Ex-Post Project Evaluation 2013: Package I-1 (China)

October 2014

JAPAN INTERNATIONAL COOPERATION AGENCY

OPMAC Corporation

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Preface

Ex-post evaluation of ODA projects has been in place since 1975 and since then the coverage of evaluation has expanded. Japan's ODA charter revised in 2003 shows Japan's commitment to ODA evaluation, clearly stating under the section "Enhancement of Evaluation" that in order to measure, analyze and objectively evaluate the outcome of ODA, third-party evaluations conducted by experts will be enhanced.

This volume shows the results of the ex-post evaluation of ODA Loan projects that were mainly completed in fiscal year 2011, and Technical Cooperation projects and Grant Aid projects, most of which project cost exceeds 1 billion JPY, that were mainly completed in fiscal year 2010. The ex-post evaluation was entrusted to external evaluators to ensure objective analysis of the projects' effects and to draw lessons and recommendations to be utilized in similar projects.

The lessons and recommendations drawn from these evaluations will be shared with JICA's stakeholders in order to improve the quality of ODA projects.

Lastly, deep appreciation is given to those who have cooperated and supported the creation of this volume of evaluations.

October 2014
Toshitsugu Uesawa
Vice President
Japan International Cooperation Agency (JICA)

Disclaimer

This volume of evaluations, the English translation of the original Japanese version, shows the result of objective ex-post evaluations made by external evaluators. The views and recommendations herein do not necessarily reflect the official views and opinions of JICA. JICA is not responsible for the accuracy of English translation, and the Japanese version shall prevail in the event of any inconsistency with the English version.

Minor amendments may be made when the contents of this volume is posted on JICA's website.

JICA's comments may be added at the end of each report when the views held by the operations departments do not match those of the external evaluator.

People's Republic of China

Ex-Post Evaluation of Japanese ODA Loan

"Hunan Province Road Construction Project"

External Evaluator: Masahiro Oseko, OPMAC Corporation

0. Summary

The objectives of the project were to improve the accessibility to markets and facilitate the regional development, thereby contributing to rise of the quality of life and reduction of poverty in inland areas by newly constructing a highway and improving a local road in Hunan Province in China. The project was highly relevant with the Chinese development plans and regional needs for the improvement of access of local products to markets, and with the Japan's ODA policy which placed a high priority on the development of provincial road network expecting the economic development of inland poor areas. Therefore, its relevance is high. Regarding the objectives of the project i.e., improvement of accessibility to markets and stimulation of regional economy, the project has contributed to rise of the quality of life and reduction of poverty in inland areas through the increase of shipping volume of agricultural products and employment opportunities of road users by realizing the increase of traffic volume and decrease of travel time. Therefore, its effectiveness and impact is considered high. While the project cost was within the plan, the project period was slightly longer than planned. Therefore, efficiency of the project is considered fair. Operation and maintenance of the facilities and equipment developed by the project have been properly done, and no major problems have been observed in terms of institutional, technical and financial aspects of the operation and maintenance system, therefore sustainability of the project effects by the project is high.

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

1. Project Description

Project Location

Shaoyang-Huaihua Highway

1.1 Background

Although Hunan Province has been enjoying a stable economic growth in recent years, its per capita GDP in 2000 was still about 80% (5,639 yuan) of the national average (7,078 yuan). Mid-western part of the province had become a bottleneck for its overall economic growth due to insufficient development of transportation sector challenged by the harsh natural environment and financial constraints. Road improvements, in particular, remained at a low level with only 7% of total lengths of public roads classified as highway, class I and class II roads[1]. In response to this situation, in the "Hunan Province 10th Five-year Plan" and the "Hunan Province 10th Five-year Transportation Construction Plan," the Hunan Province authorities have placed a high priority on the construction of five provincial trunk roads along with the improvement of local roads expecting the reduction of poverty in deprived areas. The project was as one of the major construction projects of these provincial development plans.

Also, the project located in hilly and mountainous areas where the primary industry workers accounted for a large portion of about 80% of total population. While the secondary and tertiary industries such as cement manufacturing and building material processing formulated certain foundations in local economy, infrastructure development has been insufficient and a climate for investment was fragile, thus the level of income remained low. In this situation, the project was implemented to improve the accessibility to markets and facilitate the regional development, thereby contributing to rise of the quality of life and reduction of poverty in inland areas by constructing a highway and improving a local road in Hunan Province in China.

[1] In China, roads are categorized by technical and administrative classifications. According to the technical classification by the traffic volume and geographical conditions, roads are categorized as motorways (highway, class I and class II), local roads (class III and class IV) and unclassified roads. Highways and class I roads, for example, are regulated to have four lanes or more while local roads should have at least two lanes. As for the administrative responsibility, roads are classified as national, provincial, county, township and village roads.

Figure 1: Location of the Project Site[2]

1.2 Project Outline

The objectives of the project were to improve the accessibility to markets and facilitate the regional development, thereby contributing to rise of the quality of life and reduction of poverty in inland areas by newly constructing a highway of 160km between Shaoyang and Huaihua cities and improving a provincial road (class II) of 100km between Dongkou County's Zhushi and Chengbu County in Shaoyang City in Hunan Province in China.

Loan Approved Amount / Disbursed Amount	23,000 million yen / 22,948 million yen
Exchange of Notes Date / Loan Agreement Signing Date	March 2002 / March 2002
Terms and Conditions	Interest Rate: 2.20% Repayment Period: 30 years (Grace Period: 10 years) Conditions for Procurement: General untied (Consulting Services: Bilateral tied)
Borrower / Executing Agency	The government of People's Republic of China / Hunan Provincial People's Government
Final Disbursement Date	October 2009

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Main Contractors (over 1 billion yen)	Yueyang Road & Bridge Construction Co. (China), Hunan Changde Road & Bridge Construction Co., Ltd. (China), Hunan Huanda Road & Bridge Corporation (China), Hunan Provincial Road Machinery Engineering Company (China), The 1st Engineering Co., Ltd. of China Tiesiju Civil Engineering (China), Hunan Road & Bridge Construction Group Corporation (China)
Main Consultant (over 100 million yen)	Nippon Koei Co., Ltd. (Japan)
Feasibility Studies, etc.	"Feasibility Study Report: Shanghai-Ruili National Trunk Highway, Hunan Province, Shaoyang-Huaihua Highway," Hunan Provincial Communications Planning, Survey & Design Institute, May 2001
Related Projects	- World Bank (1997) Loan for "China National Highway Project - Guangdong-Hunan Highway Corridor" ($ 400 million) - World Bank (1999) Loan for "National Highway Project (04)" ($ 350 million) - Asian Development Bank (1993) Loan for "Hunan Roads Development Project" ($ 74 million)

2. Outline of the Evaluation Study

2.1 External Evaluator

Masahiro Oseko, OPMAC Corporation

2.2 Duration of Evaluation Study

Duration of the Study: August 2013 – November 2014

Duration of the Field Study: 19 – 29 November 2013, 23 April 2014

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

3.1 Relevance (Rating: ③[4])

3.1.1 Relevance to the Development Plan of China

Emerging away of the economic growth supremacy from 1970s, the Chinese government's development policy has been changing its purpose to the rise of economic efficiency in the "10th Five-year Plan (2001-2005)" at the time of the appraisal of the project, and to the sustainable development in the "11th Five-year Plan (2006- 2010)" followed by the current "12th Five-year Plan (2011-2015)" aiming at the structural adjustment to the domestic demand-led economy. In this transition of national strategies, improvement of road network has been consistently highlighted as a basic infrastructure to realize harmonious development of urban and rural areas. Also, the "five vertical and seven horizontal highway network plan,"

[3] A: Highly satisfactory, B: Satisfactory, C: Partially satisfactory, D: Unsatisfactory

[4] ③: High, ②: Fair, ①: Low

composed of five north-south highways running vertically through the country and seven east-west highways running across the country, formulated in the "Notice of the State Council Concerning Several Policies on the Development of the West Regions (December 2000)" aimed to rectify regional economic disparities is still in progress at the time of this ex-post evaluation in 2014. The Shaoyang-Huaihua highway constructed by the project is a part of the horizontal highways of this plan.

Following these government policies, the Hunan Province authorities targeted the improvement of people's livelihoods through the economic and social infrastructure development in the "Hunan Province's 10th Five-year Plan (2001-2005)," well-balanced regional development in the "11th Five-year Plan (2006-2010)," and sustainable economic development in the "12th Five-year Plan (2011-2015)." An integrated traffic system composed of road, railway and water transportation has been aimed for as a fundamental infrastructure realizing these targets. Along with the transition of strategic targets stipulated in these development plans, the road improvement policy of Hunan Province has shifted its highlights from local roads development for poverty reduction to highway network improvement including connection roads in local areas for overall provincial economic growth. The integrated improvement of a highway and a local road intended by the project was one of the typical examples of these provincial development strategies.

3.1.2 Relevance to the Development Needs of China

The mid-western part of Hunan Province, the region along the road constructed by the project, is situated in hilly and mountainous areas where the primary industry workers account for a large portion of about 80% of total population and their major source of income is agricultural products such as rice, citrus fruits and herbal medicine, while the cultivated acreage has been very limited. Although the secondary industry such as cement manufacturing and building material processing formulated certain foundations in local economy, the level of income of local people has remained low due to the insufficient infrastructure development. The improvement of accessibility of local products to markets was therefore urgently demanded. In addition, at the time of the appraisal of the project, along the roads constructed by the project, there used to be one national level poverty-stricken county designated by the central government (i.e. Longhui County) and two provincial level poverty-stricken counties designated by the provincial government (i.e. Chengbu County and Zhijiang County). While Zhijiang County was later on delisted from the designation, Longhui County and Chengbu County stay on the list at the time of this ex-post evaluation.

On the other hand, Shaoyang and Huaihua Cities have been enjoying the growth of economy higher than the expectation at the time of the appraisal of the project, which expected about 7% to 9% of the growth of annual average GDP. And along with this, the volume of road transport has steadily increased (Table 1). The existing road of National Route 320 was, while it

was a two lanes road for inbound and outbound traffic, a low class and ill-paved that could not accommodate an increasing traffic.

Table 1: Economic Development of Shaoyang City and Huaihua City

Indicators	Fiscal Year	Shaoyang City	Huaihua City
GDP growth rate	1985 – 1999	8.6 %	7.7 %
	2000 – 2012	10.6 %	11.5 %
Road freight growth rate	1985 – 1999	7.04 %	8.69 %
	2000 – 2007	–	–
	2008 – 2012	15.79 %	–
Road passenger growth rate	1985 – 1999	7.80 %	7.70 %
	2000 – 2007	–	–
	2008 – 2012	7.75 %	–

Sources: GDP growth rate: Hunan Province Statistical Yearbook 2013
Road passenger and freight growth rate: 1985-1999: JICA appraisal documents
2008-2012: Hunan Province Statistical Yearbook 2013

3.1.3 Relevance to Japan's ODA Policy

Under the Japan' ODA policies at the time of the appraisal of the project, i.e. "Economic Cooperation Program for China (2001)," "Medium-Term Strategy for Overseas Economic Cooperation Operations (2001)" and "Country Assistance Strategy for China (2001)," the priority of the assistance to China was given to the improvement of people's livelihood and poverty alleviation in inland poor areas through infrastructure development. Regarding the road sector, the particular emphasis was placed on the improvement of provincial road network expecting the economic stimulation effects in inland poverty-stricken areas.

Among these policies, the "Country Assistance Strategy for China (2001)" laid out specific agendas of road traffic improvement in inland areas and provincial road network development anticipating better market access and domestic economic stimulations for rectifying regional economic, thus eventually contribute to improving livelihood of people and alleviating poverty.

This project has been highly relevant to the Chinese development plan, development needs, as well as Japan's ODA policy. Therefore its relevance is high.

3.2 Effectiveness[5] (Rating: ③)

3.2.1 Quantitative Effects (Operation and Effect Indicators)

(1) Shaoyang-Huaihua highway

i) Average daily traffic volume

The average daily traffic volume (PCU: Passenger Car Unit) of the Shaoyang-Huaihua highway attained its target set at the time of the appraisal (12,516 PCU per day in 2010, 3 years

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

after the completion of the project) in 2010 (Table 2). The growth rate in 5 years from 2007 to 2012 was 13% per year on average showing the steady increase.

Table 2: Average daily traffic volume

Unit: vehicles/day

Year	2000 (Before the project)	2007 (year of project completion)	2010 (3 years after the completion)	2012 (5 years after the completion)
Actual	4,520	9,162	13,625	15,037
Ratio of Actual to Plan	36%	73%	109%	120%

Source: Shaoyang City Highway Administration Bureau

ii) Average travel time and speed

The average travel time and speed on the Shaoyang-Huaihua highway achieved its target set at the time of appraisal (travel time of 2.1 hours and travel speed of 80 km/h in 2010) in 2010 (Table 3), contributing to the improvement of market accessibility and promotion of regional development.

Table 3: Average travel time and speed

Indicators		2000 (Before the project)	2007 (year of project completion)	2010 (3 years after the completion)	2012 (5 years after the completion)
Average travel time (h)	Actual	6.1	2.0	2.0	2.0
	Ratio of Actual to Plan	290%	95%	95%	95%
Average travel speed (km/h)	Actual	35	81	100	100
	Ratio of Actual to Plan	43%	101%	125%	125%

Source: Shaoyang City Highway Administration Bureau

iii) Traffic accidents

The number of traffic accidents on the Shaoyang-Huaihua highway decreased substantially in spite of increased traffic volume and travel speed (Table 4). This is mainly because of the comparison between existing road (National Route 320) under mixed traffic conditions and the newly constructed highway under the access control. Adding to this, the improvement of road alignments and pavement conditions and traffic officers' patrol for over-speed and overloaded vehicles have significantly contributed to the decline of traffic accidents.

