People's Republic of China

Ex-Post Evaluation of Japanese ODA Loan Project

"Public Health Project (Hebei Province)"

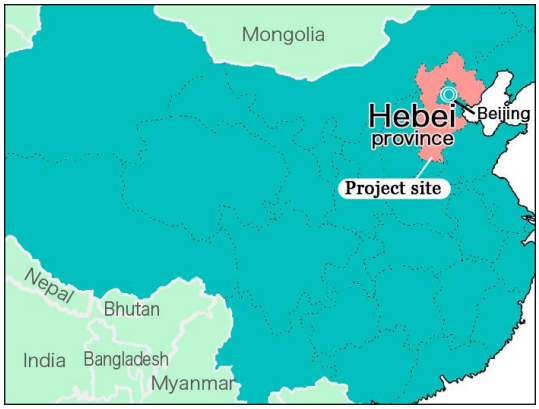
External Evaluator: Ayako Nomoto, International Development Center of Japan Inc.

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 (hereinafter referred to as "SARS"). The project aimed at strengthening the infectious disease countermeasures by procuring equipment, implementing training for personnel involved with infectious disease countermeasures, and other considerations at 13 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. Project cost was higher than planned due to escalating construction costs. The project period also significantly exceeded the plan, as it took time to complete a bidding procedure. Therefore, efficiency of the project is low. After project implementation, testing capacity, and capacity of testing, diagnosis, and treatment were enhanced at Centers for Disease Control and Prevention (hereinafter referred to as "CDC") and infectious disease hospitals, respectively. The overall function of infectious disease countermeasures in the province was also strengthened, as early emergency responses became possible. As a result, health of the local residents from Hebei improved, 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 satisfactory.

1. Project Description



Project Location

A color ultrasonic diagnostic machine procured at the Hengshui No.3 People Hospital

1.1 Background[1]

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 infectious disease countermeasures in Hebei province by procuring equipment, implementing civil works and training for the development for personnel involved with the infectious disease countermeasures at 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	1,908 million yen/1,906 million yen	
Exchange of Notes Date/ Loan Agreement Signing Date	March, 2004/March, 2004	
Terms and Conditions	Interest Rate	1.5 % (0.75% for the training component)
	Repayment Period (Grace Period)	30 years (40 years for the training component) (10 years)

[1] The project "Public Health Project" was planned and implemented in 10 provinces including Hebei.

	Conditions for Procurement: General untied
Borrower / Executing Agency	The Government of the People's Republic of China/Hebei Provincial Peoples Government
Final Disbursement Date	August, 2012
Main Contractor (Over 1 billion yen)	-
Main Consultant (Over 100 million yen)	-
Feasibility Studies, etc.	Feasibility study: Feasibility Study Report on Hebei Province Public Health Infrastructure Japanese Government Loan Project (China NORENDAR International, June, 2004)
Related Projects	【Technical Cooperation】 - Poliomyelitis Control Project (1991–1999) - National Public Health Policy Plan Management Project (Technical Assistance Related to ODA Loans) (2012–2016) 【Grant Aid】 - Expanded Program on Immunization (1998) - Program for Tuberculosis Control in Disadvantaged Areas (2000) 【Other donors, agencies】 - 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 city level Centers for Disease Control and Prevention (CDC) and infectious disease hospitals in nine cities (Tangshan, Handan, Chengde, Hengshui,

Qinhuangdao, Langfang, Cangzhou, Shijiazhuang, and Baoding). The outline of the project (procured equipment, civil works, and training) is as follows:

(1) CDCs (seven 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 (six hospitals): diagnostic equipment such as electrocardiographs, disinfection and treatment equipment, beds, ambulances, ambulance related equipment, and others.
(3) Civil works (funded by the Chinese side) (construction, expansion, renovation etc. for (1) – (2) listed above.
(4) Training for capacity development of personnel involved in the infectious disease measures

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 12, 2014 – November 29, 2014; March 3, 2015 – March 4, 2015

2.3 Constraints during the Evaluation Study

Data of the ex-post evaluation was collected through a questionnaire survey on all 13 target facilities (all facilities responded to the questionnaires), and visits to nine facilities (four CDCs and five infectious disease hospitals).

