

People's Republic of China

Ex-Post Evaluation of Japanese ODA Loan Project

“Public Health Project (Hubei Province)”

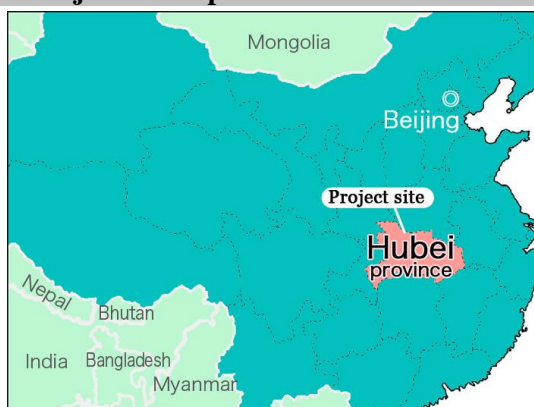
External Evaluator: Ayako Nomoto, International Development Center of Japan Inc.

0. Summary

This project was implemented to reinforce China's public health system, for which their improvement efforts had been accelerated since the outbreak of the Severe Acute Respiratory Syndrome (herein after referred to as “SARS”). The project aimed at strengthening the infectious disease countermeasures by procuring equipment, implementing training for the development of personnel involved with infectious disease countermeasures and others at 38 provincial and prefecture-level city (hereinafter referred to as “city”) basic public health institutions. The project has been consistent with China's development policy and development needs for infectious disease countermeasures, as well as with Japan's ODA policy. Therefore, relevance of the project is high. The project cost was mostly as planned, however, the project period significantly exceeded that planned, as it took time to complete a series of procedures in bidding and delivery, in addition to the implementation of additional procurement. Therefore, efficiency of the project is fair. After the implementation of the project, its testing capacity, capacity for testing, diagnosis, and treatment, and emergency transportation capacity were enhanced at the Centers for Disease Control and Prevention (herein after referred to as “CDC”), infectious disease hospitals and emergency centers, respectively. Further, the overall function of the infectious disease countermeasures in the province was also strengthened because an early response to the emergency onset of infectious diseases became possible. As a result, the case fatality rate and mortality related to infectious diseases declined, and therefore, effectiveness and impact of the project are high. No major problems have been observed in the institutional, technical, and financial aspects of the operation and maintenance systems, as well as the current status of operation and maintenance. Therefore sustainability of the project effects is high.

In light of the above, this project is evaluated to be highly satisfactory.

1. Project Description



Project Location



A full automatic biochemical analyzer procured as a part of the project

1.1 Background¹

The number of cases of legally-designated infectious diseases had decreased in China. However, the appearance of emerging infectious diseases and the problem of public health in rural areas, where the incidence of infectious diseases was still high, continued to be a critical issue in the health sector. Under such circumstances, the Severe Acute Respiratory Syndrome (SARS) broke out in November 2002. The spread of SARS revealed the vulnerability of the public health infrastructure, evidenced by the flaws in the information network and vigilance system, lack of maintenance and aging of various medical facilities, insufficient quantity and quality of health personnel, and lack of capital investment.

Given such a situation, the Chinese government took actions for improving the public health infrastructure by drawing up a master plan targeting the entire country, including programs such as the “Plan for the Construction of Disease Prevention and Control Systems” and “National Plan for the Construction of Medical Treatment Systems in Case of a Public Health Emergency,” and embarked on the establishment of a surveillance network, establishment of an emergency system, improvement of the disease prevention and control system, and other such measures to enhance the basic infrastructure for public health.

1.2 Project Outline

The objective of this project is to strengthen the infectious disease countermeasures in Hubei province by procuring equipment, implementing civil works and training for the development of personnel involved with the infectious disease countermeasures at provincial and 13 prefecture-level city (city) basic public health institutions, thereby contributing to the improvement of the health of the local residents.

Loan Approved Amount/ Disbursed Amount	2,325 million yen / 2,263 million yen
Exchange of Notes Date/ Loan Agreement Signing Date	March, 2004 / March, 2004
Terms and Conditions	Interest Rate 1.5 % Repayment Period 30 years (Grace Period) (10 years) Conditions for Procurement: General untied
Borrower / Executing Agency	The Government of the People’s Republic of China/Hubei Provincial Peoples Government
Final Disbursement Date	August, 2011

¹ The “Public Health Project” was planned and implemented in 10 provinces, including Hubei.

Main Contractor (Over 1 billion yen)	-
Main Consultant (Over 100 million yen)	-
Feasibility Studies, etc.	Feasibility Studies: China National Pharmaceutical Group Corporation–Wuhan Pharmaceutical Design Institute (November, 2003), Wuhan Technical and Economic Engineering Corporation (November, 2003), Wuhan Technical and Economic Engineering Consulting Center (August, 2008)
Related Projects	<p>【Japanese ODA Loan】</p> <ul style="list-style-type: none"> - Public Health Infrastructure Facility Improvement Project Post–training (Hubei province) (2012–2013) <p>【Technical Cooperation】</p> <ul style="list-style-type: none"> - Poliomyelitis Control Project (1991–1999) - National Public Health Policy Plan Management Project (Technical Assistance Related to ODA Loans) (2012–2016) <p>【Grant Aid】</p> <ul style="list-style-type: none"> - Expanded Program on Immunization (1998) - Program for Tuberculosis Control in Disadvantaged Areas (2000) <p>【Other Donors, Agencies】</p> <ul style="list-style-type: none"> - The World Bank: Infectious and Endemic Disease Control Project (1991–2002) - The Global Fund to Fight AIDS, Tuberculosis and Malaria (GFATM) : Nationwide Expansion of Directly Observed Treatment, Short Course to Fight the TB Epidemic in China - British Department for International Development (DFID)/Canadian International Development Agency (CIDA): Province, City and County-level Hospital Medical Equipment (1998–2002)

The target facilities of the project are Provincial Centers for Disease Control and Prevention (CDC), provincial infectious disease hospitals and city CDCs, and infectious disease hospitals and emergency centers in 13 cities (Wuhan, Jingzhou, Huangshi, Suizhou, Jingmen, Yichang, Xiaogan, Xianning, Xiangfan, Shiyan, Enshi, Ezhou, and Huanggang). The outline of the project (procured equipment, civil works, and training) is as follows:

- (1) CDCs (one provincial CDC and 13 city CDCs): Laboratory equipment, equipment for health education such as multi projectors, information equipment such as web servers, mobile emergency services—testing laboratories and others.
- (2) Infectious disease hospitals (one provincial level hospital and 13 city level hospitals): diagnostic equipment such as electrocardiographs, disinfection and treatment equipment, beds, ambulances, ambulance related equipment, and others.
- (3) Emergency centers (10 facilities): Ambulances and ambulance related equipment
- (4) Civil works (funded by the Chinese side) (construction, expansion, renovation etc. for (1) – (3) listed above.
- (5) Training for capacity development of personnel involved in the infectious disease measures (funded by the Chinese side)

2. Outline of the Evaluation Study

2.1 External Evaluator

Ayako Nomoto, International Development Center of Japan Inc.