Table 4: Traffic accidents

Unit: cases

	Before the project (National Route 320)		After the completion of the project (Shaoyang-Huaihua highway)	
Year	2000	2006 (1 year before the completion)	2010 (3 years after the completion)	2012 (5 years after the completion)
The number of traffic accidents	224	219	69	70

Source: Shaoyang City Highway Administration Bureau

iv) Employment opportunities at the highway and the local road related facilities for the poor

In order to provide employment opportunities to the poor population, the project planned to hire 9,600 workers for both of the highway and the local road during the construction period and 250 workers for the highway operation facilities such as service areas and tollgates upon the completion of the project. The target has been attained as shown in Tables 5 and 6 respectively. However, the area of poverty here was broadly considered as the Wuling Shan District and workers from this district were regarded as the poorest segment of the population irrespectively of their economic conditions such as annual income. Because of this, it cannot be said in a strict sense that employment opportunities were provided to the poorest segment of the population. But it was nonetheless positive effects of the project for the poor population in the deprived areas. The Wuling Shan District includes Longhui, Dongkou, Chengbu, Zhijiang Counties and Wugang City which were targeted as the directly benefitted areas of the project.

Table 5: Local employment during the construction period

Unit: person

Year	2004	2005	2006	2007 (year of project completion)	Total
Highway	2,000	3,200	3,600	1,700	10,500
Provincial Road	100	600	900	200	1,800
Total	2,100	3,800	4,500	1,900	12,300

Sources: Shaoyang City Highway Administration Bureau, Shaoyang City Road Administration Bureau

Table 6: Local employment for operation and maintenance of road related facilities

Unit: person

Year	2000 (before the project)	2007 (year of project completion)	2010 (3 years after the completion)	2012 (5 years after the completion)
Highway	0	225	251	236
Provincial Road	0	5	10	12
Total	0	230	261	248

Sources: Shaoyang City Highway Administration Bureau, Shaoyang City Road Administration Bureau

(2) Zhushi-Chengbu Provincial Road

i) Average daily traffic volume

The average daily traffic volume (PCU: Passenger Car Unit) of the Zhushi-Chengbu provincial road attained its target set at the time of the appraisal (7,030 PCU per day in 2010, 3 years after the completion of the project) in 2010 (Table 7). The growth rate in 5 years from 2007 to 2012 was 14% per year on average showing the steady increase.

Zhushi-Chengbu Provincial Road

Table 7: Average daily traffic volume

Unit: vehicles/day

Year	2000 (before the project)	2007 (year of project completion)	2010 (3 years after the completion)	2012 (5 years after the completion)
Actual	3,232	4,399	8,186	7,588
Ratio of Actual to Plan	46%	63%	116%	108%

Source: Shaoyang City Road Administration Bureau

ii) Average travel time and speed

The average travel time and speed on the Zhushi-Chengbu provincial road achieved its target set at the time of appraisal (travel time of 1.3 hours and travel speed of 78 km/h in 2010) in 2010 (Table 8), contributing to the improvement of convenience of everyday life as a community road, better accessibility to markets and promotion of regional development.

Table 8: Average travel time and speed

Indicators		2000 (before the project)	2007 (year of project completion)	2010 (3 years after the completion)	2012 (5 years after the completion)
Average travel time (h)	Actual	2.4	1.25	1.3	1.3
	Ratio of Actual to Plan	185%	96%	100%	100%
Average travel speed (km/h)	Actual	45	81	78	78
	Ratio of Actual to Plan	58%	104%	100%	100%

Source: Shaoyang City Road Administration Bureau

iii) Traffic accidents

The number of traffic accidents on the Zhushi-Chengbu provincial road decreased substantially in spite of increased traffic volume and travel speed (Table 9). The decline of traffic accidents in 2006 even before the construction completion was due to the partial operation of the road started when the construction completed more than half. In addition to this, the strict execution of construction-related traffic rules and regulations with traffic officers' patrol has significantly contributed to the decline of traffic accidents.

Table 9: Traffic accidents

Unit: cases

	Before the project		After the completion of the project	
Year	2000 (before the project)	2006 (1 year before the completion)	2010 (3 years after the completion)	2012 (5 years after the completion)
The number of traffic accidents	25	5	8	11

Source: Shaoyang City Road Administration Bureau

3.2.2 Qualitative Effects

A field survey visiting ten road passenger enterprises (buses and coaches) and road freight enterprises (trucks and containers) was conducted in this ex-post evaluation, and the effects of the project were confirmed as shown below.

- Transport distance was shortened. Construction of the Xuefeng-shan Tunnel resulted in the change of the route from a roundabout way to a direct way realizing the transport distance to be shortened by half to one-fourth.
- Transport time was shortened. Due to the construction of the Xuefeng-shan Tunnel stated above, the transport time was shortened by half to one-fourth.
- The volume of passengers and freight was increased by 30% to 400%.
- Sales of the business was increased by 10% to 200%.
- Operation cost such as fuel and repair was decreased by 10% to 20%.

3.3 Impact

3.3.1 Intended Impacts

(1) Impact on Economic Development

The consolidated development of the highway and provincial road has significantly improved the accessibility between urban and provincial areas. Economic activities such as agriculture, mining and commerce along the roads have been activated and, as a result, the income of local residents has increased as shown below in Table 10. In Longhui County located along the highway and Dongkou County at the junction of the highway and the provincial road, indexes such as shipping volume of agricultural products, average income, nominal GDP per capita and average income of the poorest segment of the population were on the improvement tendency (Table 10).

Table 10: Impact on local economy

Index	County	Before the project	After the project	
		2000 (before the project)	2007 (year of project completion)	2010 (3 years after the completion)
Shipping volume of agricultural products (1,000 ton/year)	Longhui	183.9	280.0	360.0
	Dongkou	204.5	250.0	290.0
Average income (Yuan/year)	Longhui	1,134	2,676	3,506
	Dongkou	2,210	3,317	4,347
nominal GDP per capita (Yuan/year)	Longhui	2,558	4,715	6,237
	Dongkou	3,643	6,340	8,311
Average income of poverty population[6] (Yuan/year)	Longhui	629	819	1,401
	Dongkou	714	907	1,427

Source: Shaoyang City Highway Administration Bureau

[6] Poverty line defined by the Chinese government was 865 yuan in 2000, 1,067 yuan in 2007 and 1,274 yuan in 2010.

Notable impacts of the project on urban development and eventually on the regional economy have been observed, for example, in Wugang City which positioned roughly in the center of the Zhushi-Chengbu provincial road. Taking the project as an opportunity for economic and social growth, the city has invited a four-star hotel (2007), a private unified school for Grades 1-12 of 9,000 students (2007), a farm product wholesale market with 600 stores (2013), and an agro-industrial distribution center largest in Hunan Province (to be opened in 2014). Also, Chengbu Miao Autonomous County, located at the far end of the Zhushi-Chengbu road, was abundant with tourism resources and started an active tourism development and promotion making a profitable use of the access to urban areas realized by the project. Specifically, the Miao's unique architectural structures were being renovated and preserved, limestone caves were illuminated, hotels and restaurants were constructed, and tourism information such as brochures and DVDs were provided at service areas and roadside stations "Michinoeki" (refer to 3.3.2(3)) constructed by the project.

(2) Beneficiary Survey

Face-to-face beneficiary surveys on impacts were conducted by this ex-post evaluation to 30 highway users respectively at the entrance and the exit of the Shaoyang-Huaihua highway (60 respondents in total), and to 10 road users and residents respectively at four points along the Zhushi-Chengbu provincial road (40 respondents in total)[7]. The results of beneficiary surveys are shown below, and it was confirmed that the project was mostly favorably welcomed by road users and local residents.

i) Shaoyang-Huaihua highway

- 83% answered that travel time for respondent's main utilization purpose of the road (travel to farms, sales/purchase, work away from home, commute to school, and as drivers of transport business, etc.) has shortened (average rate of time shortened: approx. 32%).
- 83% answered that travel time to public services (schools, hospitals, markets, etc.) has shortened (average rate of time shortened: approx. 33%).
- 88% answered that travel distance of transport of passengers/freight (buses, trucks and taxis) has increased (average rate of increase: approx. 1.5 times).
- 94% answered that shipping volume of farmers' agricultural products has increased (average rate of increase: approx. 1.4 times).
- 73% answered that employment opportunities have increased (average rate of annual

[7] The breakdown of beneficiary survey respondents is as follows.
Shaoyang-Huaihua highway users: 44 males (73%), 16 females (27%); 3% below 20 years old, 48% in their 20s, 32% in their 30s, 14% in their 40s, 3% in their 50s and 0% in 60s or above.
Zhushi-Chengbu provincial road users and residents living along the road: 23 males (58%), 17 females (42%); 17% below 20 years old, 30% in their 20s, 35% in their 30s, 10% in their 40s, 8% in their 50s and 0% in 60s or above.

income increase: approx. 20%).

- 88% answered that travel expenses (vehicle fuel cost, vehicle repair charge, commutation cost, etc.) are reduced (average reduction rate: approx. 18%).

ii) Zhushi-Chengbu Provincial Road

- 78% answered that travel time for respondent's main utilization purpose of the road (travel to farms, sales/purchase, work away from home, commute to school, and as drivers of transport business, etc.) has shortened (average rate of time shortened: approx. 56%).
- 78% answered that travel time to public services (schools, hospitals, markets, etc.) has shortened (average rate of time shortened: approx. 60%).
- 71% answered that shipping volume of farmers' agricultural products has increased (average rate of increase: approx. 1.6 times).
- 83% answered that employment opportunities have increased (average rate of annual income increase: approx. 22%).
- 75% answered that travel expenses (vehicle fuel cost, vehicle repair charge, commutation cost, etc.) are reduced (average reduction rate: approx. 18%).

3.3.2 Other Impacts

(1) Impacts on the Natural Environment

During preparation stage of the project, an Environmental Impact Assessment (EIA) was prepared by the Road Science Institute of the Ministry of Transport of China according to the national standards such as "EIA Guidelines (1995, 1997)" and "Road Construction EIA Regulations (1996)." The EIA for Shaoyang-Huaihua highway was approved by the State Environmental Protection Administration and the one for Zhushi-Chengbuy provincial road by Hunan Province's Environmental Protection Administration. Environmental considerations were made during the construction period by focusing on the following: 1) air along the roads (CO_2, NO_2, TSP), 2) air in tunnels, 3) groundwater, 4) sewage from service areas, 5) sewage from bridgeworks, 6) soil erosion, 7) noise, 8) preservation of borrow pits and disposal areas and 9) landscape. All of these nine environmental items were monitored and preliminary measures were prepared for them in case of any pollution. No major negative environmental effect was reported during the construction period.

After the opening of the roads, environmental monitoring on a regular basis is being conducted for Shaoyang-Huaihua highway by Hunan Province's Environmental Protection Administration and for Zhushi-Chengbu provincial road by Hunan Province's Traffic Environmental Protection Monitoring Center complying with the standards adopted by the Ministry of Environmental Protection of China. Monitoring items of air (CO_2, NO_2, TSP), water quality (PH、SS, COD, petroleum) and noise (noise level at public facilities such as schools

and hospitals) are measured twice a year for the highway and three times a year for the provincial road. All of these monitoring results have been within the standard values up to the present date.

(2) Land Acquisition and Resettlement

Under the regulations such as the "Land Management Act of the People's Republic of China" and "Hunan Province's Enforced Land Management Act," land acquisition and resettlement were executed only after the agreement of directly affected households was confirmed through questionnaire surveys and hearings. All of the actual values of land acquisition and resettlement in Table 11 are higher than planned values except land acquisition of the Zhushi-Chengbu provincial road. This is because of adopting approximate values estimated in the F/S (feasibility study) as planned values for comparison. During detailed design stage and construction period, in order to keep land acquisition and resettlement to a minimum, a variety of measures were taken such as the adjustment of road alignments and bridge locations and an adoption of steep slope introducing new technologies.

Table 11: Land Acquisition and Resettlement

Roads		Resettlement (person)	Land Acquisition (ha)
Highway	planned	5,000	940
	actual	7,639	989
Provincial Road	planned	2,100	230
	actual	3,447	212

Sources: Shaoyang City Highway Administration Bureau, Shaoyang City Road Administration Bureau

The project provided land cost, moving cost, alternative sites and housings as compensation for resettlement. Infrastructure and social services in relocation sites such as community roads, electricity, water, gas and job introduction have been prepared and provided by local authorities. Among those who relocated to urban areas, by renting out some parts of their new houses for shops and residences or starting their own businesses with the compensation payments, several cases of substantial income increase have been observed.

A series of local surveys, face-to-face questionnaire survey, in-depth interviews and household interviews with the affected people, was conducted in this ex-post evaluation. Face-to-face questionnaire survey was done with 10 households in Dongkou County, 10 households in Chengbu County and 20 households in Miao Autonomous County. Except for the respondents answered that relocation fees for moving were not enough (2 out of 40 respondents) or job was not available in the relocated site (1 male in his 60s out of 40 respondents), the overall level of satisfaction with prior explanation, compensation and current living conditions was high as 30 out of 40 respondents replied "extremely satisfied" or "satisfied" while 8 respondents answered "neither satisfied nor dissatisfied" and 2 answered "dissatisfied."

Although the reason for the dissatisfaction was “not enough relocation fees,” the amount of fee was based on regulations and agreed upon by these two respondents in advance. The rest of 38 respondents did not express any particular dissatisfaction. Consequently, the land acquisition and resettlement as a whole was executed appropriately as planned, and there was no delay to or effect on the project caused by social impacts.