3. Results of the Evaluation (Overall Rating: B[2])

3.1 Relevance (Rating: ③[3])

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

[2] A: Highly satisfactory, B: Satisfactory, C: Partially satisfactory, D: Unsatisfactory
[3] ③: High, ② Fair, ① Low

(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 aimed for the "establishment of a sound, basic public service system." Specifically, the government sought to strengthen professional public health service networks; this can be accomplished by preventing severe infectious, chronic, occupational, endemic, and mental health diseases, as well as improve the capacity to respond to a public health emergency.

For the "Health Sector 12th Five-Year Plan (2011–2015)," the provincial government of Hebei aims at controlling major infectious, endemic, and parasitic diseases. The government also plans to strengthen disease prevention and testing capacity by improving laboratory facilities and equipment at the provincial, city, and county levels.

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 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 2.2 in Hebei 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 number of hospital beds per 1,000 population in Hebei province was still lower than the national average (as shown in Table 1). Therefore, the need for strengthening public health countermeasures is still high. The incidence and mortality of class A and B legally-designated infectious diseases (28 diseases)[4] in Hebei province were nearly equal or better than the national average. However, mortality in 2014 was twice as high as the national average (e.g., from dysentery)[5]; therefore, enhancing the capacity to control infectious diseases is still very important. After project implementation, Influenza A (H1N1) (novel influenza) became epidemic in 2009 and thereafter. Thus, public health emergency risk remains, and early detection, identification, and implementation of control measures are still required.

Table 1: Number of hospital beds per 1,000 population

(Unit: bed)

	2002	2013
National average	2.32	4.55
Hebei province	2.2	4.12

Source: Documents provided by the executing agency

Table 2: Incidence of legally designated infectious diseases (Class A and B)

(Unit : Incidence per 100,000 population)

	2002	2013	2014
Incidence of national average	180.14	225.80	207.17
Incidence in Hebei province	152.89	181.60	164.90
Mortality of national average	0.35	1.20	0.11
Mortality in Hebei province	0.0819	0.27	0.23

Source: Documents provided by JICA and the executing agency
Note: The number of Class A and B notifiable diseases was 26 in 2002 and 28 in 2013 and 2014

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)

[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.
[5] The incidence of dysentery in Hebei was 16.999 in 2014, while the national average was 13.93.

(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 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: ①)

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 planned at the time of appraisal was procured mostly as planned (ratio against the plan: 104%). In accordance with the expansion of the CDCs and infectious disease hospitals, the number of beds, mobile emergency - testing laboratories, and others were added. These changes were appropriate because they responded to needs that emerged during project implementation.

Table 3: Comparison of plan and actual of procured equipment

Institutions	Plan (At the time of appraisal)	Actual
CDCs	1,890 items at seven institutions (seven cities). ・Laboratory equipment ・Equipment for health education such as multi projectors and web servers ・Mobile emergency - testing laboratories and others.	1,650 items at seven institutions. Items were procured nearly as planned. However, some items were changed within the scope of the equipment list.
Infectious disease hospitals	1,414 items at six institutions. Diagnostic equipment such as electrocardiographs, disinfection and treatment equipment, beds, ambulances, ambulance related equipment and others.	1,770 items at six institutions. Items were procured nearly as planned. However, some items, such as beds, were changed within the scope of the equipment list.

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

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

The construction and expansion of seven CDCs were planned at the time of the appraisal, and the actual scope was nearly as planned. The ratio of the construction area against the plan was 97%.

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

Institutions	Plan (At the time of appraisal)	Actual
CDCs	67,424m^2 at seven institutions	65,717m^2 at seven institutions

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

(3) Training

The number of trainees significantly exceeded the plan (ratio against the plan: 338%). Originally, the training target was only the city CDCs. However, the networked disease prevention and control system required participation at the county and township level divisions. Therefore, the county-level CDC was later included in the target, and the expansion of trainee scope was deemed appropriate[6].