2.2 Duration of Evaluation Study

Duration of the Study: August 2014 – January 2016

Duration of the Field Study: November 30, 2014 – December 21, 2014; March 5, 2015 – March 7, 2015

2.3 Constraints during the Evaluation Study

Data of the ex-post evaluation was collected through a questionnaire survey on all 38 target facilities (all facilities responded to the questionnaires), and visits to 13 facilities (one provincial CDC, four city CDCs, five infectious disease hospitals, and three emergency centers).

Detailed information on the outputs and project costs for China were not obtained, and therefore, efficiency is judged solely based on portion of the Japanese ODA loan.

3. Results of the Evaluation (Overall Rating: A²)

3.1 Relevance (Rating: ③³)

3.1.1 Relevance to the Development Plan of China

Both the national development plan and provincial health sector plan have prioritized the strengthening of the emergency and disease prevention system including the capacity enhancement of preventing and controlling infectious diseases and public health emergency cases both at the time

² A: Highly satisfactory, B: Satisfactory, C: Partially satisfactory, D: Unsatisfactory

³ ③: High, ② Fair, ① Low

of appraisal and ex-post evaluation. Therefore, the objectives of the project have been consistent with the development plan.

(1) Development plan at the time of the appraisal

China's "10th Five-Year Plan (2001–2005)" aimed at strengthening the emergency and disease prevention systems in urban areas and thereby promoting the monitoring and containment of infectious and endemic diseases. The Government of China also drew up master plans including the "Plan for the Construction of Disease Prevention and Control Systems" and the "National Plan for the Construction of Medical Treatment Systems in Case of a Public Health Emergency," which targeted the whole country, and thereby aimed at establishing a surveillance and emergency response network, and improving the disease prevention and control system.

Provinces in China drew up the "10th Five-Year Plan (2001–2005)" and the "Health Sector 10th Five-Year Plan (2001–2005)." As for the public health sector, the plans aimed at strengthening the disease prevention system, establishment of the sanitary management system, strengthening the information network and diverse surveillance systems, etc.

(2) Development plan at the time of the ex-post evaluation

Under the "12th Five-Year Plan (2011–2015)," the Government of China aims at the "establishment of a sound basic public service system." Specifically, the government aims at strengthening the professional public health service network; preventing severe infectious diseases, chronic diseases, occupational diseases, endemic diseases and mental health; and enhancing the capacity to respond to the public health emergency.

Under the "Health Sector 12th Five-Year Plan (2011–2015)," the provincial government of Hubei aims at strengthening the public health service system in terms of disease prevention and control, health education, maternal and child health, prevention and treatment of mental health, emergency service, hygiene monitoring and control, and prevention and treatment of occupational diseases. The government also aims at strengthening the function of the public health service under the basic medical and health service network.

3.1.2 Relevance to the Development Needs of China

The development needs for enhancing the capacity for controlling infectious diseases have been high both at the time of appraisal and the ex-post evaluation.

(1) Development needs at the time of the appraisal

"The number of hospital beds per 1,000 population," which is a representative indicator that measures the level of public health performance, was 2.1 in the Hubei province whereas the national

average was 2.32 (2002). Further, the figure was far less as compared to that in developed countries such as Japan (14.6 in 2002). The outbreak of SARS revealed the weak public health system of China including poor infectious disease countermeasures. The common challenges each province faced included improper public health facilities, lack of equipment, aging equipment, insufficient number of health professionals and limited capacity, and an inappropriate information network system and emergency service system.

(2) Development needs at the time of the ex-post evaluation

At the time of the ex-post evaluation, the incidence of Class A and B legally designated infectious diseases (28 diseases)⁴ in Hubei province was found to be higher than the national average and therefore, the needs for enhancement of the capacity for controlling infectious diseases are high. After the implementation of the project, the Class A legally designated infectious disease, cholera, broke out, and there was an Influenza A (H1N1) (novel influenza) epidemic in 2009 and thereafter (777 cases in 2011 and 217 in 2013). Thus, the risk of the occurrence of a public health emergency is still high, and the early detection, identification, and implementation of control measures for infectious disease need to be carried out.

Table 1: Incidence of legally designated infectious diseases (Class A and B)

(Unit: Incidence per 100,000 population)

	2002	2013
National average incidence	180.14	225.80
Incidence in Hubei province	n.a.	254.81
National average mortality	0.35	1.20
Mortality in Hubei province	0.56	0.73

Source: Documents provided by JICA and the executing agency

Note: The number of Class A and B legally designated infectious diseases was 26 in 2002 and 28 in 2013.

3.1.3 Relevance to Japan's ODA Policy

The project was highly consistent with Japan's ODA policy at the time of appraisal (2004). The "Economic Cooperation Plan for China" (2001) of the Government of Japan prioritized the engagement in the measures against infectious diseases and the reinforcement of human resources development such as dispatch of experts and acceptance of trainees under the support area of global issues. Additionally, the Japan International Cooperation Agency (JICA) (then called as the Japan Bank for International Cooperation) prioritized infectious diseases as a global issue, and human resource development of those who will play a key role for development in the "Strategy for

⁴ The "Law on Preventing and Controlling Notifiable Diseases" classifies the legally designated diseases into Class A, B and C. Plague and cholera, which need urgent response, are classified as Class A. As of 2014, 26 diseases including HIV/AIDS, polio, and viral hepatitis are classified as Class B, and 11 diseases are designated as Class C. The classes are categorized based on the reporting requirements (Refer to 3.3 Effectiveness) and preventive measures.