(3) Roadside Stations “Michinoeki”

Roadside stations “Michinoeki” were constructed by the project in two sites of Chengbu and Wugan along the Zhushi-Chengbu provincial road. Adopting the Japanese concept of Michinoeki, they have being used as public facilities for regional development. In China, there was a case of preceding project constructed Michinoeki which was eventually turned into a material storage space since the concept of Michinoeki was not properly introduced and the facility was constructed along the road but far from communities. In comparison with this, roadside stations introduced by the project can be evaluated as a successful example. But in addition, it is expected for Michinoeki to function not only as a market but also as a facility to provide public services regarding health, hygiene, education and culture to local people. Since Michinoeki introduced by the project do not quite function in this regard, the executing agency is currently examining what services could be provided expecting full-scale use of the facilities.

Interview survey with questionnaires was conducted in these facilities with 10 vendors and 10 visitors accounting 20 respondents in total. Most of the vendors were from nearby farms whose annual household incomes were around 50,000 yuan with average daily sales in Michinoeki of 100 to 200 yuan. Many of them had marketed their agricultural products in vegetable markets earned around 50 yuan per day before the Michinoeki were constructed. It was thus confirmed that the roadside stations contributed to the increase in their sales. As for the visitors, majority of them were non-farmers (truck drivers, office workers, etc.) whose household incomes were between 30,000 and 50,000 yuan. Although the amount they spent in Michinoeki per visit varied from 5 to 300 yuan, most of them spent about 50 yuan or less. Food products were the most popular items to be purchased. While the number of vendors and visitors swelled on local market days several times a month, there were quite a few who set up shops in or visited at Michinoeki several times a week or even every day. Most of vendors and visitors were highly satisfied with the facilities and expect further increase of the variety of market products and functions of facilities.

Column: Roadside Stations "Michinoeki"

Wugan "Michinoeki"

Agricultural products outlets, a vehicle repair yard, a sports facility, a rest house, an information desk and a first aid station can be found at the roadside stations in Chengbu and Wugan Counties. Local farmers bring their products to the spacious outlet premises. There are simple shops just laying their products on the ground, while some farmers bring their items by cars. Most of the products are vegetables and meat of chicken, goose and pork. There also are farmers who sell miscellaneous goods such as handmade clothes and shoes. In the agricultural off-season, mobile food stalls are brought in to serve local dishes made by farmers' wives who are good at cooking. Many of the vendors are happy with the facilities which provide stable and convenient places to sell their products.

While most of the visitors who drop by the facilities are commuters and truck drivers using the provincial road, quite a number of neighbors who take a walk to the outlets almost every day. Shopping is the primary purpose of visitors, there are people who enjoy exercise on the basketball court open to anybody for free or having a nice cup of tea at the rest house.

Chengbu "Michinoeki" is located in the Miao Autonomous County, and Miao's special tea with many ingredients is served in its rest house. A tourist information desk of the Miao Autonomous County is set up and brochures and DVDs for attracting tourists are provided there. Waitresses and receptionists of the rest house and information desk are local Miao women. Roadside Station "Michinoeki" is thus contributing to local economy by providing job opportunities.

Chengbu "Michinoeki"

(4) Construction of Wind Power Station

The construction of the highway and provincial road by the project made it possible to carry construction materials and equipment to rural areas, and as a result of it, "Datang Huayin Nanshan Wind Farm," the largest wind power station in Hunan Province, was built in Nanshan town located along the Zhushi-Chengbu provincial road. The first phase of the construction was completed and partial operation has started since 2011, and the full-scale operation is scheduled to start in 2015. The power generated by this firm is supplied not only to local areas but also to the urban areas of Shaoyang City. Integrated development of a highway and a local road realized the synergistic developmental effects on both of the urban and rural areas.

(5) New Standard for Concrete Pavement

Although China's national standards require the thickness of concrete pavement of public roads to be 24-25cm or above, this thickness is not enough for the long-term years of endurance. It is, however, possible to add some years to the pavement's lifetime by making it 2cm thicker. Therefore, the project accumulated and analyzed the data of the weights of vehicles and

repeated experimental studies to determine that the local roads' pavement thickness to be 26-28cm. These studies and implementations were recognized by the provincial government. Consequently, in 2012, a new standard unique to Hunan Province that required public roads' concrete pavement thickness to be 30cm or more, thicker than the national standards, was authorized.

This project has largely achieved its objectives. Therefore its effectiveness and impact are high.

3.4 Efficiency (Rating: ②)

3.4.1 Project Outputs

The planned and actual output of the project is shown in Table 12. The total length of the Shaoyang-Huaihua highway is 5% longer than planned, the number of bridges increased by 6%, and the number of tunnels, interchanges/tollgates and service areas are fewer than planned. As for the Zhushi-Chengbu provincial road, the number of bridges is more than planned.

Table 12: Output (planned and actual)

Road	Plan	Actual
Shaoyang-Huaihua highway	• Total length: Shaoyang-Huaihua 160km • Road class: 4-lane highway • Road width: 24.5m-28.0m • Pavement: asphalt with some sections of concrete • Bridges: 223 bridges • Tunnels: 19 tunnels • Interchanges/tollgates: 9 spots • Service areas: 3 service areas • Connection road: Approx. 13km (Zhutian West-Hecheng District) • Machine and equipment: charge collectors, communication system, monitoring system	• Total length: Shaoyang-Huaihua 168.381km • Road class: as planned • Road width: as planned • Pavement: concrete with some sections of asphalt • Bridges: 236 bridges • Tunnels: 14 tunnels • Interchanges/tollgates: 8 spots • Service areas: 2 service areas • Connection road: 12.8km (Zhutian West-Hecheng District) • Machine and equipment: as planned
Zhushi-Chengbu provincial road	• Total length: Zhushi-Chengbu 100km • Road class: 2-lane provincial road • Road width: 12-15m • Pavement: asphalt • Bridges: 20 bridges • Incidental facilities: 2 Michinoeki	• Total length: as planned • Road class: as planned • Road width: as planned • Pavement: concrete • Bridges: 35 bridges • Incidental facilities: as planned
Consulting Services	• Consulting Services: Environmental measures, assistance in road management • Man month: 36 M/M	• Consulting Services: as planned • Man month: as planned

Sources: JICA appraisal documents, Shaoyang City Highway Administration Bureau, Shaoyang City Road Administration Bureau

The main reasons for the change of pavement from asphalt to concrete were because of the price increase of asphalt due to soaring prices of crude oil. And the project also took into account the contribution to local economy since cement production was one of the major industries of local areas such as Shaoyang, Dongkou and Wugan. Maintenance cost for concrete pavement was estimated to be lower than the asphalt considering lifetime and frequency of repair works.

The number of bridges increased because of the following reasons: 1) the area of earthwork could be minimized by increasing the number of bridges since bridge columns were only required instead of wide-open slopes, 2) the number of bridges to be junction points in future was increased in preparation for future traffic network development and 3) the flood-prevention evaluation conducted after the F/S determined that more bridges should be built to expand the drainage area for flood. Impact on the project was mostly positive by suppressing land acquisition and resettlement and reducing flood damage without making significant increase of the construction cost of the project (refer to the following page for construction cost). Therefore, the change of the number of bridges could be recognized as being appropriate.

Decreasing the number of tunnels was a decision made at the time of detailed design as a result of close examination of land features, geological conditions and construction technologies to be applied. The number of interchanges/tollgates and service areas was also reduced since it was found that the actual traffic volume would be lower than the estimation made during preparation stage of the project. Since these changes were made in order to make the scope of work to be more relevant to the actual situations and resulted in the reduction of volume of work, they could be positively evaluated as suitable decisions.

3.4.2 Project Inputs

3.4.2.1 Project Cost

The originally estimated total project cost at appraisal was 142,924 million yen, and the actual project cost at completion was 126,374 million yen, which is equivalent to 88% of the planned cost, thus the project cost was within the plan. (Table 13)

Table 13: Project Cost (planned and actual)

	Planned (Note 1)			**Actual** (Note 2)	
	Foreign Currency (Mil. Yen)	**Local Currency (Mil. Yen)**	**Total (Mil. Yen)**	**Total (Mil. Yuan)**	**Total (Mil. Yen)**
Civil work: highway	16,762	80,744	97,506	5,946	83,958
Civil work: provincial road	4,315	1,193	5,508	344	4,857
Machine and equipment	0	3,148	3,148	353	4,984
Consulting services	123	1,401	1,524	96	1,356
Price escalation	711	784	1,495	247	3,488
Contingency	1,089	4,294	5,383	0	0

	Planned (Note 1)			Actual (Note 2)	
	Foreign Currency (Mil. Yen)	Local Currency (Mil. Yen)	Total (Mil. Yen)	Total (Mil. Yuan)	Total (Mil. Yen)
Tax and administration	0	20,661	20,661	1,377	19,443
Land acquisition and resettlement	0	7,699	7,699	587	8,288
Total	23,000	119,924	142,924	8,950	126,374

Note 1: Exchange rate: 1 yuan = 15 yen (Source: JICA appraisal documents)
Note 2: Exchange rate: 1 yuan = 14.12 yen (average between 2003-2007) (Source: Principal Global Indicators)

In spite of longer total length of road and increased number of bridges, the cost of civil works was lower than the budget. This was because of the cost-saving efforts made by the executing agency as the change of pavement material from asphalt to concrete, reduction of the volume of earthwork by making slopes steeper, reuse of waste soil, and adoption of the minimum price system upon contractors' selection. Cost for land acquisition and resettlement exceeded by 8% of the estimation by reflecting the increase of the volume of land acquisition and resettlement. Cost for machine and equipment went over the budget since the input of equipment of higher quality was increased in order to secure higher safety and to meet environmental conservation demands. Tax and administration cost did not exceed the budget as a result of the reduction of the administration cost by introducing minimum price system for the selection of contractors for investigation and design. Consulting service fees also did not go over the budget since local consultants' works for the highway covered by the local currency was significantly reduced. Because of these cost-cutting efforts, the total project cost was within the plan despite the increase of road length and the number of bridges.

The breakdown of civil work cost for the highway is shown below in Table 14. It can be confirmed that the change from asphalt to concrete pavement has significantly contributed to the reduction of the total cost of the project.

Table 14: Breakdown of civil work cost for Shaoyang-Huaihua highway (planned and actual)

	Planned (Note 1)			Actual (Note 2)	
	Foreign Currency (Mil. Yen)	Local Currency (Mil. Yen)	Total (Mil. Yen)	Total (Mil. Yuan)	Total (Mil. Yen)
Pavement (including roadbed)	11,781	37,793	49,574	2,272	32,085
Bridges	4,981	15,983	20,964	1,934	27,315
Tunnels	0	19,253	19,253	1,093	15,435
Tollgates	—	—	—	241	3,405
Service areas	—	—	—	53	750
Others	—	7,715	7,715	352	4,968
Total	16,762	80,744	97,506	5,946	83,958

Note 1: Exchange rate: 1 yuan = 15 yen (Source: JICA appraisal documents)
Note 2: Exchange rate: 1 yuan = 14.12 yen (average between 2003-2007) (Source: Principal Global Indicators)

3.4.2.2 Project Period

The original project period planned at appraisal was from March 2002 (signing of the Loan Agreement) to December 2006 (official opening to traffic) with a total period of 58 months. The actual project period was from March 2002 (signing of the Loan Agreement) to November 2007 (official opening to traffic) with a total period of 69 months, or equivalent to 119% of the plan.

The main reason for delay was the prolonged detailed design in which elaborated investigations and designs were conducted expecting thorough considerations for environment, economy and safety. While it is difficult to make a quantitative comparison with the change of the scope of work, accounting small environmental impacts, suppressed project cost and reduced traffic accidents affirmatively, the extension of project period could be positively evaluated as an adequate result.

3.4.3 Results of Calculations of Internal Rates of Return (Reference only)

Based on the cost and benefit items used at appraisal, recalculations of Financial Internal Rate of Return (FIRR) and Economic Internal Rate of Return (EIRR) were conducted in this ex-post evaluation by using the actual cost for the construction, five-year actual cost for operation and maintenance, five-year actual revenue from toll fare, and those values estimated for the subsequent project life period. FIRR and EIRR were recalculated based on the following assumptions. The recalculation results are shown below in Table 15.

Recalculation Assumptions

FIRR Cost: project cost, operation & maintenance cost
Revenue: toll revenue
Project life: 20 years

EIRR Economic Cost: highway: 87% of project cost, provincial road: 89% of project cost
operation & maintenance cost
Economic Benefit: transportation cost savings, congestion reduction savings, travel distance savings, travel time savings, traffic accident reduction savings
Project life: 20 years

Table 15: IRR

		Appraisal	Ex-post Evaluation
Shaoyang-Huaihua highway	FIRR	3.7%	5.3%
	EIRR	14.9%	14.9%
Zhushi-Chengbu provincial road	EIRR	16.5%	14.1%

Recalculated FIRR of the Shaoyang-Huaihua highway was 5.3% exceeding the FIRR of 3.7% at the time of appraisal. This was because of the profitable results of the project, while it was only slight, as shown that the actual project cost was 93%, revenue was 110% and administration cost was 98% respectively compared to the estimations at appraisal. As for EIRR, due to difficulties in collecting the necessary information and data about the calculation at the time of appraisal, recalculation was done with the economic benefits assumed as stated above and resulted in 14.9%, which was incidentally the same as the EIRR at appraisal. Since this figure exceeded 12% of EIRR, which is extensively used as a target for highways by international authorities, EIRR of the highway could be evaluated to be high.