Table 5: Comparison of plan and actual of training

Targets	Plan (At the time of appraisal)	Actual
City CDCs (Domestic training)	1,626 persons	-
Infectious disease hospitals (Domestic training)	1,310 persons	-
Total	2,936 persons	9,935 persons

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

A Japanese ODA loan was within the plan, with the actual disbursed amount being 1,906 million yen (against the approved amount of 1,908 million yen). However, the actual total project cost was 5,068 million yen, while the original planned project cost was 3,730 million yen (ratio against the plan: 136%). The project cost exceeded the plan because of escalated construction costs (and related labor) under the funds from China.

[6] As this project was the first Japanese ODA loan project for the provincial government of Hebei, it was difficult to accurately estimate the cost.

Table 6: 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	1,619	1,619	0	0	1,619	1,619	1,834	1,834	0	0	1,834	1,834
Civil works	0	0	1,329	0	1,329	0	0	0	3,162	0	3,162	0
Training	0	0	120	120	120	120	0	0	72	72	72	72
Administration cost and others	0	0	361	0	361	0	0	0	0	0	0	0
Price escalation	82	82	3	0	85	82	0	0	0	0	0	0
Physical contingency	87	87	85	0	172	87	0	0	0	0	0	0
Interest during construction	0	0	44	0	44	0	0	0	0	0	0	0
Total	1,788	1,788	1,942	120	3,730	1,908	1,834	1,834	3,234	72	5,068	1,906

Source: Documents provided by JICA and the executing agency

Note: The totals for the columns and rows may not match due to rounding errors.

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

Average of the implementation period (2004-2012): 1 yuan =13.68 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, or completion and handover of civil works) (34 months). However, the actual project period was 101 months from March 2004 (loan agreement signing date) to July 2012 (completion of the delivery of the equipment), which was significantly longer than that planned (ratio against plan: 297%).

The project period exceeded the plan because a delay occurred at each component: equipment procurement, civil works and training. Regarding equipment procurement, procedures for international competitive bidding generally take a while in China. Secondly, it took some time to prepare and amend the bidding documents, as the executing agency did not have experience with international competitive bidding. Implementation of additional procurement also added to the delay. In terms of civil works, it took time to finance material procurement, due to a sharp rise in construction and material costs. Training implementation was delayed because it was difficult to recruit personnel involved with infectious diseases in the midst of a public health emergency (Influenza A (H1N1) in 2009).

Table 7: 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	December 2003 – August 2009
Procurement of equipment	April 2004 – December 2006	September 2004 – July 2012
Training	September 2004 – September 2006	October 2004 – June 2012
Project completion (project period)	December 2006 (34 months)	July 2012 (101 months)

3.2.3 Results of Calculations of Internal Rates of Return (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, the project cost was higher than planned, and the project period was significantly longer than planned. Therefore, efficiency of the project is low.

3.3 Effectiveness[7] (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 beds in the infectious disease hospitals (wards)" and "the number of test items of city 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 per population in the infectious disease hospitals (wards) 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 the major infectious disease analyzed, (iii) changes in the reporting time of the samples of the major

[7] Sub-rating for Effectiveness is to be put with consideration of Impact.

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[8].

(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 (wards) was 0.04 in Hebei province and the same was expected to be 0.05 after the project implementation. As Table 8 illustrates, after the project implementation, in 2014, the number of beds in infectious disease hospitals (wards) in Hebei province increased to 0.07. 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 770 beds in total (2002) to 1,685 in total (2014). Thus, the project seems to have contributed to this increase to a certain extent.

Table 8: Number of infectious disease hospital beds in Hebei Province

(Unit: bed)

	Baseline 2002 Baseline Year	Target 2006 Completion Year	Actual 2012 Completion Year	Actual 2014 2 Years After Completion
Number of infectious disease hospital beds (per 1,000 population)	0.04	0.05	0.068	0.070

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 9 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 government has strengthened the requirements and development of an on-line infectious disease reporting network system (connecting the national level to the county level

[8] 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.

ones[9]) has influenced the improvement, the project contributed to this change. As mentioned below (3.3.2 Qualitative Effects), the communication and multimedia equipment procured as a part of this project enabled the participating institutions to connect to the network. This helped improve surveillance functions, 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 using available laboratory equipment.