Overseas Economic Cooperation.” JICA’s “Country Assistance Strategy 2003” also listed the need for strengthening the measures against infectious diseases, especially the improvement of public health infrastructure facilities and the development of human resources, as ways to deal with the vulnerability of China’s public health system exposed by the sudden increase in the incidence of SARS.

In light of the above, this project has been highly relevant to the country’s development plan and development needs, as well as Japan’s ODA policy. Therefore its relevance is high.

3.2 Efficiency (Rating: ②)

3.2.1 Project Outputs

Outputs were produced in keeping with the “Comparison of the Original and Actual Scope of the Project” presented on the last page of the present report. The differences in the original and actual scope are explained below.

(1) Equipment procured as a part of the project

Equipment procured as a part of the Japanese ODA Loan was almost in keeping with the plan. As the procurement cost was far below the plan as a result of the international competitive bidding, additional equipment was procured by using the undisbursed amount of the loan after the original procurement was completed. Therefore, the number of actual equipment procured exceeded the plan by 172%. Most of the additionally procured equipment was appropriate because they were procured based on the original equipment list that only listed items indispensable for measures against infectious disease. Some additional equipment that were not on the original list were acceptable as they included testing equipment for waterborne infectious diseases and equipment used for the prevention of nosocomial infection or biopsy. Thus, the additional procurement was appropriate as all additional equipment was consistent with the objective of the project and was strongly required.

According to the executing agency, the number of equipment to be procured by counterpart funding from China increased significantly in order to produce synergistic effects with the portion of Japanese ODA Loan. However, the details on the number and items of the equipment were not clear.

Table 2: Comparison of the plan and actual procured equipment

Institutions	Plan (At the time of appraisal)	Actual
CDCs	633 items at 14 institutions (one provincial CDC and 13 city CDC). • Laboratory equipment • Equipment for health education such as multi projectors and web servers • Mobile emergency - testing laboratories and others	911 items at 14 institutions. (Original procurement) Same as planned. (Additional procurement) 278 items. Laboratory equipment based on the original equipment list. However, items such as Liquid Chromatography-Mass Spectrometry, which were not on the list, were procured at the provincial CDC.
Infectious disease hospitals	209 items at 14 institutions. Diagnostic equipment such as electrocardiographs, disinfection and treatment equipment, beds, ambulances, ambulance related equipment and others.	737 items at 14 institutions. (Original procurement) Same as planned. (Additional procurement) 528 items which were procured based on the original equipment list. However, at some hospitals, items not listed in the original equipment list, such as multipurpose anesthesia apparatus, universal operating beds, and high frequency cautery knives, were procured.
Emergency centers	305 items at 10 institutions. Ordinary and negative pressure ambulances, electrocardiographs, and others.	334 items at 10 institutions. (Original procurement) Same as planned. (Additional procurement) 29 items were procured based on the original equipment list.

Source: Documents provided by JICA, by the executing agency, and from the questionnaire responses from the executing agency and participating institutions.

Note: The equipment procured using a portion of the Japanese ODA Loan only. The 14 institutions in the table include provincial and city level institutions.

(2) Civil works (funded by the Chinese side)

Renovation at six institutions was planned and actual scope was almost as planned except that Wuhan city Infectious Disease Hospital was newly constructed after it was amalgamated with another hospitals. Wuhan city Infectious Disease Hospital was merged with Wuhan tuberculosis hospital and Wuhan second tuberculosis hospital and was named as Wuhan Medical Treatment Center. These three hospitals specialized in infectious diseases and therefore, the amalgamation is justifiable.

Table 3: Comparison of plan and actual of civil works (funded by the Chinese side)

Institutions	Plan (At the time of appraisal)	Actual
CDCs	- Three institutions. - Renovation of laboratory (3,452 m ² at two institutions), reinforcement of power supply facility (one institution)	- 7,402 m ² at three institutions. - Renovation of laboratory and reinforcement of power supply facility.
Infectious disease hospitals	- Three institutions. - Renovation of outpatients' ward (area was not specified).	- 4,075 m ² at two institutions. (excluding Wuhan city Infectious Disease Hospital)
Emergency centers	-	-

Source: Documents provided by JICA and questionnaire responses from the executing agency and participating institutions.

(3) Training (funded by the Chinese side)

The dispatch of Japanese experts to China and training in Japan, which were planned at the time of appraisal, were not actually implemented because the participating institutions were unable to bear the costs. However, domestic training was implemented mostly as planned. At the time of appraisal, the components of Japanese experts and training in Japan were incorporated with the strong intention from China; however, the Japanese side considered that institutions in Beijing and Shanghai were able to provide appropriate technical guidance. Therefore, the cancellation of the components did not create a problem.

Table 4: Comparison of plan and actual of training (funded by the Chinese side)

Training/Dispatch of experts	Plan (At the time of appraisal)	Actual
Domestic training	1,025 persons	1,236 persons
Training in Japan	101 persons	Not implemented.
Dispatch of experts (from China and Japan)	—	Not implemented.

Source: Documents provided by JICA and questionnaire responses from the executing agency and participating institutions.

3.2.2 Project Inputs

3.2.2.1 Project Cost

Project cost was judged in terms of the Japanese ODA Loan alone because details of the counterpart funding from China were not clear. The counterpart funding for equipment increased significantly in accordance with the increase in the outputs, as described in the section “3.2.1 Project Outputs” above. However, the details of the outputs were not sufficient to judge whether the increase in the outputs justifies the increase in the costs. As to the counterpart funding for civil works and training, the executing agency did not collect information fully and it was also difficult to collect the information at the ex-post evaluation. Against the loan approved amount of 2,325 million yen, the actually disbursed amount was 2,263 million yen, and thus, the Japanese ODA Loan portion was lower than that planned (the ratio against plan: 97%).

Table 5: Comparison of project cost (Plan/Actual)

(Unit: million yen)

	Plan (At the time of appraisal)						Actual					
	Foreign currency		Local currency		Total		Foreign currency		Local currency		Total	
	ODA loan portion		ODA loan portion		ODA loan portion		ODA loan portion		ODA loan portion		ODA loan portion	
Equipment	2,128	2,128	449	0	2,577	2,128	2,263	2,263	1,361	0	3,624	2,263
Civil works	0	0	143	0	143	0	0	0	0	0	0	0
Training	98	0	59	0	157	0	0	0	0	0	0	0
Administration cost and others	0	0	109	0	109	0	0	0	40	0	40	0
Price escalation	91	91	2	0	93	91	0	0	0	0	0	0
Physical contingency	106	106	43	0	149	106	0	0	0	0	0	0
Interest during construction	0	0	64	0	64	0	0	0	0	0	0	0
Total	2,423	2,325	869	0	3,292	2,325	2,263	2,263	1,401	0	3,664	2,263

Source: Documents provided by JICA and the executing agency

Notes: (1) The totals for the columns and rows may not match due to rounding errors. (2) The actual amount for civil works and training (both counterpart funding from China) was excluded as the executing agency did not have accurate data.