Recalculated EIRR of the Zhushi-Chengbu provincial road was 14.1% which was lower than the value of 16.5% at appraisal. A simple comparison of these figures was not appropriate since the information and data about the calculation at appraisal were not fully available. Main reasons could be the difference of travel time savings, while 12% of annual increase of travel time savings was estimated at the time of appraisal, the assumed annual increase at the time of ex-post evaluation was 6% estimated from the result values of 5 years operation. Since the figure of 14.1% exceeded 10 to 12%, which is widely used as a target of EIRR for public roads, EIRR of the provincial road could be evaluated to be high.

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

3.5 Sustainability (Rating: ③)

3.5.1 Institutional Aspects of Operation and Maintenance

"Shaoyang City Highway Administration Bureau" has been responsible for operation and maintenance (O&M) of the Shaoyang-Huaihua highway, while "Shaoyang City Road Administration Bureau" has been responsible for O&M of the Zhushi-Chengbu provincial road. The Shaoyang City Highway Administration Bureau is a state-owned company evolved from the Shaoyang-Huaihua Highway Construction Development Co., Ltd., the company undertook the construction work of the project, by shifting its functions from construction to O&M. Since it is a company but identified as a government agency affiliated with the Hunan Province's Transportation Office, all of its revenue earned from the Shaoyang-Huaihua highway goes to the provincial government and its annual budget is provided from the provincial government. The Shaoyang City Road Management Administration is one of the departments of the Shaoyang City government.

Shaoyang City Highway Administration Bureau is comprised of one director, 4 deputy directors, 5 engineers, 10 technicians and 56 clerical staffs, while the Shaoyang City Road Management Administration consists of 3 directors, 9 deputy directors, 18 engineers, 22 technicians and 32 clerical staffs as of the end of November 2013. The institutional structures of

these organizations are expected to be stable for future since their employees are relatively young; the directors and deputy directors are in their early 40s and the engineers and technicians are in their late 20s to early 30s. Personnel transfer has never taken place in the Shaoyang City Highway Administration Bureau since its establishment in 2007 and there is no particular plan of transfer in personnel in near future. Personnel relocation in Shaoyang City Road Management Administration takes place almost every five years. From these, no major institutional problem are expected regarding O&M of the roads constructed by the project.

3.5.2 Technical Aspects of Operation and Maintenance

Employees higher than technicians of both of Shaoyang City Highway Administration Bureau and Shaoyang City Road Administration Bureau are all bachelor or master degree holders in the field of technology or business administration.

Regarding staff training, the Shaoyang City Highway Administration Bureau conducts 4 types and the Shaoyang City Road Administration Bureau offers 7 types of training on regular basis dealing with topics of road surface control, bridge maintenance, facility management and safety control. Besides these regular training programs, some other topics of training are offered on an ad-hoc basis. Staffs receiving the training have improved their competencies and the number of qualified and/or promoted personnel including Senior Administrative Officers, Senior Engineers[8] and accountants is steadily increasing.

Shaoyang City Highway Administration Bureau provides seven kinds of handy-size manuals that are convenient to carry around which deals with subjects of facility maintenance, electronic equipment operation, general affairs and financial affairs. Shaoyang City Road Administration Bureau prepares a comprehensive manual titled “Summary of Regulatory Documentation Regarding Public Road Management” which includes from regulations to specific work instructions exhaustively, and it is available at respective workplace. Compliance with manuals is overseen daily at the workplaces by superiors. O&M of the highway are subject to internal and external audits once a year respectively. The external audit is done by the National Audit Office[9]. No major issue has been pointed out by these audits so far. Since steady efforts have been made to maintain and improve skills of staffs through recruitment and training, and no major technical problem has taken place so far, technical level of these two organizations for O&M can be judged to be high.

[8] Job classes of administrative officers certified by provincial governments. A qualified Administrative Officer is allowed to engage in the Communist Party’s political activities. The highest-class administrative officer is the Senior Administrative Officer. An Engineer is a job class of an engineer and the highest-class engineer is the Senior Engineer.

[9] An administrative agency that conducts audit of government agencies and state owned companies. Comparable to the Board of Audit of Japan.

3.5.3 Financial Aspects of Operation and Maintenance

Revenue from toll fares of the Shaoyang-Huaihua highway is increasing year by year and is substantially higher than the expenditure including salaries (Table 16). Profits have been mainly allocated to payback of investment.

O&M cost for Zhushi-Chengbu provincial road is provided from the city budget and has been fixed since the completion of the project. In case a large-scale renovation becomes necessary, funds are to be covered by the Hunan Province government, while such a case has not yet occurred. Financial aspects of O&M of the provincial road thus seem to be stable, and no major financial problem is expected to take place.

Table 16: Revenue and expenditure

Shaoyang-Huaihua highway Unit: million yuan

Year	2008	2009	2010	2011	2012
Revenue (toll fare)	232	297	407	553	679
Expenditure	78	93	96	84	99
O&M Cost	9	8	8	8	9

Source: Shaoyang City Highway Administration Bureau

Zhushi-Chengbu provincial road Unit: million yuan

	2008	2009	2010	2011	2012
O&M Budget	1	1	1	1	1
O&M Cost	1	1	1	1	1

Source: Shaoyang City Road Administration Bureau

3.5.4 Current Status of Operation and Maintenance

Both of these two O&M organizations have developed and executed their maintenance plans of 6 maintenance items on site works and 11 items on indoor works. Should execution be unsatisfactory, it is subject to get points taken off in the internal/external audits (point-deduction scoring system is applied.). No major issue has been pointed out in any audit so far.

Visual inspection was conducted in the field on the entire length of the roads in November 2013 in this ex-post evaluation and confirmed current status of O&M of the roads. Pavement surface, slope surface, road shoulders, bridges, tunnels, service areas, traffic signs and trees planted looked very well maintained and few trash and litter was found. No cracks, breaks, bumps were observed on both of the highway and provincial road, and no sense of discomfort was felt during the drive.

No major problems have been observed in the institutional, technical and financial aspects of the operation and maintenance system. Therefore sustainability of the project effect is high.

4. Conclusion, Lessons Learned and Recommendations

4.1 Conclusion

The objectives of the project were to improve the accessibility to markets and facilitate the regional development, thereby contributing to rise of the quality of life and reduction of poverty in inland areas by newly constructing a highway and improving a local road in Hunan Province in China. The project was highly relevant with the Chinese development plans and regional needs for the improvement of access of local products to markets, and with the Japan's ODA policy which placed a high priority on the development of provincial road network expecting the economic development of inland poor areas. Therefore, its relevance is high. Regarding the objectives of the project i.e., improvement of accessibility to markets and stimulation of regional economy, the project has contributed to rise of the quality of life and reduction of poverty in inland areas through the increase of shipping volume of agricultural products and employment opportunities of road users by realizing the increase of traffic volume and decrease of travel time. Therefore, its effectiveness and impact is considered high. While the project cost was within the plan, the project period was slightly longer than planned. Therefore, efficiency of the project is considered fair. Operation and maintenance of the facilities and equipment developed by the project have been properly done, and no major problems have been observed in terms of institutional, technical and financial aspects of the operation and maintenance system, therefore sustainability of the project effects by the project is high.

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

4.2 Recommendations

4.2.1 Recommendations to the Executing Agency

Roadside stations constructed by the project, adopting the Japanese concept of Michinoeki, are used as public facilities for regional development. In comparison with the precedence of roadside station turned into a material storage space, "Michinoeki" introduced by the project can be evaluated as a successful example. It is recommended to the executing agency to make a full-scale use of the facilities by adding functions to provide information about health, hygiene, education and culture, and to promote public relations for realizing the extensive publicity in China as a successful case of "Michinoeki."

4.2.2 Recommendations to JICA

It is recommended to JICA to extend an assistance for the executing agency to promote public relations activities aiming at the realization of the recommendation stated above.

4.3 Lessons Learned

Integrated construction of highway and local road

The project has realized a significant development effect by connecting local areas with a

highway network and constructing a highway and a local road in an integrated manner. The improvement of a local road connecting with a highway has enabled local cities and towns to transport their agricultural products and mineral resources to urban areas, and to attract tourists from urban centers to their places. On the other hand, the extension and expansion of a local road made it possible to carry construction materials and equipment to rural areas, and as a result, a large-scale wind power station was constructed in rural area. The power generated by this firm is supplied to local and urban areas and benefits both of them. Integrated development of a highway and a local road thus realized the synergistic developmental effects on both of the urban and rural areas. As for future highway construction project, it would be preferable to include local roads constructions as much as possible anticipating the synergetic developmental effects on both of the urban and rural areas, if a single executing agency is responsible for the entire project or if it is possible to realize a close communication and coordination between the implementation agencies of highway and local road.

Comparison of the Original and Actual Scope of the Project

Item	Original	Actual
1. Project Outputs i) Shaoyang-Huaihua highway	• Total length: 160km • Road class: 4-lane highway • Road width: 24.5m-28.0m • Pavement: asphalt with some sections of concrete • Bridges: 223 bridges • Tunnels: 19 tunnels • Tollgates: 9 tollgates • Service areas: 3 service areas • Connection road: 13km (Zhutian West-Hecheng District) • Machine and equipment: charge collectors, communication system, monitoring system	• Total length: 168km • Road class: as planned • Road width: as planned • Pavement: concrete with some sections of asphalt • Bridges: 236 bridges • Tunnels: 14 tunnels • Tollgates: 8 tollgates • Service areas: 2 service areas • Connection road: as planned • Machine and equipment: as planned
ii) Zhushi-Chengbu provincial road	• Total length: 100km • Road class: 2-lane provincial road • Road width: 12m-15m • Pavement: asphalt • Bridges: 20 bridges • Incidental facilities: 2 Michinoeki	• Total length: as planned • Road class: as planned • Road width: as planned • Pavement: concrete • Bridges: 35 bridges • Incidental facilities: as planned
iii) Consulting Services	• Construction supervision: 36 M/M	• As planned
2. Project Period	March 2002 – December 2006 (58 months)	March 2002 – November 2007 (69 month)
3.Project Cost Amount paid in Foreign currency Amount paid in Local currency Total Japanese ODA loan portion Exchange rate	 23,000 million yen 119,924 million yen 142,924 million yen 23,000 million yen 1 yuan = 15 yen (as of September 2001)	 22,948 million yen 103,426 million yen (7,325 million yuan) 126,374 million yen 22,948 million yen 1 yuan = 14.12 yen (average between 2003 and 2007)

People's Republic of China

Ex-Post Evaluation of Japanese ODA Loan

"Jiangxi Urban Flood Control Project"

External Evaluator: Tomoo Mochida, OPMAC Corporation

0. Summary

The Project aims to construct or repair dikes, floodgates, and pumping stations in six cities around Poyang Lake in Jiangxi Province in order to improve the flood control capacity of the respective cities, thereby contributing to the prevention of flood damage, the stabilization of local societies and economy and to an improvement in the living conditions of the local people.

This Project is highly relevant to China's development policies, in which the Changjiang River master plans have been continuously updated and river development has been promoted, to the needs of the target cities, and to the Japan's ODA policy towards China. Since 2005, after commencement of the construction works, the Project effects have gradually started appearing and the Project has contributed to improvement in flood control capacity and the prevention of flood damage in the areas to be protected within the respective cities, to stabilization of the economy and societies and to improvements in living conditions. Therefore, the effectiveness and impacts are high. In terms of efficiency, a longer time was necessary for the preparation period, including the amount of time required for the loan agreement to be effectuated, before commencement of the construction works. This, coupled with the implementation of additional construction works, meant that the Project period greatly exceeded the original schedule. Furthermore, the Project cost had increased and surpassed the plan at appraisal time due to increases in construction costs, land acquisition and compensation and changes in the original plan due to the effects of urbanization. Thus, the efficiency is low. As for sustainability, no major problems have been observed in the institutional, technical and financial aspects of the operation and maintenance of the Project. Thus, the sustainability is high.

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

1. Project Description

Project Location
(Jiangxi Province)

In Jingdezhen city, dikes have been constructed or repaired featuring the culture of ceramics and protection of the ecosystem.

1.1 Background

Poyang Lake is one of the major lakes along the Changjiang River. In large- and medium-sized cities, such as Nanchang, Jiujiang, and Jingdezhen, that are located around the lake, existing dikes did not necessarily function sufficiently during floods and drainage capacity within urban areas was low due to underdeveloped drainage and pumping stations. Thus, local people suffered from the damage of frequent floods over a long period of time. When floods took place in 1998 around the watershed areas of the Changjiang River, for instance, dikes along the river were broken in Jiujiang city. The total economic losses in the six cities amounted to 14,600 million yuan and the total number of disaster victims reached more than 1.33 million. Investment has been concentrated on urgent rehabilitation works and the enhancement of dikes along the main flow and tributaries of the Changjiang River and lakes since the occurrence of the great floods of 1998, and it has become an urgent task to further improve the capacity of urban flood control.

1.2 Project Outline

The Project aims to construct or repair dikes, floodgates, and pumping stations in six cities around Poyang Lake in Jiangxi Province in order to improve the flood control capacity of the respective cities, thereby contributing to the prevention of flood damage, the stabilization of local societies and economy and to an improvement in the living conditions of the local people.