Table 9: Time required from the onset to reporting

	Before the project 2002 Baseline Year		Actual 2012 Completion Year		Actual 2014 2 Years After Completion	
	Specified time	Actual	Specified time	Actual	Specified time	Actual
Class A	Urban area: 6 hours Rural area: 12 hours	10 days	Urban area: 2 hours Rural area: 6 hours	7 hours	Urban area: 2 hours Rural area: 6 hours	1 hour
Class B	Urban area: 12hours Rural area: 24hours	10 days	24 hours	7 hours	24 hours	1 hour

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 CDCs to carry out.

(i) The number of test items

Table 10 shows that the number of actually implemented test items against the legally set number of items significantly increased compared to the time before project implementation.[10]

[9] 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.

[10] The central government (the National Health and Family Planning Commission) designates basic and recommended test items for provincial CDCs and city CDCs, respectively, and requires CDCs to test at 85% or above

The average ratio of actually implemented against legally set basic test items for the target CDCs was 75% in 2014, which was nearly at the same level as the Hebei provincial CDC (which was 74% in 2013). The average ratio of 11 city CDCs (all city CDCs) in Hebei province was approximately 63% in 2013, and the average of the project target institutions surpassed the average of city CDCs[11]. According to interviews with the CDCs, the project particularly contributed to an increase in test items regarding acute epidemics, food borne infectious diseases, waterborne infectious diseases (via Influenza nucleic acid analysis by utilizing real-time fluorescence-based quantitative PCR machine, and others).

Table 10: Number of test items of CDCs

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 2012 Completion Year		Actual 2014 2 Years After Completion	
					Achievement status		Achievement status		Achievement status
All	Basic (city CDC)	236	226	109	46%	166	73%	169	75%
	Recommended (city CDC)	145	133	14	9%	31	23%	40	30%
	Total (city CDC)	381	359	123	32%	197	55%	209	58%

Source: Documents provided by JICA and the questionnaire responses from the 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 2012 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 seven respondents.

(ii) Number of the samples of major infectious diseases analyzed

Table 11 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.

the basic test items (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). As of 2013, the nationwide average of implemented test items at the provincial CDC was 273, which was 70.54% of the legally set test items. Less than 10 provincial CDCs attained 85%. The average number of implemented test items of the city CDCs, nationwide, was 155, which was 68.58% of the legally set test items (Source: Internal documents from the Hebei provincial CDC).

[11] Source: Internal documents from the Hebei provincial CDC

Table 11: Number of the samples of major infectious diseases analyzed

(Unit: samples)

Infectious diseases	Before the project 2002 Baseline Year	Actual 2012 Completion Year	Actual 2014 2 Years After Completion
Influenza (Responses: seven institutions)	-	5,806	6,333
Hand-foot-and-mouth disease (Responses: five institutions)	-	6,697	3,332
Measles (Responses: four institutions)	265	523	607

Source: Questionnaire responses from the CDCs
Notes: Sum of responses.

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

The reporting time[12] 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 interviews with the 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 12: Reporting time of the samples of the main infectious diseases analyzed

(Unit: hours)

Infectious diseases	Before the project 2002 Baseline Year	Actual 2012 Completion Year	Actual 2014 2 Years After Completion
Influenza nucleic acid analysis （Responses: five institutions ）	-	4.5	3.7
Hand-foot-and-mouth disease nucleic acid analysis (Responses: three institutions)	-	5.2	3.8

Source: Questionnaire responses from the CDCs
Note: Average number of responses.

[12] 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.

