in China in 2011. Japan is taking countermeasures by sharing information on the virus properties and its scientific findings with China. They are also collecting information on avian influenza infection examples and contributing to the consideration of countermeasures in Japan.[70] The relationship between Japan and China in the field developed through the cooperation on polio eradication is also highly significant as a route for sharing information on infectious diseases between the countries and is making a major contribution to countermeasures against infectious diseases in Japan today.

[67] Ex-Post Evaluation Report on Project for Surveillance and Control for Vaccine-Preventable Diseases
[68] Information pvovided by Dr. Hiroshi Yoshikura (January 28, 2020)
[69] www.niid.go.jp/niid/images/inter/inter1/ccdc.pdf (access August 1, 2019)
[70] Interview with Dr. Hiroshi Yoshikura（November 7, 2019）

4) Promotion of collaboration with education departments of vaccination projects

In the vaccination certificate inspection and supplementary vaccination projects that were implemented in the latter half of the Project for Surveillance and Control for Vaccine-Preventable Diseases , (1) project system construction (clarification of operation implementation flows and role sharing within the health and education departments, etc.), (2) promotion of cooperation and collaboration between the health and education departments, and (3) development of human resources engaged in activities (development of human resources in each class of the health and education departments) were conducted, with the project methods and human resource development systems above being shared among all ministries after the project was completed.[71] When addressing public health issues, it is important to consider methods of solving issues in cooperation with the many players in the region, but those organizations that regularly implement projects in a vertically structured manner are more likely to have difficulties when trying to collaborate between departments. In this project, the involvement of international projects which are external organizations facilitated collaboration with other departments, built the project systems for the health and education departments and the human resource development methods, and enabled them to be shared among all ministries after the project was completed.

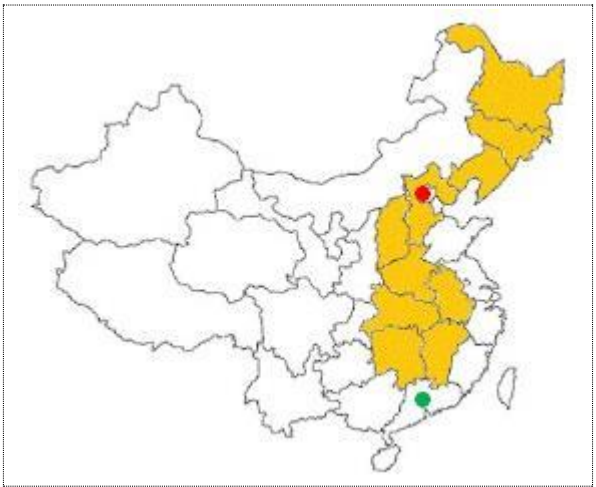
(2) Countermeasures against severe acute respiratory syndrome (SARS)

Table 5 shows the projects as achievements related to SARS.

Table 5: Projects related to SARS countermeasures

Project Title (Project Period)	Scheme
Provision of equipment for SARS (2003)	Technical Cooperation
The Project for SARS Infection Prevention (2003)	Grant Aid
Dispatch of Japan Disaster Relief (JDR) team to China to combat SARS (Severe Acute Respiratory. Disease (2003)	JDR
Public Health Infrastructure Facility Improvement Project (10 provinces) (2004 - 2011)	ODA Loan
Hospital Infection Control Project in Guangzhou (2005 -2008)	Techcnical Cooperation
Improvement of Laboratory Hygiene Inspection and the Ability to Use Health Information in the Guangzhou City (2009 - 2011)	Grassroots Technical Assistance
Project for Promotion of Community based Hospital Infection Control Activities (2010 - 2012)	Grassroots Technical Assistance

[71] The WHO Western Pacific Regional Office “SARS, how a global epidemic was stopped” (December 2007)



SARS Emergency Aid
● China-Japan Friendship Hospital
Loan assistance
■:Heilongjiang, Jilin, Liaoning, Hebei, Shanxi, Henan, Hebei, Henan, Anhui, Jiangxi
Technical assistance and grassroots technical assistance
● Hospital Infection Control Project in Guanzhou (Respiratory Disease Institute, Guangzhou Medical University First Hospital, Guangzhou City CDC)

[SARS Emergency Aid: JDR dispatch/technical cooperation/grant aid]

After the outbreak of SARS in Guangdong Province at the end of 2002, in April 2003, the Chinese government declared the fight against SARS as the highest priority.[72] Accordingly, Japan provided personal protection equipment such as protective clothing and masks, as well as anti-influenza virus drugs as emergency aid through the WHO Regional Office for the Western Pacific. In May 2003, Japan dispatched an international emergency aid team to the China-Japan Friendship Hospital that was a designated SARS countermeasure hospital to conduct seminars and provide on-site technical assistance. Japan also provided air sterilizers, X-ray imaging machines, respirators, intensive care monitors, etc. as emergency grant assistance.

[Scheme for establishing base facilities for public health: ODA Loan]

To address the vulnerabilities of the public health system revealed by the SARS outbreak, infection control measures were enhanced in 10 inland provinces by the following means: supplying equipment (various specimen analyzers, diagnostic devices, sterilizers, therapeutic instruments, information processing facilities, mobile emergency test vehicles, ambulances) to base facilities related to public health at the province/city level (disease prevention control centers, hospitals for infectious diseases, emergency centers); and human resource development (dispatching infection control personnel to higher administrative authorities; training courses in Japan; inviting experts from Beijing and Shanghai) to base facilities at the province/city level.[73]

[The Hospital Infection Control Project in Guangzhou: Technical cooperation / Grassroots technical assistance]

The causes of the spread of SARS are considered to be the insufficient initial surveillance system and secondary infections at medical institutions. The establishment of a cooperation system between CDC, which conducts surveillance, and the hospitals, which are area medical institutions, is essential to fully understand the occurrence of infectious diseases promptly. Furthermore, the establishment of a hospital infection prevention team and thorough implementation of infection-preventive standards are expected as prerequisites in order to deal with serious infectious diseases such as SARS. Technical cooperation was provided to address these issues, and to share measures against hospital infection and improve the abilities of Guangzhou CDC

[72] The WHO Western Pacific Regional Office "SARS, how was the global epidemic stopped" (December 2007)
[73] Ex-Post Evaluation Report on Public Health Infrastructure Facility Improvement Project (Province; Hunan, Jianxi, Anhui, Shanxi, Jilin, Heilongjiang, Liaoning)

to detect disease-causing agents and prevent infection. Over the course of this project, Hyogo prefecture and Fukuoka City rendered tremendous support as cooperation organizations within Japan, since Hyogo prefecture and Fukuoka City are in sister-city relationships with Guangdong province and Guangzhou City, respectively.

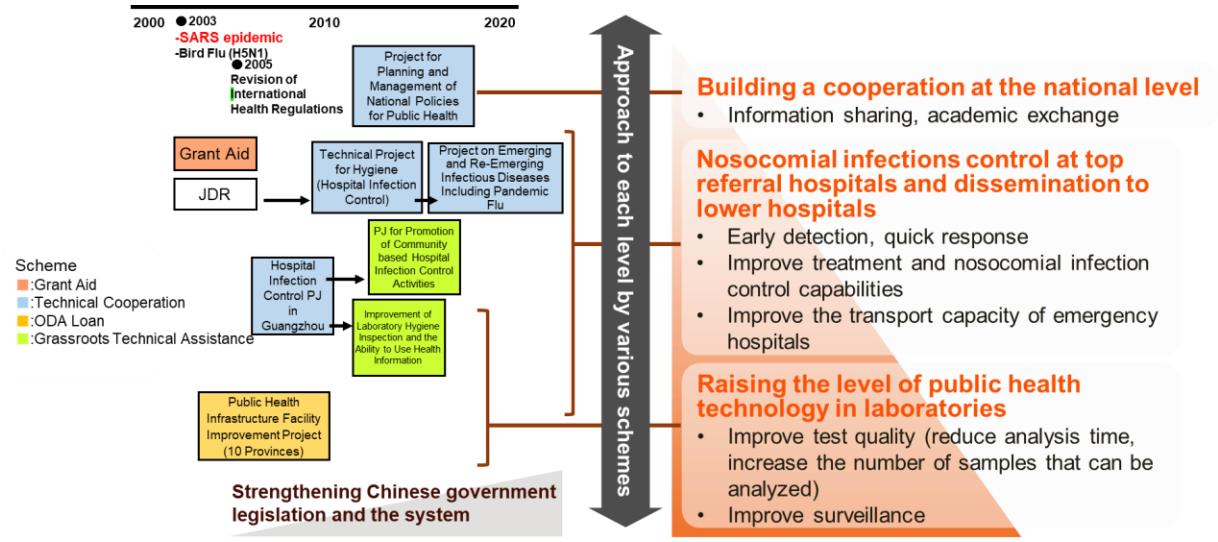


Figure 15: Support rendered by Japan in relation to SARS

The following three impacts were derived by implementing these projects.

1) Application to infection control measures at base hospitals of Japan-China cooperation

In China, since the first case of SARS in human beings was detected in Guangdong province, in November 2002, the disease spread to Shanxi, Beijing, Inner Mongolia Autonomous Region and other areas. In Beijing, mass SARS infection occurred from late March 2003 and 20% of the cases involved the hospital infection of medical professionals. To deal with this situation, Japan dispatched a "JDR Expert Team to cope with spreading of SARS in China" in May 2003, as requested by the government of China. The Chinese government appointed the China-Japan Friendship Hospital as one of the designated hospitals for SARS, and the expert team provided the hospital with support for hospital infection control against SARS. The support to prevent SARS hospital infections was conducted smoothly, since the China-Japan Friendship Hospital, which had been established through grant aid in the 1980s, was able to handle the infection control measures, and because adequate human resources had been developed by the previously conducted technical cooperation. The WHO had initially estimated at least two years until the SARS pandemic would be over; however, the end of the SARS outbreak was announced as early as July 2003.

Using the facility supported by Japan, prompt action against the public health crisis such as SARS thereby contributed to the early termination of the pandemic disease.

2) Contribution to controlling newly emerging/re-emerging infectious diseases by improving the public health system

Using the loan assistance "Public Health Infrastructure Facility Improvement Project," improvements to facilities and equipment were implemented at CDC, hospitals treating infectious diseases, and emergency centers that make up the core facilities of the public health system, in 10 inland provinces. Along with the post-SARS legislation and the government of China's enhanced system for sudden public health crises, prevention/testing measures for disease-causing agents and therapeutic capabilities were improved. The subsequent effect was confirmed in the ex-post evaluation by JICA; the responses to infectious diseases that happened afterwards, such as new type of influenzas, were improved. As specific cases, spreading of the highly pathogenic avian influenza (H5N1) and super-flu (H1N1, H7N9) were held to a minimum thanks to surveillance. Furthermore, the fact that the first case of super-flu was detected by a city CDC in Hunan province contributed to the enhanced surveillance and awareness-raising.

Since the occurrence of infectious diseases varies depending on the epidemic trends each year, year-by-year improvement trends cannot be clarified. Moreover, at this point, it has only been a few years since the project was launched, making it difficult to clearly determine the relationship between the project effect and infectious disease epidemic trends. Accordingly, further mid-to-long term observation is required. However, after the project launched in the latter half of the 2000s-decade, the early detection of disease outbreaks and the identification of infectious causes became possible through the enhanced surveillance system; this indicates that the important function to prevent the spread of infectious diseases has been strengthened. Accordingly, the enhanced public health system derived by this project did have an impact to a certain degree, considering the fact that the number of outbreaks of serious infectious diseases after the SARS outbreak remained relatively few.

3) Continuous support at the municipal level

During the "Hospital Infection Control Project in Guangzhou," Japan-China cooperation was developed at the municipal level; Hyogo prefecture and Fukuoka City, which are sister cities of Guangdong province and Guangzhou City respectively, supported the project as cooperation organizations within Japan. After the technical cooperation project ended, grassroots technical cooperation projects were implemented by the municipalities. Even after the end of these grassroots projects, doctors at Guangzhou Medical University (formerly Guangzhou Medical College), Guangzhou Institute of Respiratory Disease, medical centers in Hyogo prefecture and Kobe City, and other cooperation organizations in Japan still maintain good relationships. For example, Japanese professionals were invited to a seminar by Guangzhou Medical University, and collaborative research studies are still conducted. In addition, they exchange information on infectious diseases at the individual level. Previously, technical cooperation between expert teams conducted by the municipalities was not common in China; however, through this project, infection control support by the municipalities became one of the international methods of cooperation. When the requirements of Japan and the subject country meet, an ongoing cooperation system and platform to share information on infection control measures can be set, using the sister-city relationships or other means.

(3) Other global issues

Table 6 shows other outcomes related to global issues.

Table 6 : Other outcomes related to global issues

Project Title (Project Period)	Scheme
The Project for Supply of Equipment for Tibetan Tuberculosis Treatment Center (FY1994)	Grant Aid
The Project for Tuberculosis Control Program in Poverty Area (FY 2000, FY2002 - FY2004)	Grant Aid
HIV/AIDS Control Project (2006 - 2009)	Technical Cooperation
Project for Planning and Management of National Policies for Public Health (2012 -2016)	Technical Cooperation

[Tuberculosis control]

Tuberculosis has been the most common cause of death for a single disease in China since the 1990s, and constituted a major limiting factor in the economic development of deprived areas, because three-quarters of tuberculosis patients are young to late middle-age adults, with the financial burdens on patients and their families being significant.

Provided device for diagnosis of tuberculosis
(Photo: JICA website)

During "The Project for Supply of Equipment for Tibetan Tuberculosis Treatment Center" 170 categories of medical devices were provided to 16 facilities in the Tibet Autonomous Region from 1994, in order to enhance the detection of tuberculosis cases and the awareness of infection control, and develop and improve the foundations of the health and welfare system mainly for tuberculosis-related disease control. Through "The Project for Tuberculosis Control Program in Poverty Area (I-IV phases)," Japan supported the supply of microscopes, antituberculous drug, injectors and educational booklets for patients, which were necessary to promote the directly observed treatment, short-course[74](DOTS) plan, to 9 provinces and 3 autonomous regions from 2000.

[74] The name of the comprehensive PHC service plan which is used to detect and treat tuberculosis patients; it was developed by the WHO as a tuberculosis control plan. The five main elements are as follows: 1) the government shall recognize tuberculosis as an important issue and take the initiative to solve it; 2) promotion of diagnosis by bacteria tests and follow-up examinations; 3) instructing patients to take medicine in front of medical staff to prevent them overlooking medication; 4) stable supply of medicines; 5) recording bacteria test results and surveillance.

[HIV/AIDS control]

Grant aid:
■: Tibet Tuberculosis Treatment Center: Tibet Autonomous Region
■: The Project for Tuberculosis Control Program in Poverty Area : Tibet, Inner Mongolia, and Guangxi Zhuang Autonomous Region, Shanxi, Shaanxi, Gansu, Henan, Anhui, Jiangxi, Guizhou, Yunnan, Qinghai
Technical cooperation:
●: HIV/AIDS Control Project in Gansu Province

While the current numbers of HIV carriers and AIDS patients are not very high in Gansu province, the fluid population is particularly large. Therefore, the hidden possibilities of HIV infections and an AIDS outbreak has been considered high. However, there was insufficient infection control including the prevention of hospital infections involving this high-risk disease group. Through the "HIV/AIDS Control Project" in Gansu province, various technical cooperation activities were conducted: seminars, volunteer education, various health education activities, disease control intervention, and expansion with promotion of HIV tests.

Educational event on HIV/AIDS at a school
(Photo: JICA website)

HIV/AIDS control education for temporary residents
(Photo: JICA website)

[Project for Planning and Management of National Policies for Public Health]

Reflecting the globalized society of recent years, infectious diseases travel far beyond national borders and are brought in and out of countries more frequently. The spread of infectious diseases is no longer merely a domestic issue, but rather a task that should be solved with international cooperation. Therefore, a platform type project at the national level has been conducted since 2011 to support the exchange of information and the creation of human networks, in relation to the three common health issues between Japan and China: tuberculosis, vaccination projects, and the outbreak of serious public health problems.