Exchange rate: At the time of appraisal (August 2003) 1 yuan=14.3 yen;

Average during the implementation period (2004–2011): 1 yuan =13.8 yen

3.2.2.2 Project Period

The implementation of this project was planned from March 2004 (loan agreement signing date) to December 2006 (completion of the delivery of the equipment) (34 months). However, the actual project period was 90 months from March 2004 (loan agreement signing date) to August 2011 (completion of the delivery of the equipment), which was significantly longer than that planned (the ratio against plan: 265%). The cause of the delay was primarily due to the delay in the procurement of the equipment. Additional equipment was procured by using the undisbursed amount of the Japanese ODA Loan. Further, it took time to complete each procedure of bidding, customs, and inspection of imported equipment, as the provincial government of Hubei did not have sufficient experience of international competitive bidding, according to the executing agency.

Table 6: Comparison of project period (Plan/Actual)

	Plan (At the time of appraisal)	Actual
Loan agreement signing date	March 2004	March 2004
Civil works	January 2003–December 2006	January 2004–October 2006
Procurement of equipment	April 2004–December 2006	March 2004–August 2011
Training	September 2004–September 2006	Unclear
Project completion (project period)	December 2006 (34 months)	August 2011 (90 months)

3.2.3 Results of Calculations of IRR (Reference only)

Due to the nature of the project, a quantitative analysis of the internal rate of return (hereinafter referred to as “IRR”) was not possible. As the IRR was not calculated at the time of appraisal, IRR calculation was not included in the scope of the ex-post evaluation.

Thus, although the project cost was within the plan, the project period exceeded the plan. Therefore, efficiency of the project is fair.

3.3 Effectiveness⁵ (Rating: ③)

The extent to which the project objective of “strengthening of infectious disease countermeasures” was achieved was examined in terms of quantitative indicators and qualitative information.

3.3.1 Quantitative Effects (Operation and Effect Indicators)

At the time of appraisal, “increase in the number of hospital beds in the infectious disease hospitals (wards)” and “the number of test items of provincial CDCs” as a result of the overall function improvement were set as operation and effect indicators. In addition, an improvement in disease prevention and control, testing, and treatment and emergency service systems were set as the qualitative effects.

At the time of the ex-post evaluation, the following indicators including the above quantitative and qualitative effects were used to measure the attainment of the project objective of “strengthening of infectious disease countermeasures.” (1) As to overall function improvement, (i) the number of beds in the infectious disease hospitals (wards) per population and (ii) improvement in handling of a sudden epidemic were reviewed. (2) As to functional improvement of CDC, (i) the number of test items, (ii) number of samples of major infectious diseases analyzed, (iii) changes in the reporting time of the samples of major infectious disease analyzed and (iv) utilization of equipment were reviewed. (3) The nosocomial infection rate, in-hospital mortality rate, and number of implemented tests were used to measure the functional improvement in the infectious disease hospitals. (4) The service radius, emergency response time, and number of emergency transportation cases were used to measure the functional improvement of the emergency centers⁶.

(1) Overall function improvement

(i) Number of beds per population in the infectious disease hospitals (wards)

At the time of appraisal, the number of beds (per 1,000 population) in the infectious disease hospitals

⁵ Sub-rating for Effectiveness is to be put with consideration of Impact.

⁶ The indicators set at the time of appraisal were (i) the ones which measure part of the functions of the CDCs and infectious disease hospitals and (ii) impact level indicators which measure the overall function improvement. Therefore, it was insufficient to measure the effects of the project appropriately. Based on documents provided by JICA, additional indicators were set at the time of the ex-post evaluation.

(wards) was 0.06 and the same was expected to be 0.07 after the project implementation. As Table 7 illustrates, after the project implementation, in 2014, the number of beds in infectious disease hospitals (wards) in Hubei province increased to 0.08. After the outbreak of SARS, the Government of China had expanded the facilities of infectious disease hospitals, and the target institutions of the project also expanded the size from 1,044 beds in total (2002) to 2,022 in total (2014). Thus, the project seems to have contributed to this increase to a certain extent.

Table 7: Number of infectious disease hospital beds in Hubei Province

(Unit: bed)

	Baseline 2002 Baseline Year	Target 2006 Completion Year	Actual 2011 Completion Year	Actual 2014 3 Years After Completion
Number of beds (per 1,000 population) in the infectious disease hospitals (wards)	0.06	0.07	0.08	0.08

Source: Documents provided by JICA and the executing agency

(ii) Improvement in handling of a sudden epidemic (the time required from the onset of an infectious disease to the official reporting)

Table 8 illustrates that the handling of a sudden epidemic (the time required from the onset of an infectious disease to the official reporting) attained the time specified under the law, and improved compared with the situation before the project implementation. This improvement shows that the infectious disease countermeasures were strengthened by this project.

Although the strengthening of the requirements by the government and development of an on-line infectious disease reporting network system connecting the national level facilities to the county level ones⁷ have influenced the improvement, the equipment as a part of the project also contributed to speeding up the response to the onset of infectious diseases. Communication and multimedia equipment procured as a part of the project supported the participating institutions to share the network system mentioned above, and they were able to communicate/report the information to stakeholders, including the upper level institutions/CDCs, immediately. The sample collection time was shortened by utilizing vehicles procured as a part of the project, and the time required to identify an infectious disease was also shortened by utilizing the laboratory equipment as mentioned in the later section on changes in the reporting time of the samples of the major infectious diseases analyzed.

⁷ The network is being developed nationwide. The onset and identification of an infectious disease is immediately put into the system by an infectious disease hospital or CDC of a city/county level (or even lower level) where the disease originally breaks out and the upper level institutions/CDCs are able to check the situation online, immediately.