Loan Approved Amount/ Disbursed Amount	11,000 million Japanese yen / 8,926 million Japanese yen
Exchange of Notes Date/ Loan Agreement Signing Date	March 2000 / March 2000
Terms and Conditions	Interest Rate: 0.75% Repayment Period: (Grace Period) 40 years (10 years) Conditions for Procurement: Bilateral tied
Borrower / Executing Agency(ies)	Government of People's Republic of China / Jiangxi Provincial People's Government
Final Disbursement Date	March, 2011
Main contractor (Over 1 billion yen)	• China Gezhouba Construction Group Corporation for Water Resources & Hydropower (China) • 16th Engineering Bureau Group Ltd of China Railway (China) • Jiangxi Water Conservancy & Hydropower General Corp. (China) • Jiujiang Water Conservancy & Electric Power Building Co. (China)
Feasibility Studies, etc.	Special Assistance for Project Formation (SAPROF) for Changjiang River Basin Urban Flood Control Project in the People's Republic of China (September 1999)
Related projects	[Japanese ODA Loans] • Hubei Urban Flood Control Project (Loan Agreement signed in March 2000) • Hunan Urban Flood Control Project (Loan Agreement signed in March 2000) [Technical Cooperation] • Human Resource Development Project for Water Resources, P.R.C (July 2000 to June 2007) [Grant Aid] • Emergency Grant Aid for Flood Disasters (Exchange of Notes signed: not known) • The Project for Improvement of Dikes in Yangtze River (Exchange of Notes signed: March 1999) [Other Donors]The World Bank • Jiujiang Dikes Reinforcement Project • Poyang Lake Dikes Reinforcement Project

2. Outline of the Evaluation Study

2.1 External Evaluator

Mochida Tomoo, OPMAC Corporation

2.2 Duration of Evaluation Study

Duration of the Study: August, 2013 – November, 2014

Duration of the Field Study: November 11, 2013 – November 27, 2013,

April 23, 2014 – April 30, 2014

2.3 Constraints during the Evaluation Study

Due to personnel transfers of officers who were in charge of the Project, it was impossible to acquire enough information on the Project cost and the implementation arrangements during the Project implementation period at the provincial level in order to carry out a detailed analysis.

3. Results of the Evaluation (Overall Rating: B[1])

3.1 Relevance (Rating: ③[2])

3.1.1 Relevance to the Development Plan of the People's Republic of China

1) Relevance to the Development Plan at the time of the Project Appraisal

The Ministry of Water Resources (hereinafter referred to as "MWR") of the People's Republic of China (hereinafter referred to as "PRC") prepared and gradually updated the "Changjiang River Master Plan" for river development. In response to the massive floods of 1998, the MWR prepared the "Changjiang River Integrated Flood Prevention Facilities Construction System", which included repairing and strengthening works for dikes and river development of the mainstream and tributaries of the Changjiang River, the tributaries of Poyang Lake and so on.

The aim of the "10th Five-Year Plan for National Water Resources Development (2001-2005)" was to upgrade the flood control standards in important areas for flood protection in response to the level of economic development, thereby improving capacity to prevent flood disaster. In the plan, the following flood control standards were set:[3] [4]

Megacity: flood occurs once in every 100 or more years Large city: flood occurs once in every 50 to 100 years Medium city: flood occurs once in every 20 to 50 years Major watershed areas in the case of small and medium rivers: flood occurs once in every 10 to 20 years

Also, the said plan included plans to complete measures to prevent floods and reduce disasters in the watershed areas of the Changjiang River, in principle, by 2010. The "Outline of the 10th Five-Year Plan Framework for National Economic and Social Development of Jiangxi Province (2001-2005)", aimed to proceed with the construction of flood control facilities and pursue sustainable development strategies.

[1] A: Highly satisfactory, B: Satisfactory, C: Partially satisfactory, D: Unsatisfactory

[2] ③: High, ② Fair, ① Low

[3] At the time of the appraisal in 1999, the flood control standard of a prefecture-level city (地級市) was once in 10 to 20 years. The "prefecture-level city" is an administrative unit that is smaller than a province and larger than a county.

[4] These targets are used to mean "probability of return", the probability that a flood exceeding a certain size will occur in any given year.

2) Relevance to the Development Plan at the time of the Ex-post Evaluation

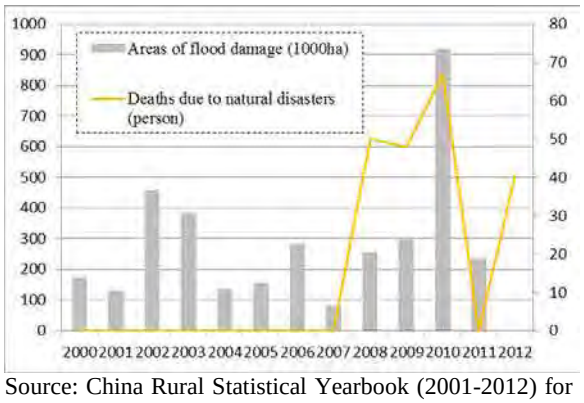
The promotion of flood control is also mentioned in the “12th Five-Year Plan for National Economic and Social Development (2011-2015)”, the “National Water Resources Development (2011-2015)” and the “Outline of the 12th Five-Year Plan for National Economic and Social Development of Jiangxi Province (2011-2015)”, which were development plans at the time of the ex-post evaluation.

As seen above, measures to strengthen capacity of flood control and prevention continued to be identified as priority issues in the national as well as the Jiang Xi provincial plans at the time of the ex-post evaluation. Hence, the Project is found to be highly relevant to these plans.

3.1.2 Relevance to the Development Needs of the People's Republic of China

1) Relevance to Development Needs at the time of the Project Appraisal

The watershed areas along the Changjiang River were hit by many large-scale floods such as the great floods of 1931, 1954 and 1998, which is at the levels of once in every 50 to 100 years. As seen from Figure 1, flood damage and deaths due to natural disasters were recorded even after 2000.



Source: China Rural Statistical Yearbook (2001-2012) for areas of flood damage and China Civil Affairs' Statistical Yearbook (2001-2013) for the number of deaths due to natural disasters

Figure 1:Areas of flood damage and deaths due to disasters in Jiangxi Province

As shown later in Table 4, the population in the five cities has exhibited a moderate increase (an annual increase of a little less than 0.4%) while their regional Gross Domestic Products (GDP) have recorded an increase of more than 10% per year in nominal terms. While the economy has rapidly developed, the Project met the development needs of the target regions, aiming to upgrade the flood control standards in the important areas for flood protection.

3.1.3 Relevance to Japan’s ODA Policy

At the time of the appraisal of the Project, the “Medium-Term Policy on Official Development Assistance” of 1999 and the “Strategy for Overseas Economic Cooperation Operations” of 1999 pointed out the importance of proactive assistance in the development of an economic and social infrastructure that would shore up sustainable economic growth. Japan’s “Economic Cooperation Program for China” in 2001 put priority on the improvement of living standards and social development in the inland regions, etc. The Project is evaluated to be consistent with Japan’s ODA policy.

This Project has been highly relevant to the country's development plan, development needs, as well as Japan's ODA policy. Therefore its relevance is high.

3.2 Effectiveness[5] (Rating: ③)

Because no operation and effect indicators were established at the time of the appraisal, the ex-post evaluation examined the extent of achievements of the "improvement of flood control capacity" as well as the "prevention of flood damage" in light of the Project Objective.

3.2.1 Quantitative Effects (Operation and Effect Indicators)

In order to examine the extent of achievements in the improvement of flood control capacity, comparisons were made on "the discharge capacity and the annual maximum flow at the reference point" and "the planned highest safe water level and the annual highest water level at the reference point". Furthermore, in order to evaluate the capacity improvement of the prevention capacity for flood damage, the following indicators were examined: "upgrading of flood control standards", "expansion of protected areas by the Project" and "the extent of flood damage due to levee breach or overflow".

3.2.1.1 Operation Indicators

1) Comparison between the discharge capacity[6] and the annual maximum flow at the reference point

Comparison is made of the discharge capacity at the reference point between the times of the appraisal in 1999 and the ex-post evaluation in 2011. As shown in Table 1, the total discharge capacity of the five cities increased by 33%, showing an improvement in the discharge capacity. If the annual maximum flow (m^3) at the reference point is less than the discharge capacity, it means that floodwater flows down safely. Figure 2 compares the discharge capacity and the annual maximum flow (m^3) at the reference point. At the reference points of all the five cities, the annual maximum flow is less than the discharge capacity, implying that floodwater flows down safely. In particular, during the period from 2010 to 2013, Jingdezhen city experienced the same level of annual

Table 1: Comparison of discharge capacities at the reference point

Unit: m^3/S

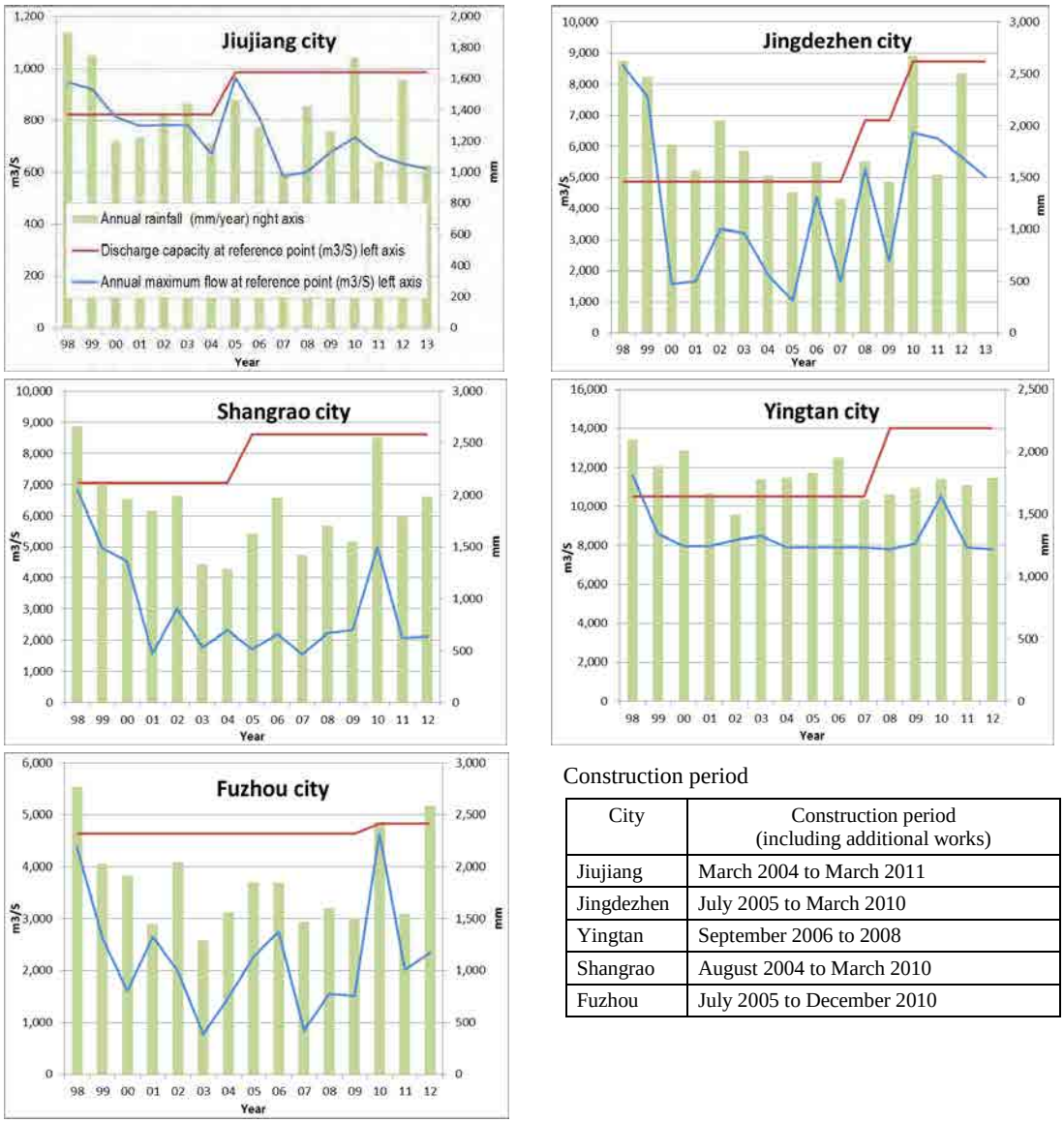
City	1999	2011	Rate of increase
Jiujiang	823	985	19.7%
Jingdezhen	4,860	8,730	79.6%
Yingtan	10,500	14,000	33.3%
Shangrao	7,035	8,604	22.3%
Fuzhou	4,640	4,840	4.3%
Total	27,858	37,159	33.4%

Source: Bureaus of Water Resources at respective cities

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

[6] The discharge capacity (m3/s) at the reference point is the maximum volume of water that can be carried safely by a river at the reference point. If the annual maximum flow is less than the discharge capacity, it means that floodwater flows down safely.

rainfall as in 1998 when floods struck the city, while the annual maximum flow far exceeded the level of the discharge capacity before the commencement of the Project. Significant improvement of the discharge capacity by the Project is manifest in this case.



Construction period

City	Construction period (including additional works)
Jiujiang	March 2004 to March 2011
Jingdezhen	July 2005 to March 2010
Yingtan	September 2006 to 2008
Shangrao	August 2004 to March 2010
Fuzhou	July 2005 to December 2010

Source: Bureaus of Water Resources at respective cities

Note: Four cities (Jingdezhen, Yingtan, Shangrao, Fuzhou cities) are located in upstream areas of tributaries of the Changjiang River, unlike Jiujiang city. Accordingly, the annual maximum flow of the four cities is larger than that of Jiujiang city.

Figure 2: Comparison between the discharge capacity and the annual maximum flow at the reference points

2) Comparison between the planned highest safe water level and the annual highest water level[7] at the reference points

Table 2 compares the actual with the planned levels in terms of the planned highest safe water level. At the time of the Project appraisal in 1999, some cities had not reached the planned levels in terms of the planned highest safe water level. However, through implementation of the Project, the required planned levels were met. In the case of Jiujiang and Jingdezhen cities, the planned highest safe water levels were upgraded.