Based on the Okinawa Infectious Diseases Initiative in 2000 and Japan's ODA policy for China that was formulated in 2001, Japan has provided highly relevant support for tuberculosis and HIV/AIDS control, putting emphasis on infection control measures and coordinated with international organizations. However, many tuberculosis control challenges still remain worldwide and further enhancement of control measures is required. The following are the outcomes and impacts of the projects relating to tuberculosis and HIV/AIDS, classified by disease.

1) Outcomes of tuberculosis control

Tuberculosis is prevalent worldwide as a re-emerging infectious disease, and delays in the progress of tuberculosis control have been identified all over the world. Similarly, in China, the number of tuberculosis cases is on a declining trend, although the prevalence rate still remains high. According to the WHO's "Global Tuberculosis Report 2019," the estimated case rate of tuberculosis[75] (per population of 100,000) in 2018 was 61, which was higher than Japan with 14, the UK with 8, and the USA with 3. However, the number of tuberculosis cases is declining as a consequence of steadily implementing the national tuberculosis control program. According to a WHO report,[76] in 2010, China cut both the prevalence rate and the mortality rate of tuberculosis over the previous 20 years by half. Tuberculosis control has not had as significant an impact as the eradication of polio, although the following outcomes were reported through a series of previous grant aid projects.

- Contributed to 100% coverage of the DOTS plan, which is globally promoted by the WHO, in China.
- Tuberculosis control contributed to developing and improving the foundations of the healthcare system mainly for tuberculosis-related disease treatment management. Consequently, the PHC service of each area was also improved.

2) Outcomes and impacts of HIV/AIDS control

During the "HIV/AIDS Control Project," training courses and various HIV/AIDS control activities were held at a model site to improve the preventive services in the area, and the experience gained during these activities was modeled (documented). The models and documents were adopted across Gansu province and the services in the area were improved. This project facilitated preventive services such as publicizing and developing both health education and voluntary HIV antibody tests[77] accompanied by voluntary counseling.

With regard to the impact reported in the ex-post valuation, the Project Cycle Management (PCM) method, an operational management technique that Gansu provincial CDC acquired through its project management, was applied to other assignments in order to conduct healthcare projects more effectively.

[75] Patients who had tuberculosis for the first time
[76] http://www.wpro.who.int/china/mediacentre/factsheets/tuberculosis/en/ (accessed October 1, 2019)
[77] The process to help a patient (an individual or couple) make an independent decision, whether or not to take a HIV test, based on accurate information about the test through counseling.

3.2.2 Enhancement of the public health service in rural areas

Table 7 shows projects that contributed to infection control through fundamentally enhancing the public health service in rural areas.

Table 7: Projects that contributed to enhancing the public health service in rural areas

Project Title (Project Period)	Scheme
Anhui Primary Health Care Technical Training Center (1999 - 2005)	Technical Cooperation
The Project for Supply of Equipment for Reproductive Health / Family Health Training Center (FY2004)	Grant Aid
The Village-based Integrated Poverty Alleviation Model Project in Daozhen County and Leishan County, Guizhou Province (2005 - 2009)	Technical Cooperation
Project for Capacity Building of Reproductive Health and Family Care Service in Central and Western Region (2006 - 2009)	Technical Cooperation
Project for Strengthening of Health Education for Prevention of Infectious Diseases through Family Health (2011 - 2016)	Technical Cooperation

Technical cooperation:
- ● Anhui PHC technical training center: Anhui province
- ■ Central and Western Region, model provinces: Henan, Chongqing, Shanxi, Gansu, Hubei, Hunan, Jiangxi, Yunnan, Hainan
- ■ Central and Western Region, subject provinces: 20 inland provinces
- ■ Family Health Project: Anhui, Hebei, Henan, Hubei, Chongqing
  *Both mid-west part reproductive health and domestic healthcare: Henan, Chongqing

Grant aid
- ● Reproductive Health / Family Health Training Center (Taicang, Jiangsu province)

[Anhui Primary Health Care Technical Training Center]

With the Health Agency, and the Science and Technology Agency of Anhui province as counterparts, Japan provided support to improve training techniques and establish a training system for teachers to provide the PHC service in training centers at the province level (Department of Health Management at Anhui Medical University, and medical colleges), and at the county level (medical schools in 15 counties) for the purpose of strengthening the abilities of those managers and technicians who are in charge of the PHC service.

[Family Health Projects]

With the former National Population Planning Commission as a counterpart, Japan supported the alleviation of poverty. The contents of the support included the enhancement of public health services in rural areas. Initially, for the purpose of formulating a poverty alleviation model, family health was selected as a model project at the national level and developed into a public health system at the community level, drawing on Japan's public healthcare system, after providing a service that combined family health, living condition improvements, and ecological farming in Guizhou province. Healthcare services such as healthcare education were promoted in response to demand from local citizens.

The family health project, involving long-term Japan-China cooperation, has undergone a few significant

changes. Details of these changes are described below.

Family health originates from "IP,"[78] which was promoted worldwide by JOICFP as "Humane family planning." The promotion of IP was accepted by local residents all around the world, and contributed to raising local awareness of health and living improvements. In many cases, the potential was proven for IP to evolve from maternal and child health to preventive medicine, and further to "regional development campaigns" as improvement of environmental hygiene and lifestyle, rather than remaining just dealing with the prevention of parasitic deseases, nutrition improvement and family planning.[79] In China, IP was conducted in 42 counties of 31 provinces across the country by JOICFP and the former National Population Planning Commission[80] from 1984 to 2007.

After 2001, Japan's ODA for China in the health sector contributed to the alleviation of poverty and the improvement of regional welfare, and led to JICA's poverty alleviation projects: the "The Village-based Integrated Poverty Alleviation Model Project in Sandu County, Guizhou Province" and the "Village-based Integrated Poverty Alleviation Model Project in Daozhen County and Leishan County, Guizhou Province". Based on the family planning projects previously conducted by JOICFP, the concept of "domestic healthcare" was introduced, health education projects from the viewpoint of the family, and poverty alleviation model projects that included a component of domestic healthcare in addition to living improvements and ecological farming.

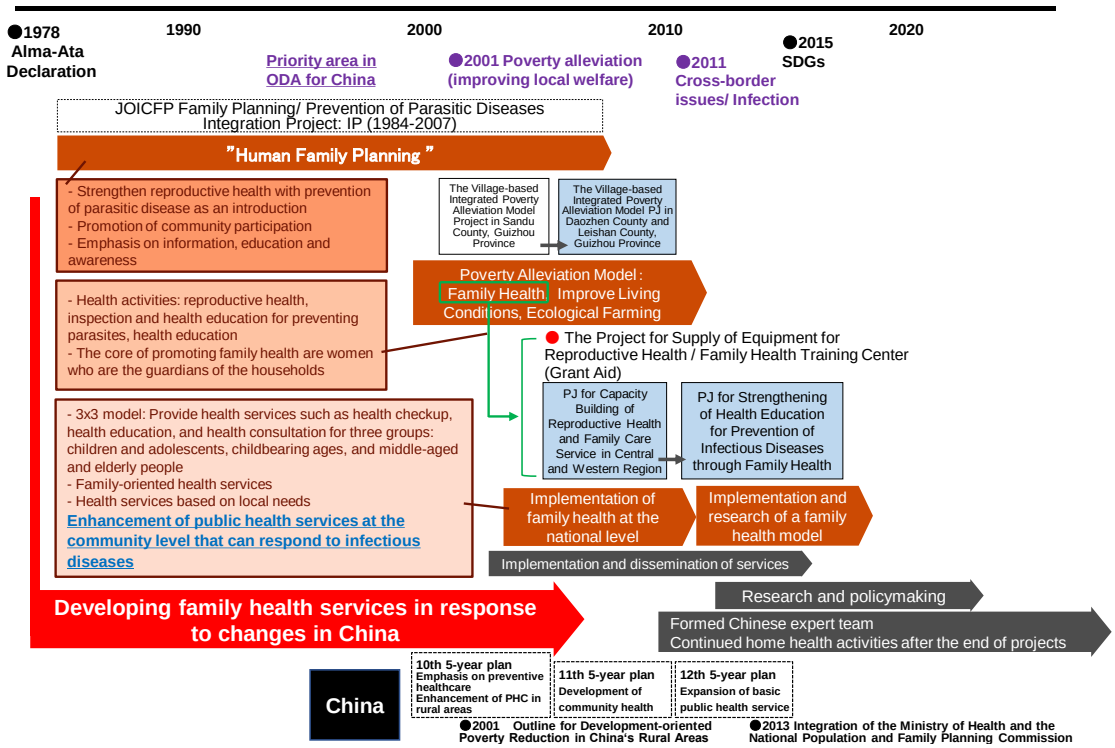


Figure 16: Transition of projects and development of family health

Source: Produced by the Evaluation Team

The concept of family health was discussed in the "Project for Capacity Building of Reproductive Health

[78] As explained in 3.1, this indicates the Integration Project of "family planning and parasites prevention project" (Integration Project:IP) .

[79] JICA, Institute for International Cooperation, "Japan's Experiences in Public Health and Medical System- Towards Improving Public Health and Medical Systems in Developing Countries" (March 2004)

[80] https://www.joicfp.or.jp/jpn/project-search_category/ch/ (accessed September 10, 2019)

and Family Care Service in Central and Western Regions" from 2006, as a framework for disease prevention at the national level including healthcare services such as health education, health check-ups and health consultations. After 2011, family health services and support for research were provided for the purpose of establishing a family health policy in the "Project for Strengthening of Health Education for Prevention of Infectious Diseases through Family Health." Eventually, family health was defined, from the viewpoint of the family, as a healthcare service consisting of health education, health check-ups and health consultations for three groups: children and young adults, those of childbearing age, middle-aged and older. A framework including guidelines and manuals was then created to conduct disease prevention for infectious diseases and others. After the project ended, China has been using this framework for follow-up on projects including the family health service.

Health activity in cooperation with junior high schools
(Photo: provided by a former project expert)

Health education for housewives in rural households
(photo: provided by former project expert)

A series of family health projects has been conducted for more than 30 years since the JOICFP project, and have been continuously developed to conform to Japan's ODA policy for China or the specific circumstances in China during each phase. Development of the projects has mainly been derived from the ongoing dedication to the projects by the counterpart organizations in China and the Chinese professionals at academic institutions, actively searching for the fundamental role of the health service together with Japanese experts.

The following are the two impacts that resulted from implementing the family health project.

1) Dissemination of the family health service through the "New Project for Developing Capacity of Family" conducted by the National Health Commission of China

Since the end of the project, the "New Project for Developing Capacity of Family" has been conducted by the National Health Commission in 31 provinces and 2 autonomous regions. As part of this project, activities that includes a component of family health are conducted. Across the country, this undertaking has helped spread health services that include the prevention of infectious diseases and lifestyle-related diseases.

2) Contribution to expanding the public health service while conforming to local demands

Developed from family planning, this project has been searching for the way that health project can meet local needs, and public health service such as disease prevention. After an organizational change in 2013, the

National Population Planning Commission and the Ministry of Health were integrated with the National Health and Family Planning Commission (currently the National Health Commission), and workers who had been engaged in family planning projects joined the public health field. This project also contributed to such a change of circumstances in China to a certain degree. Currently, China is promoting a healthcare project under the guidelines for the healthcare field "Healthy China 2030."[81] In 2019, the guidelines for health management and disease prevention "Healthy China Initiative" (2019-2030)[82] was formulated, and 6 articles out of 15 refer to intervention for each household and family-oriented support. The concept developed through the family health projects is used in the framework for health management and disease prevention as China's health policy. Thus, it is fair to say that the support received from Japan has made a certain degree of contribution.

3.2.3 Training project based at the China-Japan Friendship Hospital

In December 1979, after the conclusion of the Japan-China Peace and Friendship Treaty, cooperation between Japan and China was announced to symbolize the friendship between the two countries when Masayoshi Ohira, Japanese Prime Minister at the time, visited China. In 1980, the China-Japan Friendship Hospital was established via grant aid based on a request from China. The human resources to work as medical workers and hospital administrators were developed through later technical cooperation projects such as the infection control support projects for provincial areas that used the Japan-China cooperation platform.

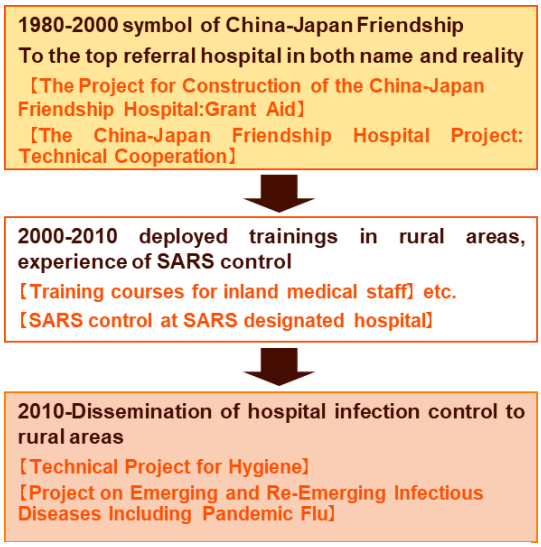


Figure 17 Change of projects at the China-Japan Friendship Hospital

In China, economic disparity between the coastal areas and inland areas widened along with the economic growth. The level of medical technology in the western regions (inland areas) had fallen behind; therefore, the government of China promoted development of the western regions as the highest priority. After 2000, the China-Japan Friendship Hospital conducted projects such as developing human resources to work as medical workers in order to share their accumulated techniques and knowledge with medical workers in the deprived areas of the western regions, and to improve the medical environment for people in those deprived areas, the medical/nursing care quality of local hospitals, and the level of the entire medical system. During this period, SARS broke out in 2003, the China-

[81] Healthy China 2030 plan outline http://www.gov.cn/zhengce/2016-10/25/content_5124174.htm
Receiving assistance from various entities/organizations, such as the government and healthcare industry, or cities and rural communities, the guidelines aim to popularize a healthy lifestyle. Detailed measures and goals to be achieved are outlined in categories of "health awareness," "medical services," "healthy environment" and "healthcare market".

[82] Health China Initiative (2019–2030)
http://www.nhc.gov.cn/guihuaxxs/s3585u/201907/e9275fb95d5b4295be8308415d4cd1b2.shtml
Out of 15 important initiatives, support from the viewpoint of the family is mentioned in the following: 1. Sharing knowledge on health; 2. Rational consumption of food and drink; 4. Smoking control; 6. Healthy environment improvements; 7. Promoting the health of expectant and nursing mothers and infants; 8. Promoting the health of primary and junior high school students.

Japan Friendship Hospital dealt with the crisis as a designated hospital for SARS upon receiving support from both international organizations and Japan. The China-Japan Friendship Hospital took advantage of its experience of contributing to the convergence of SARS to strengthen its hospital infection control measures. From 2010, the "Technical Project for Hygiene" was undertaken, which focused on hospital infection control and was selected from training project subjects that had mainly been conducted by the China-Japan Friendship Hospital. From 2016 to 2021, support is provided in other areas including the diagnosis and treatment of infectious diseases in addition to hospital infection control.