Table 8: Time required from the onset to reporting

	Before the project 2002 Baseline Year		Actual 2011 Completion Year		Actual 2014 3 Years After Completion	
	Specified time	Actual	Specified time	Actual	Specified time	Actual
	Class A	Urban area: 6 hours Rural area: 12 hours	The specified time is strictly followed	Urban area: 2 hours Rural area: 6 hours	The specified time is strictly followed	Urban area: 2 hours Rural area: 6 hours
Class B	Urban area: 12hours Rural area: 24hours	The specified time is strictly followed	24 hours	The specified time is strictly followed	24 hours	The specified time is strictly followed

Source: Documents provided by the executing agency, and the Public health emergencies and infectious diseases surveillance information report management approach

Notes: (1) The target was not set at the time of appraisal. (2) The specified timeframe was based on the Public health emergencies and infectious diseases surveillance information report management approach (a regulation on the reporting of infectious diseases)

(2) Functional improvement of CDCs

The major duties of CDCs include prevention and control of severe diseases (pathogen analysis, monitoring, and others), vaccination, food hygiene inspection, and others. The appraisal planned to measure the functional improvement of the CDCs in terms of the increase in the number of test items which the central government (the National Health and Family Planning Commission) required the provincial and city CDCs to carry out.

(i) The number of test items

Table 9 shows that the number of actually implemented test items against the legally set number of test items of provincial and city CDCs significantly increased compared with the situation before the project implementation. The central government (the National Health and Family Planning Commission) designates the basic and recommended test items for provincial and city CDCs, respectively⁸, and requires CDCs to test 85% or above⁸ of the basic test items. Both the provincial and city CDCs achieved the same, and an enhancement of the testing capacity was observed. According to the interviews with the participating CDCs, particularly, an increase in test items was observed under (a) tests on acute epidemics, food borne infectious diseases, and waterborne infectious diseases,

⁸ Basic test items refer to items that must be implemented, while the recommended test items refer to items to be implemented depending on the area's nature and needs.

(b) tests on infectious diseases such as viruses, mycoplasma, and chlamydia, and (c) bacteriological testing. Some of the testable items were added because of the introduction of the equipment procured as a part of the project, such as real-time fluorescence-based quantitative PCR machine and full auto microbial analyzer, and thus, the effect of the project was observed.

Table 9: Number of test items

Legally set number of test items				Number of feasible test items (Actual)					
Purpose	Level	2004 At the time of appraisal	2014 At the time of ex-post evaluation	Before the project 2002 Baseline Year		Actual 2011 Completion Year		Actual 2014 3 years After Completion	
					Achievement status		Achievement status		Achievement status
All	Province Basic	396	387	287	72%	336	87%	336	87%
	Province Recommended	30	46	21	70%	27	59%	27	59%
	Province Total	426	433	308	72%	363	84%	363	84%
	City Basic	236	226	163	69%	189	84%	199	88%
	City Recommended	145	133	54	37%	59	44%	68	51%
	City Total	381	359	216	57%	248	69%	266	74%

Source: Documents provided by JICA and the questionnaire responses from the provincial and city CDCs

Notes: (1) The legally set number of test items was changed in 2004 by the notice of Ministry of Health and the National Development and Reform Commission. Achievement status in 2002 was the proportion of the actual number of test items against the legally set number of test items set before 2004, while achievement status in 2011 and 2014 is the proportion of the actual number of test items against the legally set number of test items set after 2004. (2) The figures of city CDC are the average for 11 respondents.

(ii) Number of samples of major infectious diseases analyzed

Table 10 compares the number of samples of major infectious diseases analyzed before and after the project implementation. It is difficult to simply compare the situation because the number of samples is influenced by the prevalence of infectious diseases; however, the number of samples increased after the project implementation. The project enabled the participating institutions to test items such as influenza and hand-foot-and-mouth disease, for which testing was impossible in the past. These facts suggest that the testing capacity of the CDCs was enhanced.

Table 10: Number of samples of major infectious diseases analyzed

(Unit: samples)

Infectious diseases	Before the project 2002 Baseline Year	Actual 2011 Completion Year	Actual 2014 3 Years After Completion
Influenza (Responses: 11 institutions)	100	8,264	14,190
Hand-foot-and-mouth disease (Responses: five institutions)	-	2,306	2,906
Measles (Responses: four institutions)	65	146	445
AIDS (Responses: four institutions)	2,491	16,617	10,287

Source: Questionnaire responses from the CDCs

Notes: (1) Sum of responses. (2) Only the provincial CDC tested influenza before the project.

(iii) Changes in the reporting time of the samples of the major infectious diseases analyzed

The reporting time⁹ of the samples analyzed was found to reduce significantly owing to the utilization of the equipment procured as a part of the project, which shortened the time required for the isolation and identification of an infectious agent. According to the interviews with the provincial and city CDCs, in particular, the real-time fluorescence-based quantitative PCR machine (used for molecular biological diagnosis) automated and simplified the procedure such that the time needed to identify the agent was shortened.

Table 11: Changes in the reporting time of the samples of the major infectious diseases analyzed

(Unit: hours)

Infectious diseases	Before the project 2002 Baseline Year	Actual 2011 Completion Year	Actual 2014 3 Years After Completion
Influenza nucleic acid analysis (Responses: nine institutions)	89	5	4
Hand-foot-and-mouth disease nucleic acid analysis (Responses: six institutions)	7	5	4
Measles nucleic acid analysis (Responses: three institutions)	16	4	4

Source: Questionnaire responses from the CDCs

Note: Average number of responses (provincial and city CDCs).

⁹ Time from when a laboratory receives a sample and confirms the test result, to when the result is reported to the epidemiology section of a CDC.

(iv) Utilization of equipment¹⁰

The equipment procured as a part of the project was well utilized, with some exceptions. Specifically, the utilization rate of the real-time fluorescence-based quantitative PCR machine, ELIZA readers (used for microbial serological analysis), incubators (used for microbial culture), and biological safety cabinet (used for microbial isolation test) were as high as 80 to 100%, which shows that the equipment procured as a part of the project was utilized sufficiently. The exceptions include the multipurpose high-power microscope (used for microbial analysis), which was used 34% times, by an average of five respondents [refer to section 3.5 Sustainability (3.5.4 Current Status of Operation and Maintenance) for the reasons for the low utilization].

Thus, the equipment procured as a part of the project was fully utilized, and the increase in the number of test items and number of samples, and reduction in the reporting time for the samples analyzed showed that the functional testing capacity of the CDCs was strengthened.