Table 2: Planned highest safe water level (comparison between planned and actual)

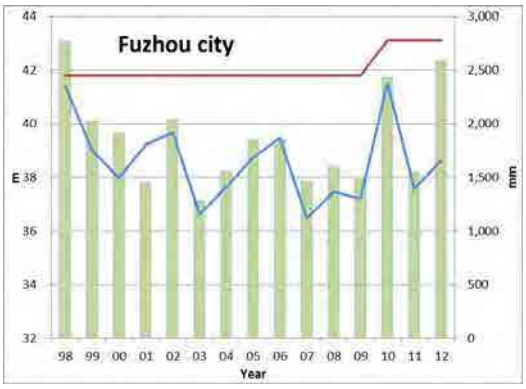
Unit: m (above sea level)

City	1999		2011	
	Plan	Actual	Plan	Actual
Jiujiang	19.85	19.85	20.85	20.85
Jingdezhen	29.53	29.53	32.71	32.71
Yingtan	32.30	30.36	32.30	32.30
Shangrao	70.80	69.10	70.80	70.80
Fuzhou	43.10	41.80	43.10	43.10

Source: Bureaus of Water Resources at respective cities

Figure 3 compares the planned highest safe water level (actual) with the annual highest water level at the reference points. At all the cities, the annual highest water levels were found to be within the planned highest safe water levels. In particular, as described earlier, during the period from 2010 to 2013, Jingdezhen city experienced floods that exceeded the planned highest safe water levels that were in existence before commencement of the Project. Direct effects of the Project have been confirmed.

[7] If the annual highest water level is less than the planned highest safe water level (actual) at a reference point, this means that a safe water level is being maintained.



Source: Bureaus of Water Resources at respective cities

Figure 3: Comparison between the planned highest safe water level (actual) and the annual highest water level at the reference points

3.2.1.2 Effect Indicators

1) Upgrading of flood control standards

Table 3 compares flood control standards at the times of the appraisal and the ex-post evaluation. At all the cities where the Project was implemented, flood control standards were upgraded. Although at the time of the appraisal some cities did not meet the flood control standards set for them, they had met the new standards at the time of the ex-post evaluation.

At the time of the ex-post evaluation, it was learned from the Water Resources Department that a lot of cities within the province did not meet the flood control standards. Therefore the fact that the five cities which had received the Japanese ODA Loan satisfied the standards is highly evaluated.

Table 3: Upgrading of flood control standards
(Comparison at the times of the appraisal and the ex-post evaluation)

City	At the time of appraisal (1999)		At the time of ex-post evaluation(2013)	
	Flood control standards for cities	**Flood control standards for dikes/ Standards for drainage**	**Flood control standards for cities**	**Flood control standards for dikes/ Standards for drainage**
Jiujiang	Once in every 20 years	Saicheng lake dike: once in every 10 years Bali lake dike: once in every 20 years Shilihe embankment: once in every 5 years Urban drainage standard: once in every 5 years	Once in 50 years	Saicheng lake dike: once in every 50 years (changed from once in every 20 years in 2009) Bali lake dike: once in every 50 years Shilihe embankment: once in 20 years Urban drainage standard: once in every 20 years
Jingdezhen	Once in every 50 years (not achieved)	Dike: once in every 20 years Urban drainage standard: once in every 20 years for urban zones, once in every 10 years for suburbs	Once every 50 years	Dike: once in every 20 years Urban drainage standard: once in every 20 years

City	At the time of appraisal (1999)		At the time of ex-post evaluation(2013)	
	Flood control standards for cities	Flood control standards for dikes/ Standards for drainage	Flood control standards for cities	Flood control standards for dikes/ Standards for drainage
Yingtan	Once in every 50 years (planned) but once in every 10 years (actual)	Dike: once in every 50 years (planned) but once in every 10 years (actual) Urban drainage standard: once in every 5 years	Once in every 50 years	Dike: once in every 50 years Urban drainage standard: once in every 20 years
Shangrao	Once in 20 years	Shibei dike: once in every 20 years Shinan dike: once in every 10 to 15 years Sanjiang Dike: once in every 20 years Urban drainage standard: once in every 5 to 10 years (up to 1999)	Once in every 50 years	Shibei dike: once in every 50 years Shinan dike: once in every 20 years Sanjiang Dike: once in every 50 years Urban drainage standard: once in every 20 years
Fuzhou	Once in 20 years	Dike: once in every 10 years Urban drainage standard: once in every 10 years	Once in every 50 years	Dike: once in every 20 years Urban drainage standard: once in every 20 years

Source: Bureaus of Water Resources at respective cities

2) Expansion of protected areas through implementation of the Project

The population in protected areas and areas protected by facilities and equipment supported by the Project exhibits a trend to increase in accordance with increases in the general population and the development of economic activities as shown in Table 4.

3) The annual maximum inundated area (km^2), annual maximum number of inundated houses (houses), annual frequency of flood damage (number of times), annual maximum amount of damage (yuan), annual maximum inundated time (hours), and the annual number of deaths (persons) due to levee breaches or overflows

Under the Project, the plan was to respond to a 50 year flood. Meanwhile, a 50 year flood occurred at Jiujiang city in 2005[8] and a 100 year flood and a 50 year flood took place at Fuzhou and Jingdezhen cities, respectively, in 2010 (Shangrao and Yingtan cities experienced a 20 year flood in 2010)[9]. However, inside the protected areas of the Project at the five cities, damage from floods and inundations did not take place after 2000 (as shown in Table 5)[10]. Through implementation of the Project, both the discharge capacity and the planned highest safe water

[8] By the time a typhoon hit Jiujiang city in 2005, Bali lake levee and other levees had been completed so that neither levee breaches nor overflows took place.

[9] Information from Water Resources Department of Jiangxi province. According to Jiujiang city, a typhoon that struck Jiujiang city in 2005 was once in every 100 years and according to Shangrao city, a tyhoon that took place at Shanrao city in 2012 was once in every 200 years..

[10] It was learned from the water bureaus of the five cities that there were no inundations within the protected areas caused by heavy rain.

level were upgraded, which contributed to the prevention of flood damage. Staff at one of the water bureaus in charge of the operation and maintenance of related facilities commented that they had been able to take sufficient measures to prevent floods and inundations based on their operational results so far.

Table 4: Changes in population, regional GDP, population and sizes of protected areas in the cities before and after the Project

Province/ City	Population (1000 persons)		Regional GDP (Million Yuan)		Population of protected areas (1000 persons)		Size of protected areas (km^2)	
Year	1998	2011	1998	2011	1998	2013	1998	2013
Jiangxi Province	41,912	44,884	1,719.9	11,703.0		-		-
Nanchang	4,186	5,089	380.0	2,689.0	420	-	28	-
Jingdezhen	1,484	1,599	81.3	565.0	396	564	47	65
Jiujiang	4,503	4,763	170.1	1,256.0	489	552	43	43
Yingtan	1,043	1,134	40.1	428.0	237	330	20	30
Shangrao	6,482	6,624	161.8	1,111.0	198	400	17	70
Linchuan/ Fuzhou	3,701 (Fuzhou ward)	3,938	115.8 (Fuzhou ward)	743.0	275 (Linchuan city)	400 (Fuzhou ward)	23 (Linchuan city)	46 (Fuzhou ward)
Sub-total of 5 cities excluding Nanchang city	17,213	18,058	569.1	4,103.0	1,595	2,246	150	254

Source: Jiangxi statistical yearbook for the population and GDP (nominal terms) in 1998 and 2011. Answers from water bureaus at respective cities for population and sizes of protected areas in 1998 and 2013 (data in 1999 instead of 1998 in the case of Shangrao and Fuzhou cities).

Table 5: Conditions of flood damage in the protected areas at the respective cities due to levee breach or overflow (total of the five cities)

Item (unit)	1998	1999	2000 - 2013
Annual maximum inundated area (km^2) due to levee breach or overflow	74	25	0
Annual maximum number of inundated houses (houses) due to levee breach or overflow	104,300	34,600	0
Annual flood damage (number of times) due to levee breach or overflow	6	1	0
Annual maximum amount of damage (million yuan) due to levee breach or overflow	4,032	1,363	0
Annual maximum inundated time (hours) due to levee breach or overflow	337	35	0
Annual number of deaths (persons) due to levee breach or overflow	0	0	0

Source: Bureaus of Water Resources at respective cities

3.2.2 Qualitative Effects

The qualitative effects were evaluated together with impacts as shown in section "3.3 Impacts" below.

3.3 Impacts

3.3.1 Intended Impacts

The Project set its Overall Goal as "contribution to the stabilization of local societies and economy and to improvement in the living conditions of the local people" by the prevention of flood damage through improvement in flood control capacity. In the following section, the effects of the Project are described in terms of the "stabilization of local societies", "improvement in the living conditions of local people" and "development of the local economy".

3.3.1.1 Stabilization of local societies and improvement in living conditions in the Project area

In order to evaluate the extent to which local societies have been stabilized and living conditions have been improved due to implementation of the Project, interview surveys[11] were conducted to ordinary residents and business operators. The following summarizes the results of the survey.

(1) Stabilization of local societies (safety during heavy rains)

Among the ordinary residents who responded (a total of 80 persons), there are only two persons at Jingdezhen city who had experienced damage from inundations before completion of the Project[12]. It was found that most of the respondents (96% of the respondents) felt "very safe" at the time of heavy rains compared to the situation before completion of the Project. The reasons behind such feelings of safety were, among others, "reduction of anxiety about power outages and water stoppages", "decreases in the risk of floods and inundations due to well-functioning drainage facilities".

As for business operators, all the operators at Jingdezhen city and two operators at Shagrao city answered that they had experienced inundations before completion of the Project. However, after completion of the Project, there were no reports of experiences of inundations. Reasons

[11] Interview surveys with ordinary residents were conducted at Jingdezhen and Shangrao cities in December 2013 at weekends when cooperation could be elicited from them. The survey sites were selected at areas where dikes had been newly constructed or rehabilitated and at areas where neither dikes nor pumping stations were located nearby. Face-to-face interviews were conducted based on the questionnaire with foot passengers and nearby residents. The number of interviewees was 80 in total, 40 each at the respective cities (purposive sampling). Twenty interviewees were women and it is assumed that 80% of them could be classified into the middle income class. In terms of interviews with business operators, 10 business operators were selected for face-to-face interviews at each city through the Bureaus of Water Resources at the above two cities. The types of business operators interviewed at Jingdezhen city were production and processing of parts and garments (4), sales of food, garments and stationery (6). Those at Shangrao city were processing (6), eateries (3) and seedling and planting management (1).

[12] Out of these, one respondent experienced inundations even after completion of the Project.

behind the feelings of safety included, for example, “dikes have been reinforced”, “reduction of anxiety about power outages and water stoppages”, “decreases in the risk of floods and inundations due to well-functioning drainage facilities” and so forth.

(2) Improvement of living conditions (landscapes and frequency of use)

In terms of landscapes surrounding dikes and pumping stations, most ordinary residents and all the business operators answered that the situation had “significantly improved” compared to the situation before completion of the Project. Furthermore, most ordinary residents answered that the frequency of use of dikes had “remarkably increased” compared to the situation before completion of the Project.

Photo 1: Shibei dike at Shangrao city
The photos on the left show conditions before the Project while the photos on the right show conditions after.

Jiujiang city

Yingtan city

Fuzhou city

Instead of simply constructing dikes, improvement of landscapes has been taken into account in the urban development plans and in response to urbanization of the cities, thereby providing residents with places of recreation.

Photo 2: Dikes at respective cities where the Project was implemented

3.3.1.2 Development of the Local Economy in the Project Areas

1) Stability of economic conditions

Through questionnaire-based interview surveys with ordinary residents and business operators, the impacts of the Project on local economic conditions were clarified. Results of the survey with ordinary residents (80 persons) revealed that most of the respondents answered that "the economic environment is stabilized to a great extent". As for the reasons behind their recognition of the stabilization of the economic environment, comments included "increase in the number of retail shops that newly opened", "price increase of real estate" and so on.

As for the survey with the business operators, nine out of the 10 business operators at Jingdezhen city responded with "stabilized to some extent" and all the respondents at Shangrao city with "greatly stabilized". Comments related to the reasons behind this included "enable to deliver and purchase as scheduled" and "price increase of real estate".

2) Development of the local economy

Although per capita real Gross Domestic Products (GDP) decreased temporarily over the period of 2004 to 2007, there was a constant increase of 10% to 15% per year in and after 2007 to 2010. In terms of the economic structure, the share of secondary industries showed an increasing trend every year and the number of enterprises and domestic investments also exhibited an upward trend. In this ex-post evaluation, it is hard to quantify the extent to which the Project for urban flood control has contributed to steady development of the macroeconomic environment. However, it can be assumed that the Project has made a contribution to the stable development of the economy.

3.3.2 Other Impacts

3.3.2.1 Impacts on the Natural Environment

1) Monitoring of the environmental aspect

Approval of the environmental impact assessment of the Project was obtained from the State Environmental Protection Administration (SEPA) (later replaced by the Ministry of Environmental Protection) in October 1999. A study (SAPROF Study) commissioned by JICA in September 1999 pointed out the possibility of air pollution caused by dust generated in the process of construction and transportation, of waste waters produced during the construction works (the main pollutants are suspended solids) and of noise generated mainly by traffic and construction machinery. In the ex-post evaluation, questions were raised about the monitoring activities and measures taken during the Project period. Although minor effects were reported, it has been confirmed that monitoring was carried out, mitigation measures were taken against the production of the dust, restrictions was imposed on the operations at night and so on. Regular monitoring has also been carried out since completion of the Project.