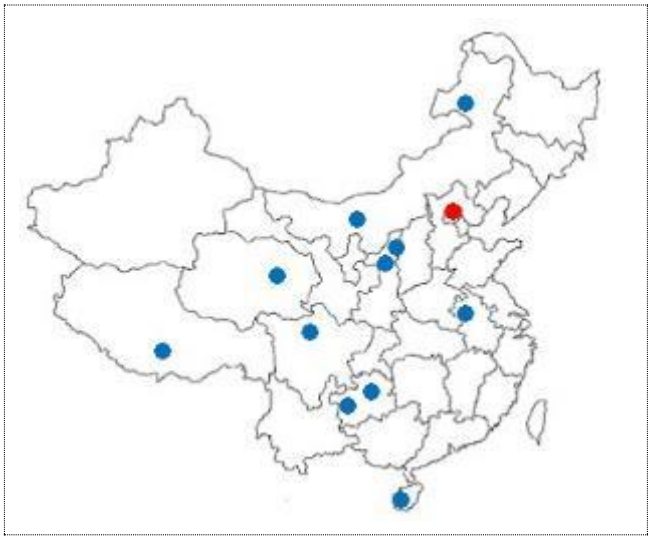
The following are the outcomes of cooperation at the China-Japan Friendship Hospital in chronological order.

[Project for Construction of the China-Japan Friendship Hospital: Grant Aid]

While implementing the various modernization policies, grant aid was provided to construct the China-Japan Friendship Hospital which consisted of a general hospital with 1,000 beds, a rehabilitation facility with 300 beds, a clinical medicine institution and a nursing school, in order to modernize medical science and improve medical standards by integrating traditional Chinese medicine with Western medicine in the healthcare field.

[China-Japan Friendship Hospital Project: Technical Cooperation]

Support was provided to improve medical techniques, develop operational management at the hospital and promote research into traditional Chinese medicine. In addition, to heighten the effects of cooperation, a three-year follow-up project was conducted from October 1989 to strengthen the central diagnosis department and to facilitate cooperation between clinical divisions. Moreover, from October 1994, which was the 10th anniversary of the hospital, the temporary dispatch of experts and a supply of devices were provided through a year-long after-care project, considering the retention status of previously supported techniques.



●China-Japan Friendship Hospital (Beijing)
●Pandemic project model facilities (11 in total): Sichuan (1), Qinghai (1), Anhui (1), Shaanxi (2), Hainan (1), Guizhou (2), Inner Mongolia Autonomous Region (2), Tibet Autonomous Region (1)

[Technical Project for Hygiene]

The government of China has been enhancing its hospital infection control after the SARS outbreak, and has conducted training projects at hospitals at the county level to strengthen their capacities to cope with hospital infections on the basis of the China-Japan Friendship Hospital.

[Project on Emerging and Re-Emerging Infectious Diseases Including Pandemic Flu]

For the purposes of prevention and the prompt convergence of any infectious disease outbreak, a training project to enhance hospital infection control, such as early diagnosis/treatment, prevention of spreading and countermeasures for antimicrobial resistant bacteria, is being undertaken for hospitals at the county level or smaller in the central and western regions; the project is to end in 2021.

The following two impacts were derived through a series of projects for the China-Japan Friendship Hospital.

1) Progressive development and contributions to infectious disease control by the China-Japan Friendship Hospital

As shown in Figure 18, as a result of Japan's long-term support of the China-Japan Friendship Hospital and the efforts made by the China-Japan Friendship Hospital itself, the hospital was designated as one of the top referral hospitals of China in 1993, and later selected as one of the "Top 10 hospitals" in Beijing and the "Top 100 hospitals" nationwide. Through an after-care project from 1994, the China-Japan Friendship Hospital was designated as a central health (high-ranked) base hospital in 2001. Currently, in addition to the increased number of beds from the initial 1,000 to 1,500, the hospital has grown into a major hospital with 68 clinical/healthcare departments, the China-Japan Friendship Clinical Medicine Research Institution, and a human resource development center. The China-Japan Friendship Hospital has been developed progressively, starting from the enhancement of its hospital functions and the creation of a Japan-China cooperation station, then the handling of the SARS outbreak, and progressing to the sharing of improved hospital functionality including hospital infection control with the inland regions. Such advancements have been mainly due to a few factors: JICA designed each plan to be developed consecutively conforming to the specific circumstances at the time it was drafted (e.g., training functions, enhanced support for inland regions); immediate actions against disruptive scenarios such as the SARS outbreak; and efforts by the China-Japan Friendship Hospital for further development.

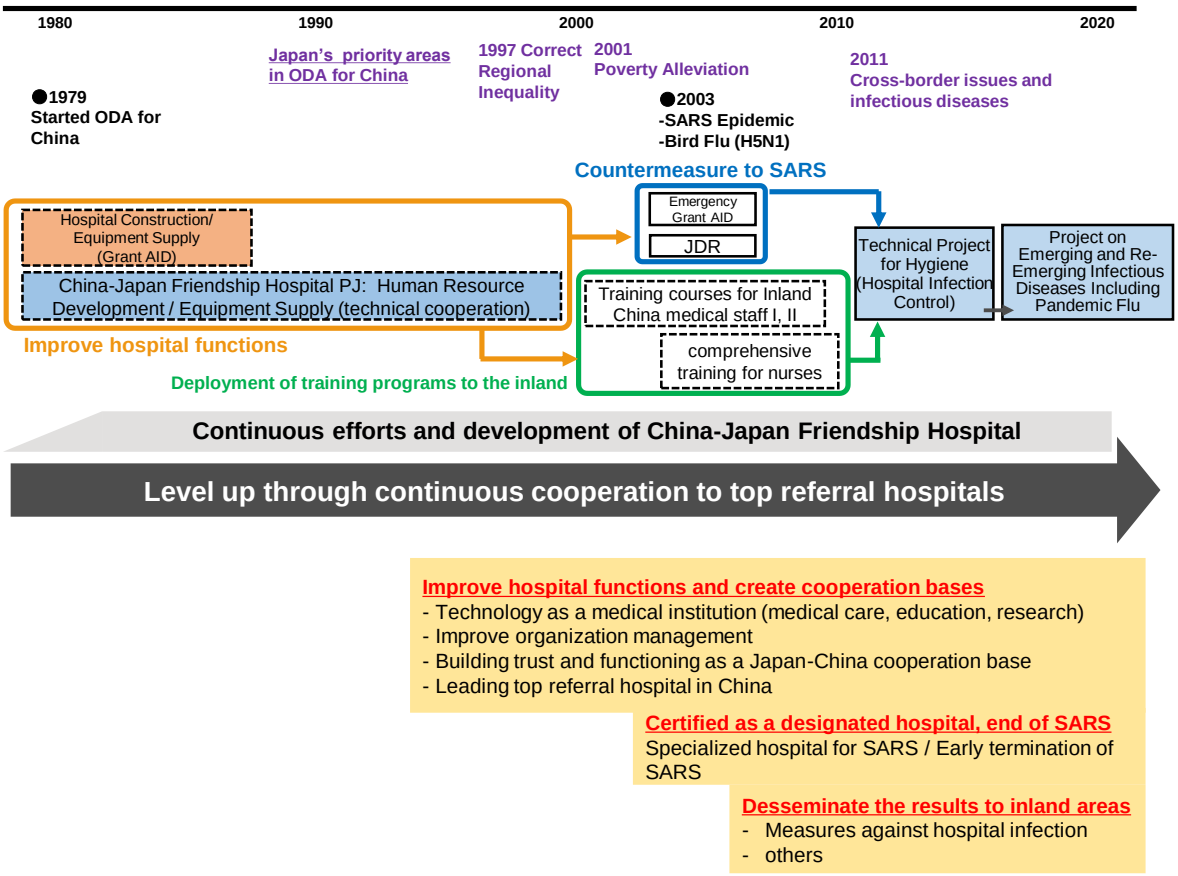


Figure 18: Support for the China-Japan Friendship Hospital and progressive development

Source: Produced by the Evaluation Team

2) Various contributions derived from Japan-China cooperation at the China-Japan Friendship Hospital

Since JICA started accepting trainees from China in 1978, more than 1,000 medical trainees have received training in Japan. Returnees acquired advanced knowledge and techniques in the medical field, and exercised such knowledge and techniques to help further develop medical care in China after their return home. Many of the returnees are already playing a key role in the places they work. Recognizing this training project as a "high-status brand," an alumni association[83] was formed by the returnees in the medical field including people at the China-Japan Friendship Hospital, for the purpose of establishing a platform for mutual information sharing and learning between returnees, as well as enhancing their own skills through further development and improvement after the training. In addition to the professional growth of the trainees themselves, this training project is contributing to the Chinese people in the form of social engagement activities such as free consultations at clinical sites, and technical support including lectures or on-site instruction by trainees for medical workers. This alumni association of trainees also plays an important role as a platform for mutual understanding between Japan and China.

Other than the alumni office of the returnees in the medical field, the front office of the Japan-China

[83] China-Japan Friendship Hospital JICA introduction of alumni returnees in the medical field https://www.zryhyy.com.cn/Html/News/Articles/100114.html (accessed December 1, 2019)

Sasakawa Medical Fellowship has also recently been set up, and playing a central role in Japan-China exchanges, benefits from the influence of the hospital as a symbol of Japan-China cooperation.

3.3 Summary (Impacts observed by a cross-section study)

In this chapter, the details of "impacts in a broad sense" made by 40 years of JICA's ODA for China were tracked, along with the revisions to how JICA has implemented ODA for China in the area of infectious diseases since 1990, in order to deal with the issues related to infectious diseases from various periods in the past.

The ODA for China conducted by JICA in the field of infectious diseases is characterized by effective approaches to problem solving by understanding the detailed circumstances of each site, and support for the activities of China in regard to the control of focused infectious diseases at the time by combining grant aid, loan aid, and technical cooperation schemes. The support provided by JICA includes the following: field surveillance and enhancement of laboratory capacity for the control of vaccine-preventable infectious diseases (e.g., eradication of polio); emergency support for convergence of the SARS outbreak; establishment of an infectious disease control system by combining various schemes after the SARS outbreak; supply of devices via grant aid to help with global initiatives, support to share enhanced infection control measures with the regions along with development of the China-Japan Friendship Hospital; and support for establishment of the public health system including infection control measures in rural areas.

Firstly, the eradication of polio in China achieved via ODA, which made a significant contribution to society in China, is recognized as an impact of the project according to the definition of DAC.

In addition, the creation of a platform for Japan-China cooperation, which is a contribution to the promotion of cooperative research, can be listed as the primary impact of all the other impacts in a broad sense derived by this series of projects. As a consequence of long-term Japan-China cooperation, the cooperative relationship memorandum between the National Institute of Infectious Diseases and the CDC in China was officially signed to facilitate cooperative research and information sharing in relation to common issues of infectious diseases in Japan and China. Furthermore, Guangzhou City and Hyogo prefecture, which have been in a cooperative relationship to enhance hospital infection control, still maintain that cooperative relationship based on each other's needs, although there is no official memorandum between them. They have established a system to share the latest information relating to newly emerging/re-emerging infectious diseases, and conduct disease control measures locally against such infectious diseases.

The second impact in a broad sense is a benefit to Japan. As a result of improving the laboratories from both the infrastructure ("hard") and technical and institutional ("soft") aspects, through projects to control vaccine-preventable diseases such as polio and projects to establish public health infrastructure, disease-causing agents can now be stopped promptly in Chinese laboratories, without being transmitted to Japan.

The third impact in a broad sense is the contribution to the technological transfer of project management methods. The project management methods transferred via technical cooperation are applied to the management of other projects, resulting in more efficient and effective operation of the health service. Moreover, in projects that require cooperation with other divisions, a system to establish the management method and solve any issues related to public health with the cooperation of all divisions has been established.

Chapter 4 Lessons Learned

4.1 Lessons learned

By reviewing the ODA to China in the fields of environmental management and infectious diseases, the impacts in a broad sense derived by the series of such projects have been analyzed. The following represents what was learned by analyzing the backgrounds and causes of cases that were successful, and cases that failed. These lessons are described in a cross-sectoral manner between the two fields, by giving examples.

Before using the lessons, the specifics of the ODA to China need to be considered. The background to the onset of these impacts in a broad sense generated by the cooperation of the two fields subject to this analysis, was the strong leadership and explicit requirements of China, in addition to the plentiful projects and the flexible cooperative system of Japan which is applicable to various areas, which all made a significant contribution. Accordingly, the abilities of the partner country or region to implement a project, and the type of project that can be implemented should be taken into consideration when using these lessons in other countries or regions.

(1) The importance of flexible implementation of a project conforming to changing requirements in the partner country

When a change of policy or new demands in the partner country occurs during the implementation of a project, providing flexible support contributes to the outset of mid-to-long term effects of development.

In China, development issues have been changing rapidly along with dramatic industrialization and economic growth. For example, in the environmental field, initiatives to combat many types of pollutants, yellow dust, SOx, dioxin and PM10/2.5 have been required since the 1990s. In Phase 1 and 2 of the environmental protectioncenter projects, enhanced research and training for the center to play a more instructive role and improved monitoring were implemented along with the construction of the center and the development of human resources. Afterwards, projects that conformed to Chinese requirements have been conducted to support solutions to environmental issues of the day.

Upon revising the plan during Phase 3 of the center's project, a suggestion was made by JICA experts, who understood China's real needs well, to change the direction more towards promoting a circular economy focused on the future of China. Phase 3 and 4 of the projects were conducted following this suggestion. Furthermore, JICA's response to the severe air pollution in 2013 was highly acclaimed by the Director-General of the environmental protection center: "If JICA had carried out the plan as originally decided, we could not have met the demand."

For the subject countries of ODA, especially countries that are experiencing dramatic economic growth, development issues that are unforeseeable at the time of planning frequently arise, and policies may be amended during relatively short periods of time. To consider how flexibly these issues can be dealt with while still trying to achieve mid-to-long term development effects as well as strengthening the cooperative relationship, the cases of China can provide good examples.

(2) The ripple effect on society by cooperation inside and outside JICA

To achieve ripple effects on the entire nation/target group, the development of laws and an enhanced implementation system are crucial.

The contribution to the formulation of a draft to revise/establish environment-related laws, such as the "Environmental Protection Law," the "Air Pollution Control Law" and the "Circular Economy Promotion Law," is one of the most important outcomes of the ODA for China. JICA has supported the amendment and establishment of laws through a series of cooperation projects related to environmental management and projects that support the development of laws as a pair of linchpins. With organizations that have a significant influence on the nation, such as the National Development and Reform Commission, and the National People's Congress as counterparts, JICA succeeded in communicating international trends and Japan's experience to the formulators of law drafts and the lawmen in these organizations. By capturing the outcomes of cooperation in the form of laws, the entire nation of China could enjoy the benefits.

Similarly, for infectious diseases, the cooperation project for polio control was conducted with ongoing assistance from national medical research institutions of Japan, and resulted in remarkable success in the form of the eradication of polio (2000) by closely working with the WHO and UNICEF. Furthermore, during the project for surveillance and improvement of control for vaccine-preventable infectious diseases, a subproject that examined vaccination certificates and supplemented vaccinations for children starting pre-school/school was conducted in cooperation with the National Bureau of Education and schools; this made it possible to address the issue of unvaccinated children. This is a good example of how an enhanced collaboration system was used to share effects with the entire nation/target group.

Collaborating with organizations in other sectors and international organizations, not just the executing agency in the partner country, is an important part of developing laws and establishing an implementation system without limiting the target area of a project or the duration of cooperation. When aiming to increase the benefits of project effects, JICA should formulate a project plan considering the relevant legislative process and the strengthening of implementation systems that cover multiple sectors.

(3) To ensure the persistence of project effects and to maintain a good relationship between the two countries for a long time after the termination of Japan's ODA to China, JICA should create a network involving the external organizations from the planning stage, and develop a system to maintain and update this network. Furthermore, a good network built through ODA projects and activities for China should be maintained and managed as an asset that can be applied to other projects.

JICA may be able to ensure the persistence of project effects, apply it to other projects, develop it in a third country, or even use it to maintain a cooperative relationship between the two countries, by creating, maintaining and updating a network with the appropriate organizations throughout the chronological periods of project planning, project implementation, post-project, and even after the termination of Japan's ODA to China. JICA is expected to create a long-term, practical and comprehensive network by following these two methods: involving organizations such as municipalities with knowledge of administrative services, enterprises willing to provide businesses or technologies, and NPOs/NGOs who play a key role in education

in addition to the counterpart organization and the Japanese assisting organizations, from the planning stage of the project; and signing a memorandum with organizations including academic institutions and organizations engaged in the actual work.