A real-time fluorescence-based quantitative PCR machine at the Huanggang city CDC



A digital x-ray equipment at Wuhan Medical Treatment Center



The Huanggang City Emergency Center

(3) Functional improvement of the infectious disease hospitals

Functional improvement of the infectious disease hospitals was expected in terms of the test and treatment capacity and nosocomial infection countermeasures.

As Table 12 illustrates, the participating hospitals experienced an improvement in the rate of nosocomial infections and in-hospital mortality rate, as well as a significant increase in the number of implemented tests. As to the improvement of the nosocomial infection rate, efforts by the participating hospitals, such as standardized procedures, strict internal control, and implementation of training, contributed to the results. Therefore, it is difficult to attribute the improvement in the nosocomial infection rate as well as in-hospital mortality rate to this project solely. However, according to the interviews with the hospitals, equipment items for nosocomial infection prevention,

¹⁰ As the number of equipment procured as a part of the project was great, the evaluation study asked the participating institutions to list three items each, of the high price equipment and the category of important items for infectious disease countermeasures. Interpretation of the utilization rate varied depending on the institutions, such as, “hours the equipment is actually utilized against the expected hours of utilization,” “hours the equipment is used against the business hours for a week,” etc. However, based on the observation of laboratories and the equipment records, the responses are deemed appropriate.

such as the ultraviolet sterilizer and air sterilizer, contributed to the improvement in the nosocomial infection and in-hospital mortality rates. In addition, utilization of equipment, such as the digital x-ray equipment and color ultrasonic diagnostic equipment, improved the accuracy and promptness of diagnosis, and thereby contributed to the improvement in the nosocomial infection and in-hospital mortality rates. As to the significant increase in the number of implemented tests, the participating hospitals were able to handle more tests with the equipment procured as a part of the project. Finally, reduction in the time required for test implementation was also observed.

Both ICU and testing equipment were utilized well, with a utilization rate of 81% and 92%, respectively (in 2014). As to the questions on the utilization of the equipment under the high price equipment category and the category of important items for infectious disease countermeasures, many hospitals listed the color ultrasonic diagnostic equipment, full automatic biochemical analyzer, and PCR machine, with a utilization of 99%, 95%, and 90%, respectively¹¹.

Table 12: Nosocomial infection rate, in-hospital mortality rate, and number of implemented tests

Indicators		Before the project Actual 2002 Baseline Year	Actual 2011 Completion Year	Actual 2014 3 Years After Completion
Nosocomial infection rate (%) (average)	All wards	4.19	4.25	3.00
	Infectious disease wards	3.68	3.04	1.94
In-hospital mortality rate (%) (average)	All wards	1.00	0.73	0.50
	Infectious disease wards	1.92	0.87	0.46
Number of implemented tests (total sum)	Bacteriological test	15,767	24,181	119,506
	Biochemical test	95,542	274,707	328,062
	Blood test	94,830	312,471	445,456

Source: Questionnaire responses of the participating hospitals

Note: Responses from 12 institutions

Thus, the function of the infectious disease hospitals improved.

(4) Functional improvement of the emergency centers

Service radius (radius of the area under the responsibility of an emergency center or emergency

¹¹ For definition of the utilization rate, refer to Footnote 10.

station, or a branch of the center, where a small radius is considered to allow a faster emergency service) and emergency response time (average time required from the report of a request for emergency transportation to the arrival at the scene/site) were used to measure the enhancement of the prompt response of the emergency service, and the number of emergency transportations was used to measure the enhancement of the transportation capacity. Thus, the overall functional improvement of the emergency centers was measured.

As Table 13 shows, the service radius and emergency response time satisfied the requirements, and the number of responses to ambulance calls increased. Although the number of services of the negative pressure ambulance (an ambulance designed to be used for infectious disease cases by lowering the atmospheric pressure inside the transportation cabin) was limited, the negative pressure ambulances were used for the transportation of severely ill patients in cases such as the novel influenza, hand-foot-mouth disease, and a suspected patient of Ebola hemorrhagic fever. Thus, the functional improvement of emergency centers was observed in terms of the promptness of the emergency services and enhancement of the transportation capacity owing to the procurement of ambulances, negative pressure ambulances, and ambulance related equipment.

Table 13: Service radius, emergency response time, and number of emergency transportation

Indicators	Before the project 2002 Baseline Year		2011 Completion Year		2014 3 Years After Completion	
	Requirement	Actual	Requirement	Actual	Requirement	Actual
Service radius (km)	32	34	34	32	40	39
Emergency response time (minute)	19	17	10	11	8	8
Number of emergency transportation (case)	-	3,057	-	7,250	-	7,839
Infectious diseases among the whole number (case)	-	57	-	126	-	244

Source: Documents provided by JICA and questionnaire responses of the emergency centers

Notes: (1) Average of eight emerging centers

(2) The number of emergency transportation cases includes the negative pressure ambulance services.

3.3.2 Qualitative Effects

The project implemented the capacity development of personnel involved in the infectious disease countermeasures, based on the needs of the respective institutions, by dispatching the personnel to institutions in major cities and by holding internal training. According to the interviews with the participating institutions, by participating in training, the testing techniques of laboratory technicians, the sanitary technicians' capacity for health education, emergency response to patients, and

surveillance capacity had been enhanced.

A training program was carried out under “Public Health Infrastructure Facility Improvement Project Post-training (Hubei province)” in 2012 and 2013. The content of the program, which was developed by Wuhan University, was very systematic and relevant with the use of the equipment procured as a part of this project. The Provincial Commission of Health and Family Planning of Hubei and the participating institutions highly appreciated the program, which had a synergetic effect with this project.

3.4 Impacts

3.4.1 Intended Impacts

Improvement in the health of the local residents, and more specifically, a reduction in the case fatality rate related to infectious diseases were set as indicators of the impact of the project. The case fatality rate (the percentage of persons diagnosed as having a specified disease, who die as a result of that illness), mortality, and morbidity of Class A and B infectious diseases in Hubei province have been illustrated in Table 14. All indicators show downward trends after the project implementation. This trend cannot be attributed to this project alone and no severe outbreaks of infectious diseases occurred in Hubei province. However, the early detection of infectious diseases was made possible by this project, and according to the Provincial Commission of Health and Family Planning, enhancement of the capacity of infection disease testing, diagnosis and treatment, and prevention of spread of infectious diseases by using the procured ambulances contributed to this outcome.