2) Results of the interview surveys on the environmental aspects

In the questionnaire-based interview surveys with ordinary residents and business operators, questions were asked about the impact on the water quality of rivers and lakes, and the number of migratory birds. Responses did not reveal a negative impact on the environment. Generally speaking, it is difficult to expect a positive impact on the environment directly from flood control projects. However, it can be assumed that improvement of the surrounding environment through the development of landscapes and public parks has resulted in positive perceptions of the environment on the part of ordinary residents and business operators. As far as the surveys are concerned, no negative environmental impacts have been identified.

3.3.2.2 Land Acquisition and Resettlement

At the time of the appraisal, it was planned that about 400 ha of land would be acquired and about 2,500 households (approximately 12,500 people) resettled for the implementation of the Project. The government of Jiangxi province was expected to establish a provincial-level Project Management Office (hereinafter referred to as "PMO"). Under its guidance and direction, environment and resident resettlement offices, which were scheduled to be established by the PMO in the respective cities, were expected to be in charge of actual resettlement. In addition, standing offices for the execution of resettlement were set up at Bureaus of Water Resources in the respective cities and resettlement plans had already been prepared. While unit prices for compensation were determined in accordance with government laws and ordinances, basic agreements were reached with residents through public hearings.

1) Comparison between the plan and actual in terms of resettlement and land acquisition

Comparison between the plan and the actual in terms of resettlement and land acquisition is shown in Table 6. It was confirmed that compared with the planned figures, the actual numbers of residents resettled, the floor areas of houses and acquired lands, etc. had decreased although the number of households resettled increased compared with the plan.

Table 6: Comparison of Plan and Actual concerning Resettlement and Land Acquisition
(Difference = Actual – Plan)

Item	Comparison of Plan/Actual	Families relocated (households)	Population relocated (persons)	Residential areas (floor area) (m^2)	Area of land acquired (Mu) Note 1	Out of which: cultivated areas (Mu)
Total	Plan	2,067	10,399	293,143	5,356	4,489
	Actual	2,100	8,907	214,094	3,778	1,844
	Difference	33	-1,492	-79,049	-1,578	-2,645

Source: Water Bureaus at respective cities
Note 1: "Mu" is a measurement unit for land in PRC. One Mu is about 667m^3.
Note 2: The above actual data includes resettlement and land acquisition required for the construction of new dike sections (a length of 8 km) carried out with the funds of Fuzhou city. The actual number of families resettled decreases from 33 to -4 in the above table if the section constructed with the funds of Fuzhou city is excluded.

2) Implementing bodies for resettlement

The implementing bodies for resettlement were units specializing in resettlement and land acquisition at the respective cities, or the district governments that administrated the areas for resettlement and land acquisition. At all the cities, resettlement and land acquisition were carried out with involvement of administrative units which are close to the residents, like district governments, under the unified management of the respective city governments.

3) Measures taken for minimization of resettlement

Households to be resettled were identified strictly within the boundaries where construction works were carried out. Thus, the number of households to be resettled was minimized.

4) Areas for resettlement and procedures/schedule

Resettlement was carried out in accordance with laws and ordinances. When substitute houses were provided, due care was taken in order to identify resettlement areas close to the original sites. However, it took more than one year for resettlement. The standards for compensation differed from city to city. For example, in the case of compensation for houses at Shangrao city, excluding those who wished to receive cash compensation, substitute houses were provided to residents together with transport expenses (relocation costs) of 5 yuan per m^2, and expenses for temporary resettlement (expenses incurred during a temporary resettlement period) of 5 yuan per m^2 per month over 18 months. The actual period at temporary resettlement sites was prolonged to 16 to 18 months. The reason why resettlement took such a long time was due to the construction periods required for substitute houses and also due to the fact that the resettlement was carried out, based on the overall resettlement plans of urban development projects[13]. Meanwhile, compensation was paid out of

Photo 3: Guanpaijia pumping station and the resettlement site at Jiujiang city

In the case of the resettlement required for the construction of Guanpaijia pumping station at Jiujiang city, a resettlement site was secured in an adjacent area.

[13] Interview surveys were conducted with those who were resettled at Jingdezen and Shangrao cities. Interviewees were identified through arrangements made through Bureaus of Water Resources at Jingdezen and Shangrao cities. Face-to-face interviews were carried out with 15 persons at each of the cities in December 2013, out of which 18 interviewees are male and 12 female. 19 respondents said that they had had regular income before resettlement and 23 respondents said that was the case after resettlement. Judging from the impression they gave to enumerators, five interviewees could be categorized into an upper income or rich class, 12 into a middle income class and one into a low income class. The survey results showed that interviewees at Jingdezen city attended public hearings twice and interviewees at Shangrao once prior to resettlement. All the respondents had received an explanation about the benefits that the Project would bring about. Furthermore, sufficient information was provided on resettlement procedures, compensation standards, conditions at the resettlement sites and resettlement schedules. The average distance between the original and resettlement sites was 4.9 km at Jingdezen city and 3.1 km at Shangrao city. The

government budgets in accordance with agreements with the residents to be resettled.

5) Employment of labor during the construction period

No specific measures were taken in terms of the employment of labor during the construction period.

3.3.2.3 Unintended Positive/Negative Impact

Impacts other than those described above have not been observed.

This Project has largely achieved its objectives. Therefore its effectiveness and impact are high.

3.4 Efficiency (Rating: ①)

3.4.1 Project Outputs

Outputs of the Project are flood control and urban drainage facilities such as dikes, floodgates, pumping stations. Out of the six cities targeted under the Project at the beginning, Nanchang city was excluded from the Project[14].

At the other five cities, the Outputs were modified in accordance with the progress of urbanization, etc. The main changes are shown in Table 7, together with effects on the construction schedule.

Table 7: Changes in the Outputs

City	Main changes
Jiujiang	The flood control standard for Saicheng Lake dike was upgraded from once in every 20 years to once in every 50 years. Accordingly, additional construction works were carried out and also measures were taken against damage caused by earthquakes that took place in nearby areas in 2005.
Yingtan	Due to urgency, two pumping stations were constructed with city funds.
Shangrao	Construction works were at first completed at the end of 2008. Later, additional works (additional works of 800m at Sanjiang dike and the extension of the drainage channel by 3.15km) were carried out and completed in 2010. Extension of the drainage channel was necessary because of the completion of a dam downstream in 2005. The channel was extended further to the downstream area of the dam. The number of drainage gates was decreased from the original plan. The city put in place urban drainage pipelines in tandem with urban development. Accordingly, the necessity for the construction of drainage gates decreased.
Fuzhou	Due to continuing expansion of urban areas at Fuzhou city, the route of the drainage canal planned at the planning stage was later seen to run through the industrial zone of the city. Accordingly, it was not possible to carry out construction. After changes were made to the design, dikes were constructed with the city's own funds (8km).

average period at the temporary resettlement sites was 10.7 months at Jingdezen city and 12.4 months at Shangrao city.

[14] Under the Project, it was planned at Nanchang city to improve urban drainage channels of a length of 12.1 km and modify three pipe culverts (the amount of the ODA Loan was 1.6 billion Japanese yen). Having faced rapid urban development, solving issues of flood damage became an urgent task. Therefore, the city started improving urban drainage channels using their own funds in 2002, completing the work in 2005.

As the Project period was extended, the initial plan was altered due to the effects of urbanization. By adjusting measures to match changes in the situations, such as the utilization of contingencies of the ODA Loan, the allocation of city budgets and so on, the Outputs were realized so as to attain the results originally expected.

Table 8: Comparison of Plan and Actual Outputs

(1) Plan of the flood control project

Item	Construction of new dikes	Rehabilitation/ reinforcement of dikes	Rehabilitation/ construction of drainage gates	Enhancement/ construction of pumping stations	Rehabilitation/ construction of river channels
Unit	km	km	site	site	km
Nanchang	0.0	0.0	3	0	12.1
Jiujiang	0.0	21.2	0	10	0.0
Jingdezhen	13.5	3.4	12	7	2.1
Yingtan	1.4	4.9	0	4	0.0
Shangrao	5.0	17.4	17	5	9.6
Linchuan	11.0	28.6	5	3	0.0
Total	**30.9**	**75.5**	**37**	**29**	**23.8**
Total excluding Nanchang	**30.9**	**75.5**	**34**	**29**	**11.7**

(2) Actual of the flood control project (excluding Nanchang city)

Item	Construction of new dikes	Rehabilitation/ reinforcement of dikes	Rehabilitation/ construction of drainage gates	Enhancement/ construction of pumping stations	Rehabilitation/ construction of river channels
Unit	km	km	site	site	km
Nanchang	Cancelled				
Jiujiang	0.0	20.4	0	8	0.0
Jingdezhen	16.7[Note 1]	3.5	9	7	3.7
Yingtan	1.4	4.9	0	4[Note2]	0
Shangrao	5.8	17.2	9	5	11.7
Linchuan (Fuzhou)	2.9 (10.9)[Note3]	22.1	5	3	0
Total	**26.8 (34.8)**	**68.1**	**23**	**27**	**15.4**
Comparison of plan and actual excluding the scope at Nanchang city					
Actual (2) - Plan (1)	**-4.1 (3.9)**	**-7.4**	**-11**	**-2**	**3.7**

Source: JICA appraisal documents, Bureaus of Water Resources at the respective cities
Note 1: City funds were utilized for 2.5 km out of 16.7km.
Note 2: By use of city funds (4 sites)
Note 3: City funds were used for 8.0km out of 10.9km. Table 9 below (comparison of the Project costs) shows one case where the Project cost includes costs for the civil works of new sections, land acquisition and compensation using city funds and another case where the Project cost does not include these, as explained in Note 3 of the table.

3.4.2 Project Inputs

3.4.2.1 Project Cost

The Project cost was calculated as in Table 9. The classification of the foreign and local portions of the Project costs calculated by Bureaus of Water Resources at the respective cities was different to that at the time of the Project appraisal. In principle, the ODA Loan portion was classified into the foreign currency portion while the funds of cities themselves was classified into the local currency portion. The planned Project cost, excluding the estimated amount that corresponds to the portion at Nanchang city, was 17,385 million Japanese yen. The actual amount was 21,816 million Japanese yen, which exceeded the planned amount by about 25% (if the relevant activities funded with the budget of Fuzhou city are included, the actual amount increases to 25,910 million Japanese Yen, which exceeds the planned amount by 49%).

The cost of the civil works increased remarkably. A number of reasons behind the increase in the Project cost have been pointed out. As time passed from the commencement of the Project to the commencement of the construction works, it became necessary to make adjustments in terms of designs, the conditions for construction, the quantity of construction materials and so on. The level of prices also changed. According to interviews at the respective cities during the ex-post evaluation, factors for cost increases included the extension of construction works, an increase in the land acquisitions and compensation costs due to an increase in price levels and house prices, and changes in the scope and size of the construction works due to urban development.

Table 9: Comparison of the Project Costs

Expenditure items	Plan			Actual		
	Foreign currency (Million JPY)	Local currency (10,000 yuan)	Total (Million JPY)	Foreign currency (Million JPY)	Local currency[Note2] (10,000 yuan)	Total (Million JPY)
A. Civil works, etc.	0	719.91	10,799	7,258	462 (618)	13,703 (15,876)
B. Pumping equipment, etc.	1,099	0.00	1,099	1,639	6	1,723
C. Land acquisition/ compensation	0	203.25	3,049	0	379 (517)	5,286 (7,207)
D. Administration	0	134.78	2,022	0	66	922
E. Price contingencies	35	94.82	1,458	0	0	0
F. Physical contingencies	116	101.84	1,644	0	0	0
G. Interest during construction	0	29.26	439	0	13	182
Total	1,250	1,283.86	20,508	-	-	-
Total (excluding portion of Nanchang city)			17,385	8,897	926 (1,220)	21,816 (25,910)

Source: Water Resource Department of Jiangxi province and Bureaus of Water Resources at the respective cities
Note 1: Actual foreign exchange rate: 13.944 JPY/yuan (an average of the annual averages from 2000 to 2011) from the International Financial Statistics, IMF.
Note 2: The numbers may not necessarily sum up due to rounding.
Note 3: The actual amounts in the brackets for local currency include the costs required for civil works, land acquisition and compensation, which were born by Fuzhou city.
Note 4: The actual amount of the interest during construction, which was born by the respective cities, is the accumulated amount of interest paid as of August 2010.

The cost of land acquisition and compensation was increased compared with the plan as shown in Table10. In particular, expenditure relating to houses at Yingtan and Shangrao cities, and land acquisition and houses at Fuzhou city increased remarkably against the plans.

Table10: Land acquisition and compensation costs

Unit: 10,000 yuan

Item	Jiujiang	Jingdezhen	Yingtan	Shangrao	Fuzhou	Total
Actual (2) - Plan(1)	-292	-320	5,416	13,759	3,423 (17,199)	21,984 (35,761)

Source: Bureaus of Water Resources at the respective cities
Note: The amounts in brackets include the costs of land acquisition and compensation, which were necessitated by civil works carried out with the funds of Fuzhou city.

As described above, the Project cost was higher than planned (149% against the plan).

3.4.2.2 Project Period

The Project period was significantly longer than planned. The Project period originally planned was 57 months from April 2000 to December 2004. The actual period was 133 months from March 2000, when the loan agreement was signed, to March 2011 when the Project was completed[15]. In particular, a lot of time passed before commencement of the construction works[16].