Importantly, a municipality should be considered as one of the assisting organizations within Japan from the stage of project planning. By having the municipalities involved from the initial stage, an ongoing cooperative relationship that uses existing frameworks including sister-city agreements can be expected after the end of a JICA project; thus, the persistence of the project and the continuation of the Japan-China cooperative relationship can also be expected. During the implementation of a project, the knowledge of municipalities can be communicated by having the municipalities host training courses in Japan for the people who supervise the project. Furthermore, it can be used as a place for person-to-person exchanges that benefit both sides.

Moreover, in the environmental field, a Japan-China inter-city collaborative project on air pollution was launched in 2014, as well as an air-pollution-related cooperative platform of local governments using their friendship-city relationship, and the outcomes of the ODA for China are expected to be used in these frameworks.[84]

In relation to maintenance and management of the network, the discontinuance of a good relationship between counterpart sections due to internal transfer was identified as an issue. Academic institutions normally experience internal transfers less frequently, and people in such institutions also play an important role as professionals who provide technical advice. These people's involvement in a project is expected to dramatically improve the project's effectiveness during implementation, the ability to continue after the end of the project, and its impact.

In the family health project to enhance the management abilities of the local health plan and improve the capabilities of the local health service, persistence of the project was maintained by allocating Chinese experts (e.g., public health professors and assistant professors from universities and government retirees) to the implementation frameworks of the project from the planning stage. After the end of the project, the Chinese experts are engaged in continuing and sharing the project as consultants for the National Health Commission. As sharing of the project outcomes met the needs in China, the budget has continued to be paid by the Chinese organization.

In the field of infectious diseases, a memorandum was signed between the National Institute of Infectious Diseases and the Chinese CDC in August 2006, with forums on infectious diseases and collaborative research being conducted often. The memorandum can be considered as a framework to facilitate collaborative operations, eliminating the complicated procedures needed for information exchanges between individuals.

Moreover, looking at the successful cases analyzed in these evaluation analyses by theme, the enhanced effectiveness of the project was achieved by selecting people at the decision-making level and people who are engaged in the practical business as Chinese counterparts, and allocating top enterprises and professionals to the training sessions and seminars held in Japan for the Chinese counterparts. According to one Japanese

[84]Ministry of the Environment HP March 2019 Result of the five-year Initiative for Improvement of Air Pollution in China by Japan-China Inter-city Cooperation https://www.env.go.jp/press/106597.html

expert, it turned out that the training courses are planned and operated by fully integrating the maximum amount of findings, and the networks of top professionals and organizations, which represent the valuable assets of each expert, in order to satisfy the requirements from China. On the other hand, such an accumulation of knowledge has never been sorted systematically; therefore, the connections with experts eventually terminated when their terms ended. JICA needs to organize this accumulated knowledge systematically.

When implementing future projects in China or ODA projects in other countries, JICA should strategically involve external organizations in order to enhance the effects of projects. In addition, JICA should maintain, manage and use networks with the municipalities, businesses, NPOs/NGOs, and academic institutions engaged in the practical business, which were established through ODA, along with the accumulated knowledge from the organizations, experts, and counterparts who took part in training courses and seminars in Japan, as organizational assets. One option for a maintenance and management method is for the local JICA office to create a framework for regular meetings among relevant organizations during the implementation of a project.

(4) Preparations should be made to develop human resources and establish relationships as an organization by foreseeing the future, along with careful maintenance of connections with Chinese cooperators who have helped make projects successful.

There were many cases that resulted in successful outcomes by working with Chinese people who have experience in cooperation projects with Japan. Once a trustworthy relationship has been built, a positive cycle is also established; such relationship continues into another project without being terminated at the first project, leading to an impact in a broad sense as a series of projects.

Successful projects commonly had such a key person. For example, in the field of environmental management, the success of a project in Guiyang City, which is a model city for the circular economy in China, was supported by staff who were continuously engaged in the project and their assistants who were well-versed in Japan helped establish a local network. Furthermore, Japanese experts had valued relationships with these key persons. In the field of infectious diseases, Chinese CDC staff in the polio project and the Chinese counterparts at the Population Planning Commission in the family health project played a similar role.

Such key persons had similar experiences in common such as studying abroad, long-term training and collaborative research studies. JICA should also prepare to establish connections or trustworthy relationships with such people for the future. As one example, a structure for deepening mutual understanding such as a one-week training camp for young people to build trustworthy relationships, instead of meetings that are temporary and short-term.

4.2 Future direction

At the Japan-China Summit Meeting held in October 2018, the announcement was made to terminate any new ODA planning for China at the end of FY 2018, under common recognition of the equal partnership between Japan and China in order to contribute to local regions and international society together. In addition, it was announced that Japan-China cooperation in the future will be evolved to the next phase which includes discussions and person-to-person exchanges relating to specific areas of development.[85] The two countries agreed to deepen their cooperation to handle global issues such as SDGs, climate change, health, and plastic pollution in the oceans.[86]

After the revision to ODA for China in the fields of environmental management and infectious diseases during the evaluation by theme, questions were asked in regards to the future possibility of cooperation after the termination of ODA for China in FY 2021, as well as the future direction of cooperation. The following is a summary of answers and suggestions to the questions.

(1) Environmental management field

In the field of environmental management, Table 8 below lists suggestions on the future direction of cooperation projects elicited in interviews.

Table 8 : Direction of Japan-China cooperation in the environmental management field

Area	Response to global issues (Sustainable Development Goals, climate change, decarbonization, green revolution, renewable energy, plastic pollution in oceans, etc.)	
Form of cooperation	Government	● High-level conversations, international conferences, cooperation in the global framework such as monitoring networks, donor interactions, creation of a post-ODA follow-up system for projects to support the policy (diplomatic policy, creation of a system to support the environmental policy of China)
	Collaborative research	● Collaborative research between Japan and China, or multiple countries
	Training	● Collaborative operation of third country training
	Exchange at the private level	● Municipality (network such as the network of municipalities for improving the air quality of China, person-to-person exchanges between sister-cities or other related cities) ● NGO/NPO (environmental education) ● Interaction of enterprises (introduction of technology, matching environmental technology by using market mechanisms, providing information on laws and regulations, collaborative projects)

Reference: Summarized from interviews by the Evaluation Team

Looking forward to 2050, Japan should face up to global issues including climate change, decarbonization, the green revolution, renewable energy, and plastic pollution in oceans, by using the networks and knowledge derived through ODA, and contribute to stability initiatives in East Asia with support from China. There was the opinion that selection and concentration, as well as strategy and a roadmap for the goal are essential in order to achieve this.[87] At the same time, a long-term monitoring and follow-up system should be established

[85] The basic policy of ODA for China https://www.mofa.go.jp/mofaj/gaiko/oda/data/chiiki/china.html
[86] Outline of Prime Minister Abe's visit to China https://www.mofa.go.jp/mofaj/a_o/c_m1/cn/page4_004452.html
[87] Interview with Mr. Chihiro Oishi (September 5, 2019)

to see whether the outcomes of ODA over the past 40 years, especially policy-related projects, are being used in actual policies at the resident level. A platform and a system should also be developed to continue holding symposiums and policy dialogue by dispatching people from Japan.[88]

China does not want the relationship with Japan to deteriorate because of the termination of ODA either. As an economic giant, China aims for collaborative relationships to solve global environmental issues, therefore recognizes the importance of cooperation with Japan toward this goal. As the air pollution level in China still remains high, China indicated there is a need to draw on Japan's experience. The clean air action plan (2013) targets a nationwide improvement by 2020, a fundamental improvement by 2035, and a clean environment (Beautiful China) by 2050; however, the air in China in 2050 is expected to remain at the same level in present-day Japan even after long-time efforts.[89]

The advantage of China's clean air action plan is that China, with its expertise in legal systems since ancient times, is well trained in system building. Moreover, China's low budget environmental contamination prevention plan meets the demand from developing countries that needs to lower the costs of their environmental policy.[90]

Japan-China cooperation by municipalities, and the collaboration between municipalities and ODA were already discussed earlier. The suggestions in Table 8 are considered to benefit both Chinese and Japanese municipalities. The network of municipalities derived through sister-city relationships can be continued after the end of ODA once the demands of both sides meet. Japanese municipalities can contribute to system design, training and on-site instruction in partner countries by using their knowledge of policy and system building.[91] In addition, the municipalities can receive opportunities for incentives such as person-to-person exchanges, international exchanges, and the promotion of local companies.[92]

JICA expects the center to play the following roles in the platform for Japan-China environmental cooperation.

- Base of inter-government cooperation and academic research cooperation
- Cooperation with a third country via Japan-China collaboration, base for local cooperation
- Platform and consultations for Japanese enterprises to expand their business into China

Reference: Administrative board of JICA, January 2019

The center aims to become a base for training courses in a third country and municipal cooperation, in addition to high-level dialogue mechanisms at the vice-minister level, and collaborative research. Furthermore, they are considering to expand their environmental cooperation to the private sector to become a technology matching platform for enterprises. At the center, the selection of technology, development, requirements, and the establishment of an online platform will be conducted in order to match environmental technologies with enterprises on demand. Their plan covers technologies in various environmental areas such as air pollution, water pollution and soil pollution; by using market mechanisms, clients select the technology

[88] Interview with Mr. Masaharu Yagishita (December, 6, 2019)
[89] Interview with Mr. Ren Yong(October 15, 2019)
[90] Interview with Mr. Hideaki Koyanagi (December 4, 2019)
[91] Ibid.
[92] Interview with Mr. Taiji Nakazato (September 25, 2019)

they need.[93]

(2) Infectious disease field

Through interviews in Japan with Japanese experts and stakeholders, and interviews in China with stakeholders there, the following items were listed as the direction of the infectious disease field in relation to subject areas and forms of cooperation.

Table 9: The direction of Japan--China cooperation in the infectious disease field

Area	Infectious diseases	Overall control of infectious diseases including newly emerging/re-emerging infectious diseases
	Aging society	Lifestyle-related disease control and nursing
Form of cooperation	Collaborative research	Collaborative research with research institutions and healthcare institutions at the national and local level
	Collaborative training	Training for third countries in Asia and Africa

Source: Complied by the Evaluation Team based on the information from Interviews

To enhance infectious disease control, the establishment of a platform for mutual information-sharing between the two countries is essential, as well as opportunities to share information in addition to the forums and seminars that are currently held at the Chinese CDC and the National Institute of Infectious Diseases.

During a field survey in China, many people cited the need for Japan-China cooperation in the aging society field. China has seen its population age rapidly in recent years; therefore, an action plan for the aging society is urgently demanded as part of the public health issue. As shown in Table 10, the public health service coverage in China was expanded in 2019, and more attention is being paid to the fundamental level of public health. The table indicates that the following items were added in 2019: nursing care for elderly people, measures to address NCDs for people 65 years of age and older, cancer screening, food safety, occupational health, and endemic diseases. It is clear that these items are given priority. Selecting health issues common to both countries and creating a platform for information sharing and collaborative research can be one possible direction in which future Japan-China operation can proceed.

[93] Interview with Mr. Ren Yong(October 15, 2019)

Table 10: Table 10: Expansion of the public health service in China in recent years[94]

14 items of basic public health services (2018)	19 items of basic public health services (2019)
1. Preparation of a Resident Health File	1. Prevention of endemic diseases
2. Health education	2. Prevention of occupational diseases
3. Vaccination	3. Monitoring of serious diseases/health risk factors
4. Health management for children 0-6 years of age	4. Avian influenza/SARS prevention control project
5. Health management for pregnant and parturient women	5. Plague prevention project
6. Health management for elderly people	6. Operation/sustainment/security management of the national health emergency team
7. Health management for people with chronic diseases (hypertension, type-2 diabetes) and patients	7. "Two cancers" test project for women in rural areas *two cancers: cervical cancer, breast cancer
8. Management of patients with serious mental disorders	8. Management of basic contraceptive service project
9. Health management for patients with pulmonary tuberculosis	9. Management of nutrition improvement project for children in poverty areas
10. Report/control of infectious diseases/sudden public health issues	10. Screening test project for newborn infant diseases in poverty areas
11. Health management using Chinese medicine	11. Folic acid supplementary project for prevention of neural tube closures
12. Supportive management for healthcare planning and control	12. Free national pre-pregnancy eugenic health test project
13. Free supply of contraceptive drugs/devices	13. Thalassemia prevention control project
14. Promotion of initiatives for healthy lifestyles	14. Follow-up evaluation project for food-safety standards
	15. Promotion project for healthy lifestyles
	16. National random monitoring/sampling survey project
	17. Management of health/integration of medical care and nursing services for elderly people
	18. Population monitoring project
	19. Monitoring/management of health and wellness project

Reference: The National Health Commission, the Central People's Government

Furthermore, another aspect was identified in the field survey: no matter the field or type of cooperation, experts from both Japan and China must study the details of the cooperation project well and coordinate the demands from both sides. Then, a financial and systematic structure needs to be created when implementing the project. For example, cooperation with Canada was offered for a project at Guangzhou Medical University. In this project, the government of China will allow budget for international cooperation after signing a memorandum, and such budget can be used for an international cooperation project conducted by China. Therefore, experts from both Japan and China can examine the themes they are interested in, decide on a project plan and apply for budget, then share the budget to conduct the project activities and share the outcomes. Interactions at the expert level in the implementation organizations on both sides produce synergetic effects, and such effects bring the quality of research to a higher level. It is more than likely that Japan-China cooperation will continue after the end of ODA by using such a framework. In addition, the future roles of JICA may include a consultation function covering the investigation of issues in partner countries and matching of support, and providing assistance for project development conducted by organizations other than JICA.

[94] http://www.gov.cn/xinwen/2019-09/05/content_5427467.htm (accessed September 30, 2019)

December 3, 2019

Review of Outputs of Past ODA Projects for China by External Evaluator

Toshihiro Nishino, International Development Center of Japan Inc.

The observations and impressions obtained through the experience of conducting ex-post evaluations in China as an external evaluator in the past can be summarized as follows.

(1) Contributions of Japanese ODA Loans as basic funds

There has been a substantial need for implementation and funding for environmental management and measures, improvement of television broadcasting, as well as higher education and training such as universities. However, necessary funding and improvement were not sufficiently carried out due to reasons such as the lack of financial leeway that forced these projects to be in a lower priority as well as insufficient experience and knowhow in China. Japanese ODA Loans were actively provided to these sectors and projects where improvement was delayed. Representative projects include the Municipal Solid Waste Treatment Project implemented in Anhui and Hunan Provinces, the Higher Education Project implemented in 23 provinces, cities and autonomous regions, and the Television and Radio Infrastructure Improvement Project implemented in Liaoning Province and six other provinces and autonomous regions.

During the ex-post evaluation of these projects, we heard many opinions from project-related people, expressing that “At the time when the Japanese ODA Loan was decided, we did not have enough money to work on these projects. We really appreciate that we could proceed in earnest with the ODA Loan.” At the same time, these projects were relatively financially favorable at the time of the ex-post evaluation. Factors contributing to this situation include: (1) improvements that proceeded using China’s own funds based on the outputs of the Japanese ODA Loan projects, and (2) a business profit base was consolidated utilizing the basic infrastructure developed through the Japanese ODA Loan. This result suggests that Japanese ODA Loan, which contributed to these factors, played an important role as essential basic funds to support these projects.

(2) Regional development based on the outputs of Japanese ODA Loan projects

The impact of the Japanese ODA Loan for China was not limited to the target organizations mentioned above. Instead, mainly in the sector of environmental management, its impact could be found in a broader region which was not directly covered by the Japanese ODA Loan for China.