Table 14: Case fatality rate, mortality, and morbidity of infectious diseases

	Actual		
	Before the project 2002 Baseline Year	2011 Completion Year	2014 3 Years After Completion
Case fatality rate of infectious diseases (Class A and B) (%)	0.36	0.31	0.32
Mortality of infectious diseases (Class A and B) (per 100,000 population)	0.5647	0.8229	0.5555
Morbidity of infectious diseases (Class A and B) (per 100,000 population)	175.41	280.3555	219.159

Source: Documents provided by the executing agency

Note: At the time of appraisal, deaths of emergency patients was set as an operation and effect indicator; however, the executing agency did not have any data on the same, while there was data on mortality and case fatality rate (the same situation is found in the Health Statistic Yearbook, 2013).

3.4.2 Other Impacts

(1) Impacts on the Natural Environment

No negative impacts were observed on the natural environment as a result of this project. In accordance with the laws in China, the project was not required to prepare an environmental impact evaluation report and obtain an approval on the same, because the main component of the project was equipment procurement and civil works that majorly involved the renovation of laboratories alone.

All 32 participating institutions that responded to the relevant question on the questionnaire reported that the medical waste discharge was appropriately processed and no negative impacts were produced. According to the interviews with the participating institutions, medical waste was first processed in a high pressure sterilizer and then handed over to specialized entities that handle medical waste. Regular monitoring was conducted by city governments.

As to the waste water generated in the facilities, all 31 participating institutions that responded to the relevant question on the questionnaire reported the waste water was processed appropriately and no negative impacts were produced on the natural environment. Interviews with the participating institutions confirmed that city authorities implemented regular monitoring, and that no problem was observed. The Huanggang and Xianning CDCs did not have their own treatment facilities because both these CDCs were constructed before the national standard on laboratory construction was established in 2003. However, they treated the waste water with chemical agents, and the discharged water met the required standards. Both these CDCs plan to construct new buildings shortly, which have appropriate water treatment facilities.

(2) Land Acquisition and Resettlement

As planned in the appraisal, no land acquisition and resettlement occurred as a part of the project.

Thus, this project has largely achieved its objectives. Therefore effectiveness and impact of the project are high.

3.5 Sustainability (Rating: ③)

3.5.1 Institutional Aspects of Operation and Maintenance

The operation and maintenance of the facilities and equipment procured/constructed under the project is carried out by each of the participating institutions (CDCs, infectious disease hospitals, and emergency centers) and monitored by the provincial and city governments, as expected at the time of appraisal.

Staff is allocated at CDCs and emergency centers based on the population of the province and cities,

while staff is allocated at infectious disease hospitals, based on the “Law on Preventing and Controlling Notifiable Diseases.” No problem was found on staff allocation. However, there was an exceptional case in which the number of actually allocated staff was below the number designated according to the population. At one CDC, the staff allocation was not appropriate as the number of laboratory technicians was far below that in other CDCs, and the ratio of the laboratory technicians with reference to the total number of personnel was also low. As a result, some high price equipment procured as a part of the project (such as multipurpose high power microscope) was not fully utilized. Therefore, further expansion of the test items is limited¹².

The basic management structure of public health in Hubei province is that the respective commission of health and family planning of the province, city, and county (and lower level), is responsible for the prevention and control of infectious diseases, which, as an administrative organization, makes decisions on planning, targeting, and measures. On the other hand, CDCs at various levels (including CDCs at lower levels) perform actual tasks such as reporting the onset, prevention measures, and control. Hospitals and emergency centers are positioned as the executing agencies in charge of reporting, treatment, and response at the onset of infectious diseases.

At the onset of infectious diseases, based on the “Law on Preventing and Controlling Notifiable Diseases” and “Emergency Response Law of the People’s Republic of China” the emergency management office of the provincial government activates a plan for the prevention of infectious diseases, and cooperates with various departments in the government (health, education, agriculture, and others) for the control and treatment of the same. The “Law on Preventing and Controlling Notifiable Diseases” and “Public Servants Law” define the relationship among the Provincial Commission of Health and Family Planning and lower entities. In terms of the decision making, the commissions cooperate with the CDC networks, which perform the actual tasks, to manage the situation at each institution at the provincial, city, and county level.

Thus, the operation and maintenance structure, basic institutional set up of the public health management, and the roles of stakeholders at the onset of infectious diseases are clear, and the staff allocation is largely appropriate.

3.5.2 Technical Aspects of Operation and Maintenance

Each participating institution has sufficient technical capacity to perform tasks on infectious disease countermeasures defined under the “Law on Preventing and Controlling Notifiable Diseases” and others, as well as the capacity to carry out maintenance of the equipment. Each of them implements training for medical staff, technicians, and maintenance staff regularly. Operation manuals and

¹² According to the Provincial Commission of Health and Family Planning, although the achievement rate of the number of test items required is one of the lowest in the province, the rate is the same as the average rate in other provinces, and therefore, the CDC satisfies a certain level.

maintenance records are kept and utilized appropriately.

As mentioned in the section on the effectiveness of the project, the equipment procured as a part of this project is utilized appropriately, and there are few cases in which the equipment is not utilized because the specification is too high compared to the technical capacity of the participating institutions. As an exception, the multipurpose high power microscope was not fully utilized as the average utilization rate of the five respondents was 34%. One of the CDCs interviewed revealed that high priced equipment items such as multipurpose high power microscope and micro full automatic fluorescence Eliza reader were not utilized because of the lack of manpower and technical capacity. However, according to the questionnaire survey and interviews, equipment items which were not utilized comprised only a small part of the items procured as a part of the project (1,982 items in total), and therefore, overall, there is no problem in the use of the equipment.

3.5.3 Financial Aspects of Operation and Maintenance

CDCs and emergency centers operate with a budget funded 100% by the government. The budget in the past three years shows an upward trend and the budget obtained is nearly the same as the amount initially applied. According to the interviews with the participating institutions, appropriate funds required to fulfill their duties were received.