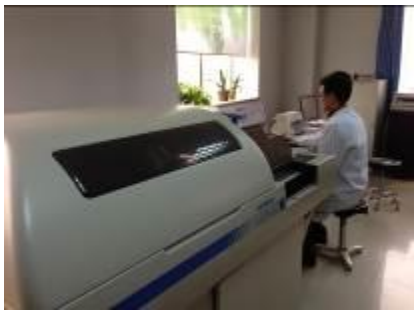
(iv) Utilization of equipment[13]

The equipment procured as a part of the project was well utilized, with some exceptions. As the number of items was large, data regarding utilization rates could only be collected for some machines. However, based on interviews with the CDCs, overall equipment usage was satisfactory. The average utilization rate among respondents of the questionnaire survey for important equipment for infectious disease countermeasures was 91.8%. This included the biological safety cabinet (used for microbial isolation test) listed by several respondents. Utilization of a real-time fluorescence-based quantitative PCR machine and ELIZA reader (used for microbial serological analysis) were the most important items in terms of infectious disease countermeasures. The average utilization rates were 87.5% and 90.8%, respectively. As for the high-priced equipment, the average utilization rate (average of six institutions among seven institutions) for the full automatic microbe (biochemical) analyzer (used for automatic microbial analysis) was as low as 36.3%. According to interviews with the institutions, since the number of samples was small, and running costs were high (batteries, spare parts, reagents, and others), tests were being implemented using alternative approaches (e.g., use of a semi-automatic microbe analyzer, medical agent, and others).

Thus, the procured equipment was generally utilized to a satisfactory level. The increase in the number of test items and the number of samples, and reductions in reporting time indicate that the CDCs' functional testing capacity was strengthened.

A PCR amplification machine procured for the Chengdge CDC

A digital X ray machine procured for the Hengshui No.3 People Hospital



A full automatic biochemical analyzer procured for the Handan Infectious disease hospital.

(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.

[13] 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.

As Table 13 illustrates, the participating hospitals experienced decreased nosocomial infections and in-hospital mortality rates, as well as significant increases in the number of implemented tests. In terms of nosocomial infection improvements, efforts by the participating hospitals (such as standardized procedures, strict internal control, and training implementation) contributed to these results. It is difficult to attribute any improvement in the nosocomial infection rate (as well as in-hospital mortality rate) solely to this project. However, according to interviews with the hospitals, equipment utilization (such as the digital x-ray machine, color ultrasonic diagnostic machine, and full automatic biochemical analyzer) improved diagnostic accuracy and promptness, thereby contributing to these improved outcomes. As to the significant increase in the number of implemented tests, the participating hospitals were able to handle more tests due to the equipment. Finally, reductions in the time required for test implementation was also observed.

Average testing equipment utilization rates were 87% in 2013 and 71% in 2014. This suggested that the equipment was adequately utilized. In particular, utilization of high priced equipment (such as the digital X-ray machine, color ultrasonic diagnostic machine, full automatic biochemical analyzer, and others) was 92.3%.[14]

Table 13: Nosocomial infection rate, in-hospital mortality rate, and number of implemented tests

Indicators		Before the project Actual 2002 Baseline Year	Actual 2012 Completion Year	Actual 2014 2 Years After Completion
Nosocomial infection rate (%) (average of four respondents)	Infectious disease wards	3.48	2.00	0.70
In-hospital mortality rate (%) (average of three respondents)	Infectious disease wards	0.40	0.33	0.31
Number of implemented tests (total sum of five respondents)	Bacteriological test	1,838	6,816	10,177
	Biochemical test	85,065	146,254	149,098
	Blood test	36,890	83,390	79,230

Source: Questionnaire responses of the participating hospitals

Thus, the overall function of the infectious disease hospitals improved.

[14] For definition of the utilization rate, refer to Footnote 13.

3.3.2 Qualitative Effects

The project specifically contributed to improvements with networking mechanisms in the province, as well as surveillance coverage by procuring communication and multimedia equipment. As shown in section 3.3.1 Quantitative Effects, the on-line infectious disease reporting network system was developed in Hebei province and surveillance coverage (the number of participating institutions) increased. Thus, 39 legally designated diseases have been surveilled successfully. The procured communication and multimedia equipment allowed the participating institutions to share this network system and immediately report information. The rate of institutions above the county level that could connect to the online network in Hebei reached 100% in 2009, which surpassed the national average by 4%. At the township level, the rate in Hebei was 98.86%, which was 28.66% higher than the national average. Thus, the online reporting system in Hebei is now one of the most advanced in the country[15]. The online system-related equipment procured was integral to this improvement.