In the Municipal Solid Waste Treatment Project and the Jilin City Comprehensive Environment Improvement Project, final waste disposal sites, collection and transport facilities, heat supply for heating and sewer network construction were initially implemented in only a single region within the province/city. Although the necessity of these projects had been pointed out, their progress was delayed because output could not be guaranteed. However, having seen the satisfactory results brought about by the advanced development carried out with the Japanese ODA Loans, improvement is now progressing rapidly in other parts of the province/city with Chinese domestic funds. As a result, these issues were improved in a wider area. (In view of the outputs of the Jilin City Comprehensive Environment Improvement Project, similar projects are being carried out in

other cities in the province with financial assistance from other donors.) It is considered that because the Japanese ODA Loan for China has broadly and specifically demonstrated the necessity and outputs of these projects, it has encouraged improvements in a wider area including regions not covered by the projects.

(3) Effects of support combining funds and soft components in Japanese ODA Loan projects

Especially for the Japanese ODA Loan for China in the latter half, considering that China has a certain level of financial capacity and that experience in Japan is supposed to be useful, instead of mere financial cooperation, training in Japan was actively provided. Representative projects include the Municipal Solid Waste Treatment Project implemented in Anhui and Hunan Provinces and the Jilin City Comprehensive Environment Improvement Project and the Higher Education Project implemented in 23 provinces, cities and autonomous regions.

In particular, for project-related people in the environmental management sector, since China did not have enough experience and that the future of the project and the roles of concerned persons were unclear, training in Japan was highly evaluated as extremely important in learning advanced cases and reconfirming the meaning of the project. Many cases of actually employing the training results could also be found. Training participants from the Municipal Solid Waste Treatment Project mentioned that “Understanding the current state of Japanese household solid waste management, as well as clearing up the long-term vision for solid waste management and administration and what issues need to be addressed going forward to achieve this vision have made it possible for us to develop business with confidence and with the future in mind. As a specific example, securing land to construct sanitary landfills for household solid waste had not always been recognized as a big problem in China. However, upon hearing that ‘urbanization will make it difficult to secure the land needed to construct sanitary landfills’, after returning to China, we promoted the incineration of household solid waste ahead of Chinese policies. As a result, a waste-to-energy plant was completed in 2013 by BOT, the earliest endeavor among medium-sized cities in Anhui Province. We are planning a project in the future to tackle the conversion of food waste into fertilizer/feed.” Another participant said, “Having learned the Japanese practice of not distinguishing rural areas from urban areas for solid waste management, along with the project, we implemented solid waste control measures in rural areas, formulated a treatment plan for all towns in the province, developed an administrative system and constructed related facilities.” There were also many examples that JICA partners who were inspired by Japan’s environmental education started building environmental education facilities and giving environmental lectures for schools while using examples of methods and teaching materials from Japan. As for the Higher Education Project, we see many cases where university faculty and staff concluded exchange agreements between universities after their training in Japanese universities, bringing research and educational exchanges between Japanese and Chinese universities and students.

In this way, giving support by combining funding and soft components in the Japanese ODA Loan for China is considered to have an important meaning in enhancing the outputs of the projects.

Responsible ex-post evaluation projects in China

	Project name	Sector	Project type	Start fiscal year	Evaluation type	Evaluation fiscal year	Rating
1	Liaoning Television and Radio Infrastructure Improvement Project	Broadcasting	Japanese ODA Loan	2001	Ex-post evaluation	2010	A
2	Project for Surveillance and Control of Vaccine-Preventable Diseases	Health / Health care	Technical cooperation project	2006	Ex-post evaluation	2014	B
3	Inland Higher Education Project (Regional Vitalization, Market Economy Reform Support, and Environmental Conservation) (Guangxi Zhuang Autonomous Region) (Jiangxi Province) (Hubei Province) (Shanxi Province)	Higher education	Japanese ODA Loan	2003, 2004	Ex-post evaluation	2015	A
4	Hebei Higher Education Project(Hebei Province)	Higher education	Japanese ODA Loan	2006	Ex-post evaluation	2016	A
5	Shanxi Xilongchi Pumped Storage Power Station Project	Electrical power	Japanese ODA Loan	2002	Ex-post evaluation	2016	B
6	Hunan Municipal Solid Waste Treatment Project	Urban sanitation	Japanese ODA Loan	2007	Ex-post evaluation	2017	B
7	Anhui Municipal Solid Waste Treatment Project	Urban sanitation	Japanese ODA Loan	2007	Ex-post evaluation	2017	B
8	Guizhou Province Environment Improvement and Education Project	Environmental issue / Higher education / Basic healthcare	Japanese ODA Loan	2006	Ex-post evaluation	2017	B
9	Higher Education Project(Liaoning Province)	Higher education	Japanese ODA Loan	2006	Ex-post evaluation	2017	B
10	Higher Education Project(Hainan Province)	Higher education	Japanese ODA Loan	2006	Ex-post evaluation	2018	B
11	Jilin Province Jilin City Comprehensive Environment Improvement Project	Environmental issue / Sewerage	Japanese ODA Loan	2006	Ex-post evaluation	2018	A

Review of Outputs of ODA Projects for China

December 13, 2019

1. Summary

(1) As an evaluator, I conducted ex-post evaluations for a total of 22 loan assistance projects. Many of them were environmental measures and afforestation projects.

(2) Given the urgency of taking environmental measures in the rapid growth period of China, although there were problems in the process of project formation, ODA to China in the late 1990s were still significant. In the equilibrium growth period, ODA was appreciated for its contribution as seed money beyond the scale of the projects.

(3) Towards the end of ODA to China, amidst China's rapid development, there is a stronger impression that the effect of ODA has transformed from an explicit effect brought by ODA itself to a more indirect ripple effect in the overall development projects in China.

(4) It seems to me that the significance of the outputs of ODA projects in developing countries like China cannot be measured merely by the concept of projects evaluation based on existing DAC standards.

2. Writer: Kenji Momota, President of IC Net Limited

3. Writer's evaluation of ODA to China thus far

I have been engaged in ex-post evaluation of Japanese ODA loan projects as an external evaluator contracted by JICA for many years. Especially in the last 10 years or so, I have had many opportunities to be working on ex-post evaluation in China. I evaluated a total of 22 projects launched from the late 1990s to around 2007, of which 13 projects were about environmental measures such as water supply, sewerage, and air pollution control, three were afforestation projects (some duplicated), and seven other projects concerning health and roads. I was also in charge of work such as supporting the preparation of project completion reports, and I have experience working in 14 provinces in China.

Speaking of the regions, I worked in the three provinces in Northeast China (Heilongjiang, Jilin, and Liaoning) and coastal cities such as Suzhou in Jiangsu Province from the late 1990s to the early 2000s. Since the late 2000s, I have been engaged in projects mainly in inland areas and cooperation projects in provincial cities. I was mostly in charge of environmental measures projects, as well as water environment (water supply, sewerage, and flood control) and atmospheric environment (heat supply system) improvement projects, following changes in the support policies and priority regions based on the country assistance plan at that time.

Environmental improvement projects took many forms from the late 1990s to the early 2000s, including comprehensive support of water supply and sewerage infrastructure in large cities and the so-called sub-projects, which are programs of small-scale projects for state-owned enterprises and factories. Regarding the overall trend, as China's domestic policies and systems were being

developed, sub-project-type support as in the late 1990s has gradually decreased, while cases of utilizing the Japanese ODA Loans to support small- to medium-sized provincial cities and to cover part of the development projects for large cities have increased.

The distribution of rating results is generally good, with 11 cases of A (highly satisfactory), five cases of B (satisfactory), and one case of C (partially satisfactory).

I would like to look back at the ODA projects for China based on my experiences thus far and summarize my comments as follows. While I was writing this review, I took a holistic view from my past experience, including transition over time from the late 1990s to the late 2000s and transition along with changes in the form of financial assistance and region, and chose those points that are particularly impressive as topics. For this reason, my observations are somewhat subjective and may not be in line with the facts. In addition, compared to the usual quantitative analysis reports, the structure and contents of this review may be less coherent. I appreciate your understanding.

4. Review

(1) Transition and background of project structure and form - “Turning from rapid growth to equilibrium growth”

Many ODA loan projects to China were sub-project-type supports consisting of multiple cities and projects. The structures and contents of environmental measures projects varied a lot in particular. Some of the projects that I was involved in had changed significantly from their original plans. The background and changes to these projects varied greatly depending on when the projects were implemented. They can be broadly divided into projects implemented in China’s development period in the late 1990s to the early 2000s, and projects implemented in the mid-2000s to the final stage of ODA to China. This is equivalent to the period of the 9th to 11th Five-Year Plans (1996 to 2010) in China’s national development plan.

① ODA in the rapid growth period - “Difficulties in project formation during periods of radical change”

Because of the severity and urgency of environmental problems in China in the late 1990s, ODA at that time had different contents and structures, and was more or less an emergency aid to deal with immediate crisis. An example is the Jilin Song Liao River Basin Environmental Improvement Project (loan agreement (L/A) in 1998). This project consisted of nine sub-projects including wastewater treatment and improvement of city sewerage system for key factories such as paper factories and ferroalloy factories. These sub-projects did not seem to have been selected in the usual ODA logical framework in a planned manner. Instead, it seems to me that they were implemented as a quick-fix to handle severe pollution and urgent problems. Meanwhile, China’s environmental measures have been undergoing changes even faster than the urgency. Reform of state-owned enterprises, industrial restructuring, and environmental policies were quite advanced in China at that time. Because of their influences, ODA sub-projects had to be frequently canceled or replaced. There was a case in which the

factory itself was designated as a source of heavy pollution right after a wastewater treatment system had been built. The factory was ordered to shut down, and the state-owned enterprise itself could not survive. Due to the large number of sub-projects and the scale of many of the individual projects being small, some of them succeeded while others failed. Of course, sub-projects that did not produce an effect received low rating in ex-post evaluations. I did have a debate with local project-related people when I gave a C rating to the Jilin project. Some of them, in particular, argued that it was against their will to be evaluated that strictly only by mechanical standards for what they had worked so hard for during that period of radical change.

At that time, I insisted on the objectivity of ODA evaluations, and was determined to face the results. Since then, however, I have been in charge of many projects evaluations and I myself gained some experiences in corporate management and project operation. Looking back at the changes in the environment over the past dozen years or so, now I have a slightly different impression. Since the 1960s, Japan has experienced a cycle from high economic growth to the emergence of pollution problems. In China, this cycle occurred simultaneously in a much shorter period of time. Amidst such rapid changes in national and provincial development and environmental policies, there was no choice but to take various actions at the same time. If you ask me whether I could have made a sustainable plan considering the mid- to long-term development policies in that environment, my answer is probably not. However, the major pollution sources that existed at that time could not be neglected. Even if a project's mid- to long-term sustainability was unclear, people had no choice but to carry it through. In such a major upheaval, it may be necessary to proceed with projects with some flexibilities and risks. In that sense, when I look back at the history of China's major environmental policy changes, I believe that some aspects of the projects were unavoidable. For example, promptness of support is one of the perspectives in evaluating urgent support projects. However, when we evaluate the significance and role of projects in the transition stage under drastic changes in national policies and industrial structure, some aspects may need to be considered besides the five DAC evaluation criteria currently adopted. Some sub-project-type ODAs at that time were allowed to be replaced flexibly according to the progress of the project without fixing the details of individual projects at the time of signing a loan agreement. Now I began to think that, given the severity of environmental pollution and the urgency of actions, it is reasonable to have adopted such a flexible project plan. Even if the yield of the sub-projects was somewhat low, prioritizing the proposition of vigorously pushing forward measures against pollution is still meaningful from the cause of ODA of supporting mid- to long-term nation-building.

Suzhou City after water quality improvement

Sewage treatment plant in Nanyang City of Henan Province

② ODA in the equilibrium growth period - “Contributions as seed money”

On the other hand, I feel that the environment for project formation of ODA since the mid-2000s has become much more stable, partly because environmental policies were tightened to some extent. In most cases, there was a well-established development plan in each region for projects to be formulated upon. Under the ownership of the government, more development plans were implemented with ODA clearly incorporated, and activities could be carried out in a more planned manner. In the final stage of ODA to China, most projects were formed as part of the overall development plan, making it a lot more difficult to evaluate ODA as individual projects.

Looking back at projects implemented from around 2004 and 2005, mid- to long-term project plans that foresaw the tightening and drastic changes in environmental policies were formulated from the very beginning of the planning, and ODA was utilized as part of the process. For example, consider the sewage treatment plant built through ODA in the Guangxi Zhuang Autonomous Region Yulin City Environment Improvement Project (L/A in 2007). An upgrade had been planned for this treatment plant from the beginning in anticipation of tighter water quality regulations by China afterward. Taking into consideration its design specifications, ODA was adopted as the first phase of the project. This project style is more consistent with the mid- to long-term regional development plan. Further, in this project, it was originally planned to improve sewer pipe facilities with ODA, but due to concerns about the duration of procurement time, it was changed to procure with domestic fund, and the ODA fund was used for another purpose. As a result, the distinction between ODA and each city’s infrastructure improvement project became ambiguous, and it was to some extent difficult to accurately assess the status and outputs of ODA as a single project using the existing operations evaluation framework.

Around this time, as an evaluator, I started to become aware of the meaning and sustainable contributions of ODA to China over the mid- to long-term might not be accurately assessed within the existing evaluation framework that targets the project itself. Therefore, I shifted my focus during field surveys to a more mid- to long-term development perspective, such as how an ODA project is positioned in the development plan of the target city, and how it contributes

to sustainable infrastructure development afterward. Specifically, my interviews focused more on perspectives such as how infrastructures developed by ODA projects have been modified and improved thereafter to adapt to China's environmental policies, or conversely, how the infrastructure development has affected the environmental policies and regulations in each region, and how the experience gained from operation and management of these infrastructures has contributed to improve the capabilities and technology development of the implementing agency.

During my investigation of the Baotou Atmospheric Environment Improvement Project (L/A in 2005), I have heard that the implementing agency was tendering a bid for the procurement of gas supply equipment for Central Asia based on its experience and know-how gained through the ODA project. Like this case, I believe that the efforts of ODA are not limited to the effects on individual projects, but are having sustainable impacts in various forms. By this time, the technical level of water supply and sewerage enterprises even in inland local cities has caught up with that of developed countries. Exchange of opinions with engineers also took place at a higher level such as discussing advanced processing methods and more sophisticated ideas for improving cost efficiency. Even the inland local companies started to compete on the international stage. I strongly felt from their burning desire for development that China is no longer a country that needs to receive support.

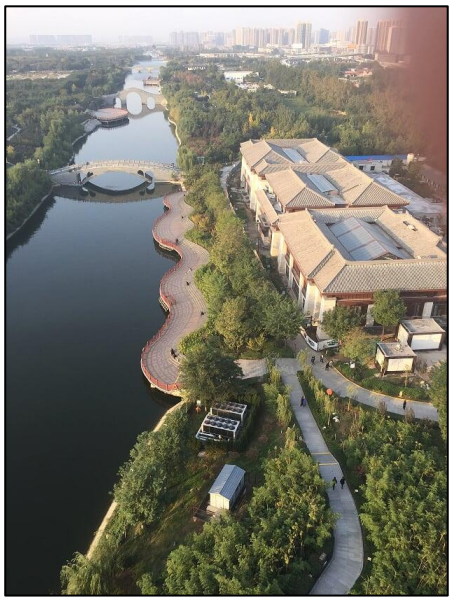
The two impressions mentioned above are quite different, but in fact the two projects were started only seven years apart. Though the situation in Japan at that time was different, the fact that such a mature implementation environment could be consolidated for development projects in such a short time of not more than 10 years in China does show a marked contrast to Japan's "lost 20 years" in the same period. Furthermore, in the past few years, there has been an increase in interest in the projects evaluation itself in on-site discussions. There are also more public projects in China that are operated by the private sector. It shows me that their abilities of improving planning and development have further advanced.