Table 15: Applied and obtained budget of CDC

(Unit: 10,000 yuan)

		2011	2012	2013
Provincial CDC	Applied	15,000	16,000	18,000
	Obtained	15,000	16,000	18,000
City CDCs	Applied	1,861	2,014	2,199
	Obtained	2,099	2,286	2,493

Source: Questionnaire responses from the CDCs

Note: Figures for city CDCs are averages for 10 CDCs

Table 16: Applied and obtained budget of emergency centers

(Unit: 10,000 yuan)

	2011	2012	2013
Applied	536	600	721
Obtained	617	693	840

Source: Questionnaire responses from the emergency centers

Note: Average of seven emergency centers.

Infectious disease hospitals run with operating revenue, which is the main source of revenue, and with funding from the government. The trends for the past three years show that the revenue and

expenditure is balanced or surplus is produced.

Table 17: Revenue and expenditure of infectious disease hospitals

(Unit: 10,000 yuan)

	2011	2012	2013
Revenue	17,151	21,441	25,943
Operating revenue	13,900	17,494	21,126
Funding from the Government	1,142	1,290	1,674
Expenditure	16,858	20,221	23,828
Balance	293	1,220	2,115

Source: Questionnaire responses from the infectious disease hospitals

Notes: (1) Average of 11 infectious disease hospitals

(2) The breakdown of the revenue does not match the total revenue because revenue from the drug sales was not included in the options. According to the interviews with infectious disease hospitals, drug sales are a big part of the revenue.

Thus, the required funds for operation and maintenance are secured at CDCs, infectious disease hospitals, and emergency centers.

3.5.4 Current Status of Operation and Maintenance

The equipment procured as a part of the project is properly maintained at each institution. Daily check-ups are carried out by the users/technicians who keep a record of the status of the equipment. Minor repairs are handled by the section in charge of the equipment, while repair of the large equipment or that which cannot be repaired by the equipment staff is contracted out to agents of the manufacturers and others. Interviews with the participating institutions revealed that there was no problem with the after sales services or procurement of spare parts, and that most of the equipment were in good condition. Although there is no urgent problem of aging equipment, some equipment needs to be renewed in the near future. When the equipment was renewed in the past, usually the participating institutions applied to the city governments (the provincial government in case of the provincial CDC and the provincial hospital) for the budget during the annual budgeting. Though the application is not always approved in the year it is applied for, there has been no problem so far, as the budget is obtained in the following year or so. As various special funds on public health are disbursed from the national, provincial, and city governments, no problems are foreseen.

Thus, no major problems have been observed in the institutional, technical and financial aspects of the operation and maintenance system as well as the current status of operating and maintenance. Therefore sustainability of the project effects is high.

4. Conclusion, Lessons Learned and Recommendations

4.1 Conclusion

This project was implemented to reinforce China's public health system, for which their improvement

efforts had been accelerated since the outbreak of SARS. The project aimed at strengthening the infectious disease countermeasures by procuring equipment, implementing training for the development of personnel involved with infectious disease countermeasures and others at 38 provincial and city basic public health institutions. The project has been consistent with China's development policy and development needs for infectious disease countermeasures, as well as with Japan's ODA policy. Therefore, relevance of the project is high. The project cost was mostly as planned, however, the project period significantly exceeded that planned, as it took time to complete a series of procedures in bidding and delivery, in addition to the implementation of additional procurement. Therefore, efficiency of the project is fair. After the implementation of the project, its testing capacity, capacity for testing, diagnosis, and treatment, and emergency transportation capacity were enhanced at the CDCs, infectious disease hospitals and emergency centers, respectively. Further, the overall function of the infectious disease countermeasures in the province was also strengthened because an early response to the emergency onset of infectious diseases became possible. As a result, the case fatality rate and mortality related to infectious diseases declined, and therefore, effectiveness and impact of the project are high. No major problems have been observed in the institutional, technical, and financial aspects of the operation and maintenance systems, as well as the current status of operation and maintenance. Therefore sustainability of the project effects is high.

In light of the above, this project is evaluated to be highly satisfactory.

4.2 Recommendations

4.2.1 Recommendations to the Executing Agency

(1) Renewal of equipment

Renewal of equipment is expected to be necessary in the coming years, although some equipment has already been renewed. Each CDC, infectious disease hospital, and emergency center is recommended to renew their equipment appropriately, in order to sustain the enhanced capacity for infectious disease countermeasures, which was confirmed at the time of the ex-post evaluation.

(2) Need for proper management of discharged waste water

Some CDCs (the Huanggang and Xianning CDCs) do not have their own treatment facilities due to space constraints. However, no negative impacts were observed on the natural environment as the waste water was treated with chemical agents. Both these CDCs plan to construct new buildings shortly, which will have water treatment facilities. However, the provincial government is recommended to continue monitoring the same to ensure that no negative impacts are produced on natural environment, and to confirm whether the appropriate treatment facilities are constructed at both the CDCs.

4.2.2 Recommendations to JICA

None

4.3 Lessons Learned

If multiple health equipment items are procured, sufficient analysis of the required technical level should be made so that the appropriate equipment is selected.

Most equipment procured as a part of the project was effectively utilized. However, at some CDCs, it was difficult to fully utilize some equipment due to the constraint in the technical capacity and the number of technicians. Therefore, they were not able to expand the scope of laboratory tests. At the project planning stage (at feasibility study), it is necessary to analyze the technical capacity needed and how staff should be allocated for the effective use of the equipment procured. By doing so, participating institutions will be able to select the appropriate equipment.

Comparison of the Original and Actual Scope of the Project

Item	Plan	Actual
1. Project Outputs		
(1) Procurement of equipment	633 items at 14 CDCs 209 items at 14 infectious disease hospitals 305 items at 10 emergency centers	911 items at 14 CDCs 737 items at 14 infectious disease hospitals 334 items at 10 emergency centers
(2) Civil works	6 facilities (renovation of laboratories, outpatient wards, and others)	6 facilities (renovation of laboratories, outpatient wards, and others)
(3) Training	Domestic training: 1,025 persons Training in Japan: 101 persons Dispatch of experts	Domestic training: 1,236 persons
2. Project Period	March 2004–December 2006 (34 months)	March 2004–August 2011 (90 months)
3. Project Cost		
Amount paid in Foreign currency	2,423 million yen	2,263 million yen
Amount paid in Local currency	869 million yen (60 million yuan)	1,401 million yen (101 million yuan)
Total	3,292 million yen	3,664 million yen
Japanese ODA loan portion	2,325 million yen	2,263 million yen
Exchange rate	1 yuan=14.3 yen (As of August 2003)	1 yuan=13.8 yen (Average between 2004 and 2011)