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, and surveillance capacity had been enhanced.

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 rates (the percentage of persons diagnosed as having a specified disease who die as a result of that illness), of infectious diseases was set as impact of the project. While data on case fatality rate from infectious diseases was not obtained, mortality and morbidity rates in Hebei province are shown in Table 14. Since the data lack continuity and consistency, it is difficult to compare rates before and after project implementation. However, as Table 2 shows, morbidity and mortality from infectious diseases in Hebei appear to be less than the national average. According to the provincial government, enhanced infectious disease control capacity through this project contributed to the noticeable improvement.

[15] Source: Internal documents from the Hebei provincial CDC and Hebei Daily (January 5, 2009).

Table 14: Mobility and morbidity of infectious diseases

(Unit: per 100,000 population)

	Actual		
	Before the project 2002 Baseline Year	2012 Completion Year	2014 2 Years After Completion
Mortality of infectious diseases (Class A and B)	0.0819	0.221	0.23
Morbidity of infectious diseases (Class A and B)	152.89	184.25	164.90

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 (the same situation is found in the Health Statistic Yearbook, 2013).

3.4.2 Other Impacts

(1) Impacts on the Natural Environment

All 13 participating institutions responded to the relevant questionnaire items and reported that both medical waste and discharged wastewater were appropriately processed, with no negative consequences. According to interviews with the participating institutions, medical waste was first processed in a high-pressure sterilizer and then handed over to specialized entities that handle such waste. City governments conducted regular monitoring.

As to the waste water generated in the facilities, all 13 participating institutions responded to the relevant question on the questionnaire and reported that 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.

(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 and infectious disease

hospitals) and monitored by the provincial and city governments, as expected at the time of appraisal.

Staff members are allocated at CDCs based on city population. Conversely, staff are allocated to infectious disease hospitals based on the "Law on Preventing and Controlling Notifiable Diseases." No problems were noticed in terms of staff allocation. However, among the institutions visited, there was an exceptional case whereby the number of actually allocated staff was below the number designated by the population. While that CDC hoped for an increase in staff allocation, there was no major problem reported in terms of that institution undertaking its duties.

The basic management structure of public health in Hebei 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 maintenance records are kept and utilized appropriately.

As mentioned in the section on 3.3 Effectiveness [3.3.1 Quantitative Effects, (2) functional improvement of CDCs], the equipment procured was utilized appropriately. There were few cases in which the equipment was not utilized because specifications were too high compared to the technical capacity of the participating institutions. One exception was that the full automatic microbe (biochemical) analyzer was not fully utilized, as the number of samples was small, and running costs were high (batteries, spare parts, reagents, and others). Thus, tests were being implemented using alternative approaches (e.g., semi-automatic microbe analyzer, medical agents, and others). Thus, the equipment did not match technical levels in terms sample numbers. However, even though the number of samples was small, the equipment was justified, as such equipment is necessary in the case of a public health emergency.

Thus, no problems have been observed in the technical capacity as each institution has a system for sustaining/updating technical capabilities and, uses manuals and equipment record appropriately, and the equipment is mostly used appropriately.

3.5.3 Financial Aspects of Operation and Maintenance

CDCs 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 city CDC

(Unit: 10,000 yuan)

	2011	2012	2013
Applied	1,062	1,206	1,029
Obtained	964	1,065	1,052

Source: Questionnaire responses from the CDCs
Note: Figures are average for seven CDCs

Infectious disease hospitals run with operating revenue, which is the main source of revenue, and with funding from the government. As Table 16 illustrates, the trends for the past three years show that the revenue and expenditure is balanced or surplus is produced.