Amidst such rapid development, it is hard to verify exactly how ODA has contributed. In my discussions with the project-related people at the time, however, I often heard their gratitude for the ODA funding that had made it easier for them to raise funds from the government and other sources, and that the role of so-called seed money was greater than the actual amount of funding. I think this was not just about funding. It was also the appearance of the evaluation of secondary effects such as the recognition and trust brought by the ODA projects and the effects of transfer of technology through training in Japan.

Let's take the Shaanxi Water Environment Improvement Project (Xi'an City) in 2005 as an example of the impact brought about by training in Japan, which was conducted as part of ODA. In this project, drainage canals were constructed in the city. On top of that, a Public Relations Center was built near the canal as an educational facility to display information about the importance of the flood control project and as a learning corner for children. Local

project-related people expressed that these kinds of educational programs reflect what they learned during their training in Japan as part of ODA.

Water quality after treatment (treatment plant in Nanyang City of Henan Province)



Waterway improvement project in Xi'an City

This kind of knowledge and technology transfer-type support has produced a ripple effect in addition to ODA projects. It also triggered incorporation of new mechanisms into the mid- to long-term development plans. As I will mention below, ODA in these days is less directly recognized by beneficiaries. Instead, because it is incorporated into mid- to long-term urban development, you could say that it continues to contribute beyond the scale of the project to which ODA was invested.

(2) Changes in beneficiaries - "As a part of normal life"

Next, I will summarize what I felt from my exchanges with local residents who enjoy the benefits of the projects. The most noticeable change that I felt in my recent evaluations is that beneficiaries' interest and awareness of the development of core infrastructure, rather than ODA projects, are very low. This is not a negative thing. In China these days, even houses in local cities have faucets. People can get water whenever they twist the faucet. Flush toilets could also be commonly found. As was in the Jilin Province project mentioned above, in the late 1990s, the environmental policies and regulations in China were still weak. There were not a few cases where harmful substances such as heavy metals were discharged from pollution source factories untreated. Even developed coastal cities like Suzhou at that time had daily problems such as water pollution due to eutrophication, which was a social problem even recognized by beneficiaries. That was why the effects brought about by the ODA projects were remarkable. There was no more runoff from factories, the water quality of the river improved dramatically, and the odors and health hazards that residents had felt were also notably reduced.

Interview with beneficiaries in Yining City (2015)

Participants from Yining City attending training in Japan (2015)

However, amidst the full-scale economic development and the tightening of environmental policies in China in the late 2000s, infrastructure development using local financial funds also progressed rapidly. For this reason, to the general public, not only ODA, but also basic infrastructures such as water supply, sewerage and heat supply have become a matter of course. When I asked about the impacts and benefits of a specific infrastructure in interviews with beneficiaries, most of their responses were like “Why do you ask such a common thing?” As regional development including ODA progressed, people became less aware of the development projects. Of course, this does not impair the significance of the projects. Just like us living in Japan, we seldom think of water supply and sewerage in our lives. I believe it proves that the country has developed and matured, and it is also true that ODA plays a part in that. In addition, when it becomes so common to have infrastructures equivalent to those of developed countries, the awareness of people in urban areas will further change. An example is the increase in awareness of saving water. In my recent visit for the Ningxia Hui Autonomous Region Water Environmental Improvement Project (L/A in 2007), I found more efforts were put on soft components to raise awareness, such as developing and selling water-saving machines, holding water conservation campaigns, and giving enlightenment education to children.

(3) Conclusion

To conclude, when I look back, what I feel the most is the rapid development of China’s national power. I have been working in China almost every year for the past dozen years or so. Year by year, even from small aspects such as arranging a car for evaluation and the infrastructure procurement environment, I could feel that the environment in China is completely different from other developing countries where I usually work. In that sense, I think it is natural to end ODA projects for China. In today’s world, many regions and countries are developing at the same speed. I believe that the experience of ODA to China will be a valuable hint when we think about how ODA should be utilized effectively to support mid- to long-term development in an environment with rapid development and changes in development policies and situations like China.

Reference: List of ex-post evaluation projects

Project type	Rating	Start fiscal year	Evaluation type	Evaluation fiscal year	Country	Sector	Project name
Japanese ODA Loan	B	1996	Ex-post evaluation	2010	China	Environmental issue	Lanzhou Environmental Improvement Project
Japanese ODA Loan	C	1998	Ex-post evaluation	2009	China	Environmental issue	Jilin Song Liao River Basin Environmental Improvement Project
Japanese ODA Loan	B	1998	Ex-post evaluation	2009	China	Environmental issue	Heilongjiang Songhua River Basin Environmental Improvement Project
Japanese ODA Loan	A	1999	Ex-post evaluation	2010	China	Environmental issue	Suzhou Water Environmental Improvement Project
Japanese ODA Loan	A	2000	Ex-post evaluation	2012	China	Environmental issue	Shenyang Environment Improvement Project: Phase 2
Japanese ODA Loan	A	2000	Ex-post evaluation	2009	China	Roads	Heilongjiang Heihe-Bei'an Road Construction Project
Japanese ODA Loan	A	2002	Ex-post evaluation	2015	China	Forestry / Forest preservation	Inner Mongolia Afforestation and Vegetation Cover Project
Japanese ODA Loan	B	2002	Ex-post evaluation	2014	China	Sewerage	Nanning Environmental Improvement Project
Japanese ODA Loan	A	2003	Ex-post evaluation	2012	China	Health / Health care	Public Health Project (Liaoning Province)
Japanese ODA Loan	A	2003	Ex-post evaluation	2012	China	Health / Health care	Public Health Project (Heilongjiang Province)
Japanese ODA Loan	A	2003	Ex-post evaluation	2012	China	Health / Health care	Public Health Project (Jilin Province)
Japanese ODA Loan	B	2004	Ex-post evaluation	2015	China	Environment issue, water supply, sewerage	Xinjiang Yining City Environmental Renovation Project
Japanese ODA Loan	A	2004	Ex-post evaluation	2014	China	Environment issue, forestry / forest preservation	Eco-environmental Construction and General Treatment Project of the Yangtze Upper Reaches in Sichuan Province
Japanese ODA Loan	A	2005	Ex-post evaluation	2016	China	Sewerage	Shaanxi Water Environment Improvement Project (Xi'an City)
Japanese ODA Loan	A	2005	Ex-post evaluation	2016	China	Gas / Oil	Baotou Atmospheric Environment Improvement Project
Japanese ODA Loan	A	2006	Ex-post evaluation	2017	China	Water supply, sewerage	Sichuan Water Environmental Improvement Project
Japanese ODA Loan	Ongoing	2007	Ex-post evaluation	2018	China	Water supply, sewerage	Guangxi Zhuang Autonomous Region Yulin City Environment Improvement Project
Japanese ODA Loan	Ongoing	2007	Ex-post evaluation	2018	China	Water supply, sewerage	Ningxia Hui Autonomous Region Water Environmental Improvement Project
Japanese ODA Loan	B	2007	Ex-post evaluation	2017	China	Environment issue, sewerage, gas / oil	Henan Province Nanyang City Comprehensive Environment Improvement Project

The Roles Prayed by ODA Projects for China in China's Environmental Management and Future Japan-China Environmental Cooperation

January 17, 2020

Institute for Global Environmental Strategies

Naoki Mori

I worked with the State Environmental Protection Administration (SEPA (currently the Ministry of Ecology and Environment)) in China (the counterpart organization) from 2003 to 2006 as a JICA long-term expert with the aim of enhancing the cooperation between Japanese ODA Loans and other Japanese environmental cooperation. As one of the important tasks, I conducted mid-term reviews to verify the expected effects of the Environmental ODA Loan projects (Japanese ODA Loan projects aimed at environmental measures) being implemented at that time. I visited over 15 project sites throughout China, and through exchanging opinions with the counterpart organization, I was able to realize the roles played by the Environmental ODA Loan and its issues. The results of the mid-term reviews are applied in the "Survey Regarding Evaluation on Contribution of Environmental ODA Loan to China - Assistance for Environmental Improvement in China (Air and Water)" (a survey contracted by JBIC (Japan Bank for International Cooperation) in 2005).

Below, I would like to look back on the impacts of the Environmental ODA Loans committed from the 1990s to the early 2000s on China's environmental policies and systems with reference to the above survey report. I would also like to have an overview of the trends in China's environmental policies and systems since 2007 when approval of new Japanese ODA Loans to China finished, and then give my personal opinions on new areas in future Japan-China environmental cooperation.

1. Impacts of Environmental ODA Loans on China's environmental policies and systems

First of all, let's have an overall picture of the Environmental ODA Loans to China. There are a total of 81 Environmental ODA Loan projects from 1988 to 2004, and the amount of Japanese ODA Loans provided reached 822.8 billion yen. Some of these projects consist of multiple sub-projects, totaling nearly 300 sub-projects. I would like to summarize the outline of Environmental ODA Loans in line with China's Five-Year Development Plans.

[Environmental ODA Loan projects during China's 7th to 8th Five-Year Plans (1985 to 1995)]

Environmental projects were mainly about water supply improvement and other urban environmental infrastructures. There were 14 sub-projects of water supply improvement, which accounted for about 70% of the commitment amounts of Environmental ODA Loan projects.

[Environmental ODA Loan projects during China's 9th Five-Year Plan (1996 to 2000)]

There are a variety of environmental projects including industrial pollution control, sewerage improvement, water supply improvement, regional gas and heat supply, and conservation of the ecological environment. These projects account for about 45% of all Japanese ODA Loans provided during this period (approximately 1 trillion yen). In addition, the total project costs of the Environmental ODA Loan projects are RMB26.4 billion, which account for about 5% of the total environment investment of RMB450 billion under the 9th Five-Year Plan. Further, the planned

amount of foreign funds in this Five-Year Plan is US $4 billion, of which the Environmental ODA Loans account for US $1.3 billion, or about 30%.

[Environmental ODA Loan projects during China's 10th Five-Year Plan (2001 to 2005)]

Environmental projects continued to focus on urban environmental infrastructure improvement, desertification prevention, and conservation of the ecological environment of the Yangtze River basin. The 10th Five-Year Plan has set out a goal to increase the domestic wastewater treatment rate in urban areas to 45%. Under this background, both the number of sewerage improvement projects and the commitment amounts in Environmental ODA Loans increased from the previous Five-Year Plan. In terms of commitment amounts, the ratio of regional gas and heat supply also increased significantly from 8.0% to 22.0%. Industrial pollution control, on the other hand, greatly decreased. The total project costs of the Environmental ODA Loans committed during the 10th Five-Year Plan (commitment amounts from 2001 to 2004) are RMB25.4 billion, which account for about 4% of the total environment investment of RMB650 billion under this Five-Year Plan.

So, how did these Environmental ODA Loans affect China's environmental policies and systems? This point is addressed in the next chapter, by extracting and reorganizing the parts of the survey report "Survey Regarding Evaluation on Contribution of Environmental ODA Loan to China - Assistance for Environmental Improvement in China (Air and Water)" which I introduced earlier, based on my experiences through site visits and exchange of opinions with the counterparts at that time.

(1) The effectiveness in formulation of national environmental plan

The Environmental ODA Loan provided during China's National 9th Five-Year Plan on Environmental Protection (hereinafter referred to as the "Environmental 9.5 Plan") has given necessary investment funds to implement the Plan timely and effectively. The Environmental ODA Loan (the 4th Environmental ODA Loan) provided during that period exceeded 450 billion yen. The important point that I want to emphasize is that the governments of both countries have been discussing Environmental ODA Loans from the formulation stage of the Environmental 9.5 Plan.

The Japanese government strongly requested to the Chinese government that the 4th Japanese ODA Loan measures should put priority on environmental protection and development of inland areas. This has drastically changed the policy on the use of foreign government funds of the Chinese government, which placed emphasis on economic infrastructures at that time. In response to this request, the Chinese government started discussions with the Japanese government on the 4th Japanese ODA Loan in 1993, about two years before the Environmental 9.5 Plan was officially approved. During this process, the SEPA discussed closely with the State Planning Commission in China based on the Environmental 9.5 Plan. Then the State Planning Commission informally informed the Japanese government of their candidate projects, including environmental projects, for the 4th Japanese ODA Loan. Afterward, the Japanese government dispatched a preliminary survey team, and at the end of 1994, the terms and conditions were decided. It was decided to provide 580 billion yen for 40 projects, including 15 environmental projects (nine for air and water pollution measures, six for water supply), for the first three years of the 4th Japanese ODA Loan.

These Environmental ODA Loans mainly targeted areas designated by the Chinese government as having a high priority for addressing pollution. For example, with regard to air pollution control, nine provinces and two municipalities in the southwest and southern regions were designated as priority areas of acid rain pollution. Chongqing, Changsha, and Liuzhou in particular, were regions with frequent acid rain. In light of this, 109 projects for addressing acid rain were listed, of which 67 projects planned to

use foreign funds. In addition, 23 cities were selected as priority for air pollution control, including Shenyang, Dalian, and Guiyang, which had been suffering from pollution caused by soot, dust and sulfur dioxide for years. A total of 219 air pollution control projects were listed, and 136 of these projects were planned to use foreign funds. Among these projects, the Environmental ODA Loans were provided to support improvement of Chongqing, Guiyang, Liuzhou, and other cities designated as priority areas of acid rain pollution, as well as Shenyang, Benxi, Lanzhou, and other cities designated as priority for air pollution control.

(2) The effectiveness in local government's ability to manage environmental projects

The Environmental ODA Loan is considered to have enhanced the abilities of Chinese local governments to plan, implement, and manage environmental projects, and played a useful role in facilitating the implementation of these projects. At that time, the "Environmental Protection Target Responsibility System[1]" and the "Quantitative Examination System for Comprehensive Urban Environment Improvement[2]" were introduced in provinces and municipalities with heavily polluted cities and areas, showing that they were aware of the need for addressing environmental issues. In reality, however, many local governments prioritized more economic growth in their regions than environmental protection. In view of this, the SEPA reflected plans that focus on pollution control in the Environmental 9.5 Plan, and guided local governments to incorporate environmental conservation into their economic and social development plans.

In September 1995, the State Planning Commission and the SEPA convened the provincial governments, the planning committees from cities under separate state planning (cities delegated with more authorities than an ordinary city), and the Environmental Protection Bureau, and held the National Working Conference on Environmental Protection. It was concluded in this conference that, (1) local governments' plans shall be in line with the central government's 9th Five-Year Plan, (2) local governments' 9th Five-Year Plan on Environmental Protection shall include not only environmental protection goals and indicators, but also environmental improvement projects and funds, and (3) the plan for environmental improvement projects and funds shall be incorporated into the annual budget plan in addition to the Five-Year Plan. In addition, the roles of each party were proposed as the principle of financing for environmental investment; enterprises secure funds by themselves through reinforcement of the polluter-pays principle, local governments secure funds for the construction of urban environmental infrastructures, and the central government provides support through financing from domestic banks and the use of foreign capital. Furthermore, it was also made clear that in principle, local governments and enterprises shall be responsible for project implementation. The central government's responsibility is limited to providing indirect support.

The 4th Environmental ODA Loan has provided funds to the local governments, especially the municipal governments of cities designated as priority polluted areas, through the central government

[1] A system in which the governor, mayor, and/or magistrate stipulate specific environmental protection goals within their term of office, and sign a document stating that they will be responsible for achieving those goals. They receive rewards and punishments according to their performance in achieving the goals.

[2] The Quantitative Examination System for Comprehensive Urban Environment Improvement introduces an index for quantitatively judging the environmental quality of cities. This system consists of five sectors: air, water quality, noise, solid waste utilization and treatment, and urban greening. The environmental quality of cities is scored using a total of 21 quantitative criteria. This system also serves as a criterion for examining whether the responsibilities prescribed in the Environmental Protection Target Responsibility System have been fulfilled. There are two types of examinations under this system. One is the national examination, in which the state directly examines 37 cities throughout China, whereas the other one is the provincial examination conducted by the provincial governments on focus cities within their jurisdiction. At present, the provincial examination covers 230 cities nationwide.

(SEPA) for the implementation of environmental projects. Thereby, many local governments followed the progress management methods demanded by the Japanese ODA Loans when implementing the funded environmental projects. On average, the Japanese ODA Loan covered about 40% of the total project costs. The rest of the money had to be raised by the local governments of each project from their own budgets or financing from a bank. In that sense, Japanese ODA Loan can be said to have contributed to indirectly improve the local governments' ability to raise money. Environmental ODA Loan projects have been implemented in all provinces and autonomous regions except Qinghai, Hainan and the Tibet Autonomous Region, involving over 100 cities.

(3) The effectiveness in introduction of clean technologies

Environmental ODA Loan projects were not only about supporting technologies for treating pollutants emitted from factories, but also cleaner production technologies that suppress emissions of pollutants in the production process with energy-saving/resource-saving technologies, and technologies that enable the collection and reuse of valuable resources contained in waste. Information on available cleaner production technologies was provided to enterprises at the project formulation stage to encourage them to adopt those technologies. This allowed companies to recover the costs of environmental investment and even gain profit.

Centered on the steel industry, Benxi, Liaoning Province, is a heavy industrial city that produces abundant iron ore and coal. It has suffered from severe air pollution so seriously that the city was called "the city invisible to satellites". In 1989, the municipality established the Benxi Seven-Year Plan for Environmental Improvement, and implemented environmental improvement measures using financial funds from the local government. However, most of the funds were provided for investment in companies' pollutant treatment technologies, and because the sources of emission were not sufficiently monitored, the pollution control equipment being installed was often stopped. In view of this situation, in the Benxi 9th Five-Year Plan on Environmental Protection formulated in 1995, the municipal government set the annual average sulfur dioxide concentration, sulfur dioxide emissions and emission reductions for 2000. At the same time, it also decided on about 70 environmental investments, with a total project cost of about 30 billion yen, to meet the requirements. Of which, the Environmental ODA Loans supported 25% of all projects, which was about 50% in terms of money amount. This figure included the support provided to state-owned enterprises for investment in cleaner production technologies that require changing the production process, and technologies that enable the collection and reuse of valuable resources contained in waste. According to what I heard locally, an engineer from a company involved in the cleaner production project under the Japanese ODA Loan was qualified as a cleaner production consultant after leaving the company and diagnosed other companies.

On the other hand, there are also cases in which the introduction of these technologies was affected by changes in economy and other conditions. For example, market competition began to intensify with the progress of market economy and reform of state enterprises in China. The state-owned enterprises, which had been carefully protected by the local government, delayed their management reform and were unable to keep up with the sudden changes in the external environment. As a result, although environmentally-sound technologies had been introduced, the factories themselves could not survive and had no choice but to stop production. For another example, the liquefied propane gas (LPG) supply project was implemented to replace coal used in residential areas and restaurants. The concentrations of sulfur oxides and total suspended particulate matters have steadily declined since the project started. However, from the end of 2004, the cost of LPG supply rose as crude oil prices soared. Pipelines were also constructed for the natural gas developed in western China. When supply of natural gas began in July 2005, LPG lost its competitiveness and its supply was forced to stop.

(4) The effectiveness in environmental systems and standards

In the process of implementing Environmental ODA Loan projects, we can see some cases where the ODA Loan has also contributed to building institutional systems by local governments, which were indispensable for achieving sustainable development. Such as cleaner production I mentioned above, the central government recognized its effectiveness and enacted the Cleaner Production Promotion Law in 2001. Furthermore, many urban environmental infrastructures such as regional heat and gas supply and sewerages were constructed under the Environment ODA Loans. As knowledge on their construction, maintenance, and operation was accumulated and disseminated, some of the knowledge were institutionalized. For your information, I conducted mid-term review on six concentrated heat supply projects, 10 city gas projects, and 32 sewerage projects (the number of sub-projects).

For example, as sewerage projects increased, the Chinese government began to recognize the need to establish a sewage treatment fee collection system. Many local governments introduced such system based on the polluter-pays principle. Since the sewage treatment fee was determined based on the volume of water used measured by water meters, water companies collected sewage treatment fees along with the water fees. However, prior to 2003, the fees collected had not been directly used for sewerage operation and maintenance. Instead, they had been first put into the municipal governments' finances and then provided by the Municipal Finance Bureaus to sewerage departments according to their financing needs. Nevertheless, the Municipal Finance Bureaus had not always allocated sufficient funds for the maintenance and operation of sewerages. Some sewage treatment plants had been forced to stop operation due to a lack of budget. Under the sewage treatment fee collection system in 2003, however, a sewerage usage fee was collected as the sewage treatment fee. The sewage treatment fees collected by the water corporations were almost automatically allocated to the sewage treatment facilities without being included in the financial income of the municipalities. This has enabled the sewage treatment facilities to secure a stable source of revenue from the sewage treatment fees.

Besides, standards for the design and construction of sewage treatment plants, as well as operation technologies and accounting management were gradually introduced. Guidelines for selecting sewage treatment technologies for sewage treatment plants were also developed. Knowledge on the criteria for selecting sewerage technologies was accumulated as many sewage treatment plants were being constructed through the Japanese ODA Loan projects. For example, in areas with a high proportion of industrial wastewater, an anaerobic-aerobic treatment system or an anaerobic-anoxic-aerobic treatment system that can respond to changes in the amount and concentration of wastewater should be selected. In the region of North China there is in a severe water shortage, and sewerage treatment should be designed assuming the use of reclaimed wastewater. In areas where more money can be invested, one should consider the digestion treatment of sludge, and the recovery and use of methane gas generated in the process to generate power. It has also been emphasized that sewer pipes should be constructed at the same time or before the construction of a sewage treatment plant in order to be able to fully exert the effects of the treatment plant. Even though sewage treatment plants were built with the Japanese ODA Loans or financial funds from the central government, in many cases, local governments had to raise funds by themselves to construct the sewer pipes. However, local governments tended to be slow in procuring funds, thus causing the construction of sewer pipes to be delayed, and as a result, the amount of sewage flowing into the sewage treatment plant sometimes fell below the treatment capacity. That was why sewer pipes should be constructed first.

(5) The effectiveness in environmental cooperation between cities in Japan and China

Environmental ODA Loans have had an effect in promoting and strengthening technical cooperation and exchanges between China and Japan at the city level. For example, in the Environment Model City Projects and the Beijing Sewage Treatment Plant Construction Project, which were supported by the Japanese ODA Loans, technical cooperation and exchanges took place between cities in Japan and China. The Dalian Environment Model City Project is a project that started from the environmental technical cooperation initiatives between Dalian and Kitakyushu City. It was originally the Dalian Environment Model District Plan that Kitakyushu proposed to the Dalian authority while conducting surveys on cleaner production for representative companies in Dalian and holding seminars for engineers from enterprises. This led to the formulation of a master plan by the Japan International Cooperation Agency (JICA), thus allowing subsequent Environment Model City Projects to be implemented through the Environmental ODA Loans based on this master plan. Environmental cooperation at the private and citizen levels were further enhanced in the process of implementing the Environment Model City Projects.

The Chongqing Environment Model City Project played a role in complementing the technical cooperation between local governments regarding advanced natural gas utilization that Osaka City had been moving ahead with. Before constructing natural gas tanks and pipelines in Chongqing under the Environmental ODA Loan project, Chongqing and Osaka conducted joint researches on various technologies, including gas supply technologies for automatic supply systems, combustion technologies for industrial fields such as boilers and furnaces, and detection technologies for gas leakage. Based on this experience, in the construction of a natural gas supply facility in Henan Province supported by the Environmental ODA Loan, Osaka strove to promote technical cooperation and exchanges between cities, such as providing technical assistance to cities in Henan Province to improve air pollution.

In the Beijing Sewage Treatment Plant Construction Project, the Gaobeidian sewage treatment plant, which boasts a treatment capacity of 500,000 m3/day, was constructed with the Environmental ODA Loan. At that time, however, China had little experience in planning, constructing, and operating such a large-scale sewage treatment plant. In view of this, the Bureau of Sewerage of Tokyo, a friendship city of Beijing, accepted trainees for training on water treatment and management techniques, as well as on how to start up a new sewage treatment plant. The sewage treatment plant was constructed and operated smoothly, in the end. Moreover, many of the trainees are now executives in the Beijing Water Authority. Currently, the Gaobeidian sewage treatment plant has enhanced its treatment capacity to 1 million m3/day. As a representative and the largest sewage treatment plant in China, it does not only accept a great number of visitors from China and abroad, but has also established a new training facility inside the plant.

2. Recent trends in China's environmental policies and institutional framework, and JICA's technical cooperation

Provision of new Japanese ODA Loans ended in 2007. However, the Environmental ODA Loan projects have continued to be implemented, operated, and managed since then. Although these projects have contributed in part to improving the environment in China, the environmental issues in China are becoming more diversified and complex nowadays, reflecting economic and social conditions. Below, I would like to take air pollution as an example to give an overview of the recent status of environmental issues in China and the changes in policies and institutional framework for tackling these issues. Then, I will touch on how JICA's technical cooperation has been involved and contributed in the process.

(1) Strengthening of policies and institutional framework for addressing air pollution in China

Let's have a look at the air pollution situation in China in 2016 with the latest data. The achievement status of air pollution emission standards in 338 cities in China is as follows: sulfur dioxide 97.0%, nitrogen dioxide 88.1%, carbon monoxide 97.0%, total particulate matter (PM10) 41.7%, and fine particulate matter (PM2.5) 28.1%. The emission standard achievement rate of sulfur dioxide and nitrogen dioxide, which are the causes of acid rain and were prioritized under the Environmental ODA Loan, reach a high of about 90%. On the other hand, the standard achievement rate of PM10 and PM2.5 is rather low. However, when we look at the PM2.5 of 74 cities that has been measured since 2013, it can be observed that the achievement rate of emission standards has been improving steadily year by year from 2013 to 2016 (4.1% -> 12.2% -> 16.2% -> 18.9%). PM (particulate matter) is a substance formed when particulates generated from industrial smoke, car exhaust gas, dust storms, forest fires, etc. chemically react with gaseous substances in the atmosphere, and to which heavy metals such as arsenic and cadmium adhere. Its mechanism of formation is complex and it has a serious impact on health.

The State Council of China formulated the Air Pollution Prevention and Control Action Plan in 2013 with the aim of improving air quality over the medium to long term. This Action Plan set 2017 as the target year, by which PM10 in prefectures and cities at or above the prefectural level nationwide should be reduced by 10% from 2012, while PM2.5 in Beijing, Tianjin and Hebei areas should be reduced by 25% from 2012. Specific measures include improving coal boilers (stopping the construction of small boilers, switching from coal to gas, etc.), improving the quality of gasoline and other fuel oil, scrapping old vehicles, curbing the total coal consumption (lowering the percentage of coal to not more than 65% of the total energy consumption, banning the construction of new coal-fired power plants other than for cogeneration, etc.), and accelerating the introduction of clean energy (13% renewable energy and 50 million kilowatts of nuclear power generation capacity in 2017, etc.). The Action Plan also includes improvement of environment for achieving these targets, such as technologies and R&D, energy and industrial restructuring, strengthening of regulations and supervision, clarification of corporate social responsibility, and public participation.

On January 1, 2015, the amended Environmental Protection Law (hereinafter referred to as the amended Environmental Law) entered into force in China. The former Environmental Protection Law, which had been promulgated in December 1989, was amended for the first time in 25 years and was completely revised. The background underlying the amendment of the Environmental Law was the complexity and seriousness of environmental pollution, as symbolized by PM2.5, and the increase in environmental awareness among citizens. New perspectives are included in the amended Environmental Law. First, the amended Environmental Law called for ever stricter penalties for polluters of the environment, because law enforcement under the existing environmental laws and regulations had become routine and loose. People were not punished even if they did something illegal. It also specified the responsibilities of the regulatory parties at the same time, which had not been included in the former law. Second, the amended law clarified the subject of public interest lawsuits in environmental pollution cases, which had been ambiguous under the former law and the Civil Procedure Law. It also institutionalized disclosure of environmental information by governments and enterprises.

Regulations have also been tightened in implementing the amended Environmental Law. The basic idea is to limit the role of the government to institutional framework, supervision and auditing, and to incorporate incentives and toughened penalties to encourage enterprises to address environmental issues autonomously. For example, in the past, ex-ante regulations were applied in which the government's environmental departments check and approve applications received from enterprises. After the amendment, enterprises are required to prepare applications in accordance to guidelines. This has made

it easier to obtain approval, yet on the other hand, a new sample investigation is conducted after the approval, and severe penalties are imposed for violations. In addition, from the viewpoint of promoting highly transparent administrative execution and mutual monitoring, the information of the Pollutant Discharge Permit is publicly disclosed on the Internet (the National Administration Information Platform) after the application is approved. The information includes discharge substances, concentrations, and total annual discharge amount. The industries covered include petroleum refining, coke, steelmaking, papermaking, and chemicals.

The former law adopted a sewage charging system in which local governments' Environmental Protection Bureaus collected sewage charges from enterprises. Under the amended law, enterprises are required to file this charge as local tax and the local tax authorities collect it. Tax payments are calculated by multiplying the pollution equivalent value by the applicable tax amount. As an incentive, tax payments are reduced if emissions fall below the emission standard (e.g. 50% reduction if emissions are less than 50% of the standard). On the other hand, in the case of a violation such as underclaim, a fine of up to five times the amount underclaimed is imposed (the fine was up to three times under the former law).

Environmental auditing methods were also strengthened. A central environmental audit system was introduced in response to criticism that it would not be able to handle collusion between the government and enterprises by the traditional audits conducted by local governments. In the new audit system, not only enterprises but also local governments are subject to audits based on reports from the public. In the two years from 2016 to 2017, all provinces (30 provinces) were audited, and the number of punishments was about 24,000 cases, with about 15,000 people being punished. There were about 120,000 cases of accusations during this period, of which 20% was punished.

It is also interesting to note that a CO2 emissions trading system that makes use of the market economy has been introduced. It is a part of the measures for the Paris Agreement to combat global warming. Since controlling CO2 emissions involves many measures related to fossil fuel combustion, it eventually leads to air pollution abatement measures. In 2013, markets for trading CO2 emissions were launched in eight provinces and cities including Beijing, Shanghai, and Chongqing, and pilot runs started. Enterprises selected by each local government were assigned with a total emissions allowance, and they were obligated to purchase allowance for the excess emissions from the emissions trading market. It is reported that from 2013 to 2016, a cumulative total of approximately 370 million tons of CO2 emissions, about 100 billion yen, has been traded by more than 3,000 companies (including 70 Japanese companies). From the result of this trial run, it was decided to roll out this system nationwide from 2017. It covered 1,700 electricity enterprises in the first stage, and will gradually expand to other industries, including petrochemical, steel, non-ferrous metal, and chemical in the future.

(2) Contributions of JICA technical cooperation

JICA technical cooperation projects are also considered to contribute to formulation and implementation of the Chinese government's air pollution abatement-related laws mentioned above. I would like to give some examples. As I mentioned earlier, the Air Pollution Prevention and Control Action Plan announced in September 2013 includes improvement of pollution control, such as technologies and R&D, energy and industrial restructuring, strengthening of regulations and supervision, clarification of corporate social responsibility, and public participation, which are required for implementing the specific measures. Some of these contents are related to the outputs obtained through the cooperation in the implementation of the JICA projects. Some related articles can be picked up from JICA China Office News (Oct. and Nov. 2013 (combined issue)). The following table summarizes them.