Table 16: Revenue and expenditure of infectious disease hospitals

(Unit: 10,000 yuan)

	2011	2012	2013
Revenue	7,590	9,876	11,659
Operating revenue	2,832	4,026	4,735
Funding from government	800	863	1,290
Expenditure	7,676	9,589	11,031
Balance	-86	287	628

Source: Questionnaire responses

Notes: (1) Average of six 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 and infectious disease hospitals.

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 were no problems with the after-sales services or the ability to receive spare parts, and most of the equipment was in good condition. Each institution appropriately renewed their communication and multimedia equipment, which quickly became outdated. Regarding other equipment, although there were no urgent problems with aging equipment, some equipment will need to be renewed in the near future (with appropriate funding). As various special public health funds are disbursed from national, provincial, and city governments, funding problems are not anticipated.

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 the SARS. The project aimed at strengthening the infectious disease countermeasures by procuring equipment, implementing

training for personnel involved with infectious disease countermeasures, and other considerations at 13 city level 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, the relevance of the project is high. Project cost was higher than planned due to escalating construction costs. The project period also significantly exceeded the plan, as it took time to complete a bidding procedure. Therefore, efficiency of the project is low. After project implementation, testing capacity, and capacity of testing, diagnosis, and treatment were enhanced at CDCs and infectious disease hospitals, respectively. The overall function of infectious disease countermeasures in the province was also strengthened, as early emergency responses became possible. As a result, health of the local residents from Hebei improved, 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 satisfactory.

4.2 Recommendations

4.2.1 Recommendations to the Executing Agency

It is recommended that the target CDCs create a medium-to-long-term equipment renewal plan and consider pooling necessary funds for this renewal. At the same time, CDCs are recommended to share the renewal plan with the city and provincial governments to secure funding. By doing so, it is expected that enhanced infectious disease countermeasure capacity which was confirmed at the time of the ex-post evaluation will be sustained.

4.2.2 Recommendations to JICA

None

4.3 Lessons Learned

In a case where multiple health equipment items are procured, sufficient analysis of required technical levels, as well as maintenance costs, should be made so that appropriate equipment is selected.

Most equipment procured as a part of the project was effectively utilized. However, at many CDCs, the full automatic microbe (biochemical) analyzers were not sufficiently utilized, as the number of samples was small, running costs were high (consumables, reagents, and others), and spare parts were also costly. Interviews at the ex-post evaluation revealed that CDCs were not fully aware that these expensive maintenance costs were necessary at the time of the appraisal.

At the time of the appraisal, JICA (then called as the Japan Bank for International Cooperation) requested that their Chinese counterparts select equipment after analyzing running costs and determining whether there were sufficient samples for the equipment, and considering whether the specification and equipment match the number of samples. However, procedures for checking the components were not adequate, and the feasibility study did not fully incorporate this aspect.

For projects where multiple health equipment items are procured, during the project planning stage (the feasibility study), it is necessary to collect and present information regarding necessary maintenance costs, and costs for reagents and consumables so that participating institutions are able to select appropriate items.

Comparison of the Original and Actual Scope of the Project

Item	Plan	Actual
1.Project Outputs		
(1)Procurement of equipment	1,890 items at seven CDCs 1,414 items at six infectious disease hospitals	1,650 items at seven CDCs 1,770 items at six infectious disease hospitals
(2)Civil works	67,424m^2 for seven CDCs	65,717m^2 for seven CDCs
(3)Training	Domestic training :2,936 persons	Domestic training :9,935 persons
2.Project Period	March 2004–December 2006 (34 months)	March 2004–July 2012 (101 months)
3.Project Cost		
Amount paid in Foreign currency	1,788 million yen	1,834 million yen
Amount paid in Local currency	1,942 million yen (135 million yuan)	3,234 million yen (236,418,158 yuan)
Total	3,730 million yen	5,068 million yen
Japanese ODA loan portion	1,908 million yen	1,906 million yen
Exchange rate	1 yuan = 14.3 yen (As of August 2003)	1 yuan =13.68 yen (Average between 2004 and 2012)