Main contents of the "Air Pollution Prevention and Control Action Plan"	JICA technical cooperation projects and their outputs which can be considered to be related to the "Air Prevention and Control Action Plan"
Study on correlation between air pollution and health (Action Plan (Article 8))	In the "Training Project for Promoting the Institutional Building on Compensation for Health Damage by Environment Pollution", JICA shared with China Japan's experience of severe pollution-related diseases and how it had established a compensation system for victims of pollution-related diseases after numerous court battles.
Circular production through recycling by companies, development of circular industrial parks (Action Plan (Article 10))	In the "Promotion of Circular Economy Project", JICA formulated a maintenance plan and guidelines for zero emissions in industrial zones (industrial parks) through mutual recycling of waste between factories.
Strengthening of nitrogen oxide management (total emission control system) (Action Plan (Article 17))	Through the "Project for Total Emission Control of Nitrogen Oxide in Atmosphere", based on the know-how of how Japan controls total emissions, JICA identified technical issues as well as policy and institutional issues required for reducing emissions, and disseminated practical control technologies and methods.
Strengthening of environmental supervision and management (Action Plan (Article 23))	In the "Promotion of Circular Economy Project", taking Japan's corporate environment supervisor system as a model, JICA introduced it to China. It also held seminars for dissemination of the system for more than 7,000 people, including local environmental government officials and concerned persons from enterprises.
Public participation (Action Plan (Article 35))	JICA is building a "Japan-China Environmental Information Plaza" (tentative name) in the Sino-Japan Friendship Center for Environmental Protection as a national-level environmental education base. It also provides training for environmental volunteers and develops educational materials. In the "Project on Capacity Building on Climate Change and Public Participation", JICA is giving training with the aim of improving citizens' environmental awareness.

Let me give one more example. JICA cooperated in preparation for the amended Environmental Protection Law, which was revised in January 2015 for the first time in 25 years. With the cooperation of the Ministry of the Environment of Japan, JICA conducted training in Japan from April 1 to 11, 2013, before the Standing Committee of the National People's Congress (NPC), the legislative body of China, held the second meeting to deliberate on the law amendment. Eleven members from the Administrative Law Office of the NPC Legislative Affairs Commission and the Ministry of Environmental Protection who were involved in the amendment of the Environmental Protection Law attended the training. During this training, lecturers from various stakeholders engaged in environmental issues in Japan were invited, and through site visits, trainees got required information on the comprehensive system and operation status of Japanese environment-related laws. They also actively exchanged opinions. With regard to the Environmental Law, an outline of Japan's Basic Act on the Environment, the philosophy of environmental rights, the impact of lawsuits on environmental policies, settlement of environmental pollution disputes, and the relationship between local governments and companies were introduced. As for pollution lawsuits, in addition to a lecture given by the Pollution Control and Environmental Protection Committee of the Osaka Bar Association, the Aozora Foundation (NPO) also shared its experience of air pollution lawsuits in the Nishiyodogawa area from the perspective of local residents. Many participants from China expressed, "I'd like to apply what I learnt from the background of local governments and companies' voluntary efforts in environmental protection, the active participation of citizens, and the government's incentive policies for enterprises, in order to strengthen the environmental protection measures in China in particular." (JICA China Office News, April 2013 issue)

Furthermore, after the amendment of the Environmental Protection Law, JICA invited its counterparts to Japan to the Country-Focused Training for China in 2015. The counterpart of the Project for Administrative Litigation Law and Administration-related Law was invited to the Air Pollution Law course, and the counterpart of the Project for Capacity Development of Planning for Pollution Control of O3 and PM2.5 in Atmosphere was invited to the Air Pollution Control course respectively to share their useful knowledge in the implementation of the amended law.

(3) Trends in the air pollution situation in China

As we have seen, the Chinese government has made continuous efforts and adopted new initiatives to improve the environment since the 1990s and 2000s when the Environmental ODA Loans were provided. Now, here is a question. Have the outputs actually led to improvements in environmental quality? Here, I will examine air pollution by having a look at the changes in the emissions of sulfur dioxide, one of the air pollutants. The data of sulfur dioxide has been published by the SEPA in the "Report on the State of the Environment in China" every year since the 1990s. The changes in sulfur dioxide emissions in China in the past are shown in the following table (bar graph). (The figures for 1995, 1996, and after 2015 are not included in the graph, because, instead of the volume of emissions, they were published as standard achievement rate or other indicators in the "Report on the State of the Environment in China".)

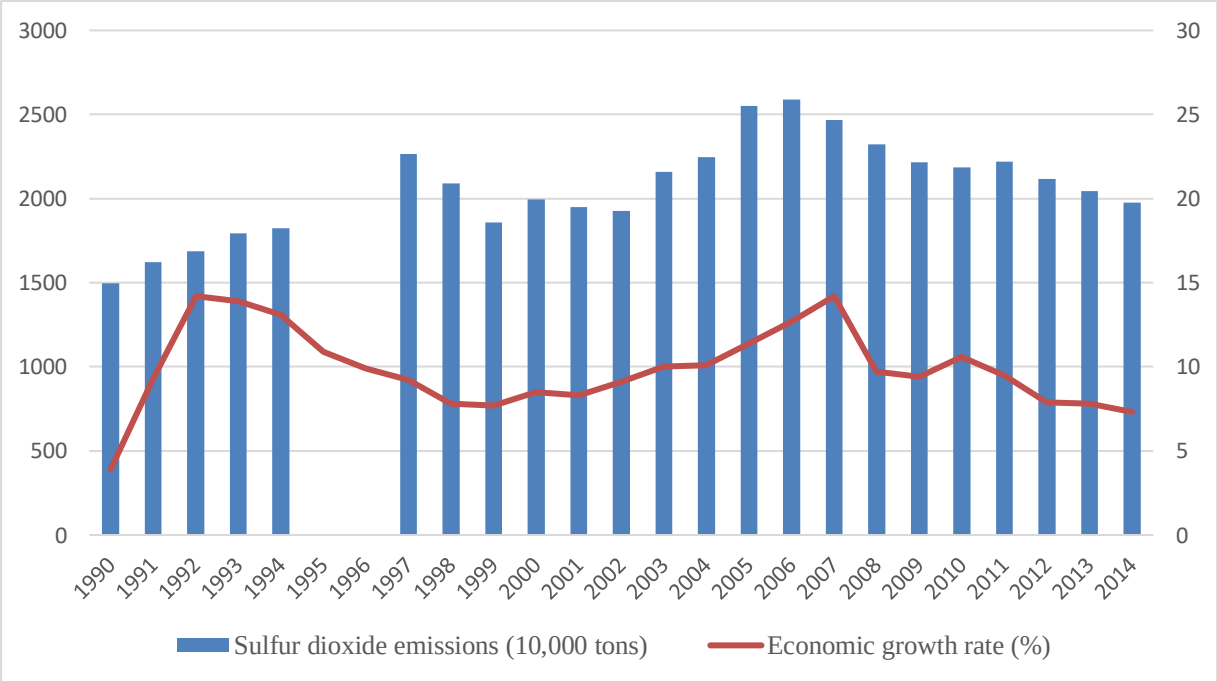


Table - Changes in sulfur dioxide emissions and economic growth rates in China (The left scale shows sulfur dioxide emissions and the right scale shows annual economic growth rates. Sulfur dioxide emissions are based on the "Report on the State of the Environment in China", and economic growth rates are based on World Bank data.)

These figures indicate that sulfur dioxide emissions have been increasing since 1990. It showed a decline around 2000, but started to increase again, reaching a maximum in 2006, and declined every year since then. On average, total sulfur dioxide emissions increased by about 30% between 1990 and 2014. It is hard to know the outcomes of the environmental measures taken by the Chinese government from the changes in sulfur dioxide emissions. What we should note here, however, is that the Chinese economy has substantially grown about thirtyfold (US $0.37 trillion -> US $10.5 trillion; World Bank GNP data) between 1990 and 2014.

As another viewpoint, I would like to compare sulfur dioxide emissions with the annual economic growth rates during the same period. The annual economic growth rates are shown by the line graph in the above table. This graph shows that economic growth rates and sulfur dioxide emissions have been changing similarly since 1998. For example, looking at 2011 to 2014, sulfur dioxide emissions dropped by an average of 12.3% from 22.18 million tons to 19.75 million tons, while economic growth rates also declined from 9.5% to 7.3%. In any case, sulfur dioxide emissions have been on the decrease since peaking in 2006, but it is not clear from this data alone how much this is due to the outcome of environmental measures. The above table is based on data up to 2014. Since 2015, the Chinese government has drastically amended the Environmental Law and has begun to considerably strengthen its regulatory system. We look forward to further analysis from 2015 onward.

3. Future Japan-China environmental cooperation; promotion of green finance

The strengthening of environmental regulations by the Chinese government can have an impact on business activities such as adding costs. However, from the macro perspective, the higher need for environmental measures will create opportunities for environmental businesses. In addition, economic incentives for pollution control by the Chinese government and emissions trading using market mechanisms also stimulate environmental businesses.

It is said that there are two kinds of companies that engage in environmental businesses: companies that "sell the environment" and companies that "sell with the environment". A company that "sells the environment" is a company that rolls out environmental businesses such as environmental engineering and environmental solutions among companies. They cover different sectors, including energy-saving, resource-saving, and pollution control measures for water, air, waste, and soil. The Circular Economy Promotion Law was enforced in China in 2009, and in 2011, the Regulations on the Administration of the Recovery and Disposal of Waste Electrical and Electronic Products, the Chinese version of the Act on Recycling of Specified Kinds of Home Appliances, was introduced. In response to this move, a company that engages in waste treatment and resource recycling has started a home appliance recycling business using a system similar to that in Japan, and is also working on rolling out a business to handle contaminated soil. On the other hand, a company that "sells with the environment" is a company that primarily engages in businesses between companies and consumers, and offers eco-friendly products and services. Their products not only need to be superior, but should also be a brand trusted by consumers. For example, a Japanese printer manufacturer has set up one of its worldwide toner cartridge recycling bases in China. They completed an international recycling system by giving clients an eco-friendly image while having clients continue to use the company's inks and toners.

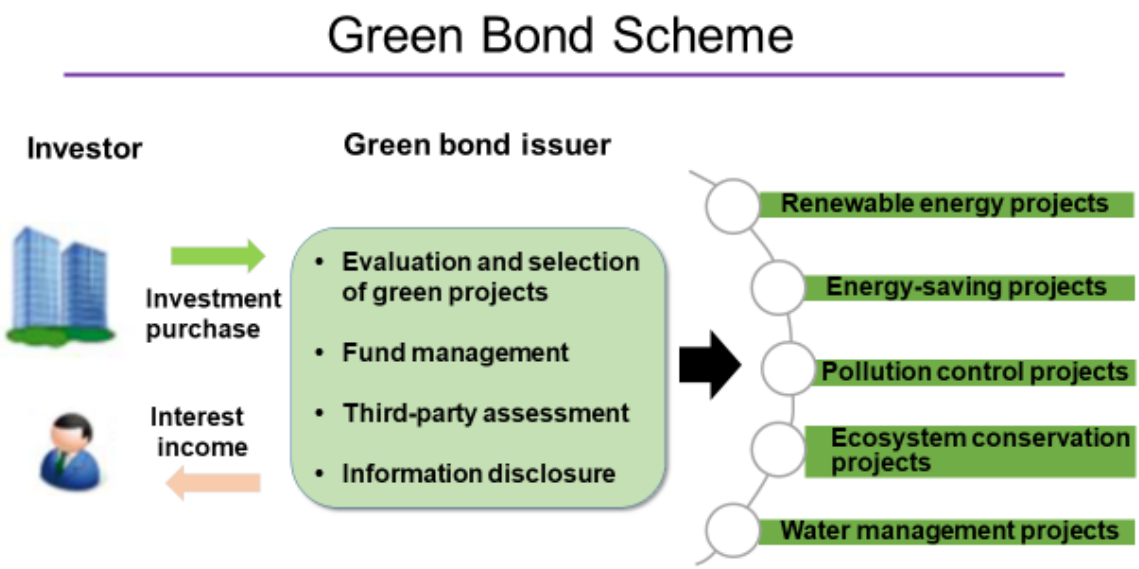
From the perspective of cooperation between Japan and China in the environmental field, we can see that the government sector took the lead from the 1990s through the 2000s when the Environmental ODA Loans were utilized. Since then, companies and business sectors have been assuming a leading role. Amidst such drastic changes, which field should we focus on in order to promote further environmental cooperation between Japan and China? I would like to propose "green finance" through which environmental businesses in both countries can to be further enhanced.

The Sustainable Development Goals (SDGs) and the Paris Agreement to combat climate change agreed on in 2015 have led to a growing international recognition of the need to promote activities such as renewable energy and energy-saving, resource efficiency and circular economy, nature and ecosystem conservation, and climate change adaptation (measures against floods, droughts, etc.), as well as the

importance of expanding green finance where private funds, in particular, are expected to be mobilized for these activities.

At the G20 Summit hosted in China (Hangzhou) in July 2016, the Chinese government launched an international Green Finance Study Group (GFSG) and addressed expansion of green finance in the G20 joint statement. China has a strategic policy of using green finance to solve serious environmental problems in the country, which is in line with the intention of developed countries to expand green finance for low carbon. Green finance in China has in fact made significant progress. For example, in August 2016, seven ministries and the Central Bank jointly issued the "Guidelines for Establishing the Green Financial System in China" with the aim of supporting policy incentives such as grants or subsidies in loans and guarantees for expanding green finance.

Let us take a look at green bond, a specific financial instrument of green finance, as an example. Green bond raises funds from the capital market necessary for the implementation of environmental (green) projects such as renewable energy, pollution control, and waste management by issuing bonds. These bonds can be issued by companies, banks, local governments, or even the central government. One of the features of the green bond is information disclosure on the green projects to be financed, such as project outline, funding amount and environmental benefits. China issued approximately US $30 billion (3.24 trillion yen) of green bonds in 2018, second only to the United States' amount of about US $34 billion. The amount of green bonds issued in the world in that year was approximately US $170 billion, of which China accounted for 18%. Over the past few years, China has boosted its international presence with its large green bond issuance. In comparison, Japan seems a little behind. The Ministry of the Environment issued the Green Bond Issuance Guidelines in 2017, and established technical and financial supporting schemes to expand the green bond market in Japan. Since then, the amount of green bonds issued in Japan has rapidly increased. In 2018, about 540 billion yen of green bonds were issued by companies (electricity, electric railways, ships, real estates, construction, retails, etc.), banks and leasing companies, and local governments. In parallel with green bonds, the Ministry of the Environment is planning to develop a system to expand loans and credits to mobilize funds to green projects.



In this way, there is a clear rising trend of green finance in both Japan and China, and the need for the formation and implementation of the underlying green projects is also high. Companies of Japan and China are making their business in each other's countries. For example, more than 30,000 Japanese companies operated in China as of 2016. Greening activities such as environmental improvement and low-carbon activities have been increasing in recent years. Green finance systems and markets to financially support these activities are also growing. Accordingly, it is expected that more and more Japan-China joint ventures will issue green bonds in the financial markets in each other's country, and that more and more Japanese and Chinese investors will purchase the green bonds.

On the other hand, the finance system needs to be further improved in order to expand green finance. For example, the issue of the definition of "green". In China, clean coal is included as a green project, but it is basically not recognized as green in international market. In Japan, switching fuel from oil to gas can be considered as green, but it is controversial internationally. Both countries need to coordinate the definition of "green", taking into consideration the discussions in the international financial market. In addition, information disclosure on environmental projects and their benefits is also an issue. There is an opinion that information disclosure by companies in China is not always sufficient. For green investors and financial institutions, however, information disclosure is essential for making investment decisions. Furthermore, incentives to develop green projects are required. China has introduced a financial support package like the "Guidelines for Establishing the Green Financial System in China", but Japan does not have such a comprehensive framework. Therefore, there must be areas where Japan and China can cooperate while sharing their experiences on these issues.

As the environmental businesses in Japan and China continue to grow, there are opportunities for both governments to cooperate in developing a framework for enhancing green finance while taking advantage of the common ground of SDGs and Paris Agreement. I believe it will become a promising area for future Japan-China environmental cooperation.

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