Table 11: Project period: Planned and Actual

Item/Action	Plan	Actual (at the time of the ex-post evaluation)
Signing of Loan Agreement (L/A)	January 2000	Signing: March 2000, effectuation: March 2002
Preparation of tender documents	April 2000 to September 2000	Not available
Tender – conclusion of contracts	July 2000 to June 2001	- Announcement of Prequalification (P/Q) in October 2002 - Concurrence to evaluation results of the tender at Jiujiang in March 2004, which is the earliest date among the five cities.
Civil works	October 2000 to December 2004	Civil works were started from April 2004 at Jiujiang city and completed in March 2011 including additional works.

[15] According to information provided by JICA, the Project completion date was set at December 2004, based on the premise that the Loan Agreement (hereinafter referred to as "L/A") would be concluded in January 2000. The definition of the Project completion was set as " the acceptance of all the facilities for the Project according to relevant national standards, and that the acceptance should be conducted by the six municipal governments".

[16] It took two years to effectuate the L/A. During this period, the report on the feasibility study (hereinafter referred to as "F/S") was approved by the State Development Planning Commission (currently renamed as "The National Development and Reform Commission") in September 2001, a sub-loan agreement was concluded between the Jianxi Provincial Department of Finance and the Export-Import Bank of China in December 2001. As a sub-loan agreement to be concluded after an F/S report is approved by the State Development Planning Commission, it is thought that the reason behind the large amount of time spent for the effectuation of the L/A was due to delays in approval of the said report for various reasons.

Item/Action	Plan	Actual (at the time of the ex-post evaluation)
Purchase/installation /operation of equipment	October 2000 to December 2004	Not available
Project completion (Project period)	December 2004 (57 months)	March 2011 (133 months)
Project completion date	March 6, 2009 (scheduled at the time of signing L/A)	March 7, 2011

Sources: JICA appraisal documents and interviews during the site survey.

The final disbursement date was extended from March 2009, the original date, to March 2011. The reasons behind this extension were the time required for the internal procedures of PRC in order to rectify the preliminary design, effects of natural disasters on construction schedules, and the necessary procedures for contract amendments due to adjustments in the construction works.

According to the plan, the period of the civil works was scheduled for 39 months from October 2000 to December 2004. As far as the construction periods, excluding those for additional works, are concerned at the respective cities, construction was carried out without a substantial delay, although there are some differences observed depending on the cities.

Meanwhile, no consultant was employed under the Project. Although the JICA appraisal mission and the Jiangxi Provincial Government agreed to discuss whether and how training sessions targeted at the Jiangxi Provincial government and municipal (i.e., city) officials should be conducted at the time of the appraisal, before the L/A was to be effectuated, it was not confirmed that these training sessions had been implemented.

As described above, although the Project period substantially exceeded the planned schedule, it is considered that the Project was properly implemented after the commencement of the construction works.

3.4.3 Results of Calculations of Internal Rate of Return (Reference only)

Because it was not possible to obtain reliable data to estimate economic benefits nor to accurately calculate the Economic Internal Rate of Return (EIRR), a recalculation of EIRR was not conducted at the time of the ex-post evaluation.

As described above, the Project cost exceeded the plan, while the Project period significantly exceeded the plan. Therefore, the efficiency of the Project is low.

3.5 Sustainability (Rating: ③)

3.5.1 Institutional Aspects of Operation and Maintenance

(1) Operation during the Project implementation period

The main Outputs of the Project are the flood control and urban drainage facilities. The executing agency of the Project was Jiangxi Provincial People's Government. In the Provincial

People's Government, a Project Leading Group (hereinafter referred to as "PLG") was scheduled to be formed. PLG had the authority to make decisions on important issues, and was obliged to instruct on and oversee the overall progress of the Project. Under the guidance of PLG, a PMO was expected to be set up as a practical implementing body in order to communicate and coordinate with the respective city governments and JICA, as well as actually managing and implementing the Project. Likewise at city level, it was planned that PLG would be headed by the tops of the respective governments, under which PMO were supposed to be established to supervise the Project, carry out financial management, etc. At the time of the ex-post evaluation, the operational conditions during Project implementation, particularly at the provincial level, had not been confirmed due to the transfer of relevant personnel. However, based on interviews with the relevant personnel of the Project and responses to the questionnaires, it was assumed that the Project was implemented as planned.

(2) Operation and maintenance after completion of the Project

City and county governments were scheduled to be in charge of the operation and maintenance of the facilities after completion of the Project. It was confirmed at the time of the ex-post evaluation that the flood control and urban drainage facilities had been under the operation and management of the riverbank management offices and the pumping station management offices, etc. of the Bureaus of Water Resources at the respective cities. At each Bureau of Water Resources, staff members, including engineers and general technicians, are assigned for the operation and maintenance of facilities, including routine and periodic maintenance[17]. In addition, at some places, where dikes are integrated into public parks, the operation and maintenance of public parks are contracted out by cities' Landscaping and Greening Management Bureaus for plant management and Departments of Environment and Sanitation Management for garbage collection and weeding.

[17] For example, at the Bureau of Water Resources of Jiugiang city, Jiugiang river and lake management office and Jiugiang urban pumping station management office are engaged in the operation and maintenance. At the time of the ex-post evaluation in 2013, the total number of staff engaged in the operation and maintenance was 144, out of which 30% was engineers (including six senior engineers).

Table 12: Operation and maintenance system of facilities and equipment at the time of the ex-post evaluation

City Government	O&M organization	Operation and maintenance system	Implementation of routine and periodic inspections
Jiujiang	- Department of River and Lake Management, Bureau of Water Resources at Jiujiang city - Jiujiang Urban Pumping Station Management Office	The number of staff working at the Bureau of Water Resources totals more than 200, out of which 144 are engaged in maintenance works. Out of 144, 30% are engineers. Among the engineers, there are six senior engineers.	With regard to dikes, a riverbank patrol inspection system and a routine patrol system are adopted. Cleaning works, including garbage collection, are carried out every day, weeding is once a month, and repair works are periodically conducted (through outsourcing). Routine inspection at pumping stations is carried out on a daily basis. Periodic inspections are carried out from October to March (the rainy season lasts from April to October. In particular, heavy rains are concentrated in the period from May to July).
Jingdezhen	- Department of River and Riverbank Management, Bureau of Water Resources at Jingdezhen city	The number of staff working at the Bureau of Water Resources totals 150, out of which 70 work for the operation and maintenance division (15 are administrative staff and 55 are technical personnel (out of which, 28 are engineers and 27 are general technicians)). A qualification system exists for pump operations.	Routine inspections are carried out over all the dikes once every 10 days. During the rainy season (from April to August), daily patrols are conducted. Periodic inspections at pumping stations are conducted from January to March. All the test runs are carried out. Plant management is carried out by the Landscaping and Greening Management Bureau of the city, and garbage collection and weeding are outsourced.
Yingtan	- Department of Flood Control Construction Work Management, Bureau of Water Resources at Yingtan city	The number of staff at the Bureau of Water Resources totals 100. Out of these, 15 are assigned for the operation and maintenance of dikes and pumping stations (assigned concurrently). Out of the total 100, 20 are administration staff, 20 are general staff (such as drivers), 60 are technical personnel (out of which, 30 are engineers and another 30 are general technicians). A qualification system is applied to the operation of pumps.	Routine inspection of dikes is carried out every day during the rainy season (from April to September) and once every half a month during the dry season. Inspection of pumping stations is conducted every day during the rainy season and periodic inspection is carried out twice a year (during the dry season). Plant management is carried out by the Landscaping and Greening Management Bureau of Yingtan city together with management of parks. Garbage collection and weeding are carried out by the Department of Environment and Sanitation Management at Yingtan city.
Shangrao	- Department of Urban Flood Control Construction Work Management, Bureau of Water Resources at Shangrao city	The total number of staff at the Bureau of Water Resources is 300. Out of these, 49 are in charge of the operation and maintenance of facilities and equipment. Out of these 49, 16 are working on dikes, drainage gates and water channels and 21 are for pumping stations. These 49 staff members include 12 administrative/general staff members, 37 technical personnel (out of which 7 are engineers and 30 are general technicians). There are 30 qualified personnel for pump operations.	Routine inspection of dikes is carried out once a day. During the rainy season from April to August, the frequency of the patrol is increased. Pumping stations are operated for 24 hours in three shifts and daily operating conditions are recorded. Periodic inspection is carried out three times a year in total: before, during and after the rainy season. Management of plants is carried out by the Landscaping and Greening Management Bureau of Shangrao city. Garbage collection and weeding are carried out by the Department of Environment and Sanitation Management of Yingtan city.

City Government	O&M organization	Operation and maintenance system	Implementation of routine and periodic inspections
Fuzhou (Linchuan)	- Department of Urban Flood Control Construction Work Management, Bureau of Water Resources at Fuzhou city - Office of Shangdundu Riverbank Management at Linchuan District, Bureau of Water Resources at Fuzhou city	The total number of staff at the Bureau of Water Resources is 60. Out of these, 25 personnel are working at the Department of Urban Flood Control Construction Work Management (12 persons) and the Office of Shangdundu Riverbank Management at Linchuan District (13 persons). Out of these 25 persons, 13 are in charge of the operation and maintenance of dikes (maintenance of gates and water channels) and 4 are in charge of pumping stations (4 persons work on a full time basis. At the pumping station visited by the external evaluator, 6 persons, including part-time workers, were working in three shifts), and 8 are in charge of administration. Out of the 17 persons who are in charge of the operation and maintenance of dikes and pumping stations, 12 are engineers and 5 are general technicians. There are four qualified personnel for pump operations.	Routine inspection of dikes is carried out twice a week during the flooding season (from April to June) and once a week in the rest of the time. Routine inspection of pumping stations is undertaken every day during the major flooding period (in June). The Landscaping and Greening Management Bureau of the city is in charge of construction and management of public parks including plant management, garbage collection and weeding.

Source: Bureaus of Water Resources at the respective cities

Changes in the number of staff members in charge of the operation and maintenance are shown in Table 13.

Table 13: Number of staff in charge of operation and maintenance

Unit: Persons

City	2010	2011 (Project completion)	2012	2013 (Ex-post evaluation)
Jiujiang	138	142	142	144
Jingdezhen	58	60	65	70
Yingtan	15	15	15	15
Shangrao	45	45	45	49
Fuzhou	25	25	25	25

Source: Bureaus of Water Resources at the respective cities

The facilities subject to operation and maintenance vary depending upon the cities. There are large differences in terms of the number of staff members and maintenance budgets, as described later. Some Bureaus of Water Resources commented that they found it difficult to carry out maintenance because they were responsible for the operation and maintenance of wider areas of dikes while others set up monitoring cameras at pumping stations in order to monitor water levels, making up for shortage of human resources. Bureaus of Water Resources at the respective cities have been taking counter-measures against such issues as shortages of human resources and have been carrying out the operation and maintenance works of facilities and equipment developed under the Project, keeping them out of major trouble.

3.5.2 Technical Aspects of Operation and Maintenance

The general observation on the technical level of the operation and maintenance is that

Bureaus of Water Resources are capable of routine operation and maintenance works and carrying out minor repair works, although some of them pointed out a necessity to improve expertise and strengthen techniques for routine maintenance in the future.

Training is regularly conducted by the Water Resources Department of Jiangxi province and the Bureaus of Water Resources at the respective cities. When equipment is newly installed, training is offered by the manufactures and/or suppliers of the equipment.

Manuals for the management of dikes and pumping stations are made available and procedures for operation and maintenance are posted at offices in order to ensure that routine maintenance is carried out thoroughly.

3.5.3 Financial Aspects of Operation and Maintenance

Operation and maintenance budgets at the respective cities are different, depending upon the scale of the facilities to be operated and managed. The amount of budgets in the last four years are either stable or on an increasing trend. Some Bureaus of Water Resources commented that they faced shortages in operation and maintenance budgets and found it difficult to carry out monitoring works due to the wide area of the dikes for which they have responsibility. However, other Bureaus of Water Resources responded that the level of operation and maintenance budgets were sufficient or fair. In the case of Yingtan and Shangrao cities, additional budgets were received from the cities if they faced budgetary shortages. Observing that routine and periodic inspections have been carried out, it is considered that budgets are allocated without causing major hindrances.

3.5.4 Current Status of Operation and Maintenance

Some Bureaus of Water Resources commented that it was difficult to implement routine patrols because urbanization had progressed and areas to be protected with dikes had expanded, together with the areas for which they were responsible. Others explained that the renewal of parts for newly installed equipment was too fast to keep up with. However, as far as the conditions of facilities and equipment assisted under the Project were directly observed on site, it is thought that they are properly operated and maintained as the Bureaus of Water Resources at the respective cities are adopting counter-measures against these issues.

In terms of the operation and maintenance of facilities, as equipment at pumping stations is made in PRC, part replacement can be made without causing hindrances. As for dikes as well, no major issues were identified during the on-site visits. It was confirmed that facilities have been maintained in relatively good condition through the routine patrols of dikes, the routine and periodic inspections of pumping stations, etc.

No major problems have been observed in the institutional, technical and financial aspects of the operation and maintenance system. Therefore sustainability of the Project effect is high.

4. Conclusion, Lessons Learned and Recommendations

4.1 Conclusion

The Project aims to construct or repair dikes, floodgates, and pumping stations in six cities around Poyang Lake in Jiangxi Province in order to improve the flood control capacity of the respective cities, thereby contributing to the prevention of flood damage, the stabilization of local societies and economy and to an improvement in the living conditions of the local people.

This Project is highly relevant to China's development policies, in which the Changjiang River master plans have been continuously updated and river development has been promoted, to the needs of the target cities, and to the Japan's ODA policy towards China. Since 2005, after commencement of the construction works, the Project effects have gradually started appearing and the Project has contributed to improvement in flood control capacity and the prevention of flood damage in the areas to be protected within the respective cities, to stabilization of the economy and societies and to improvements in living conditions. Therefore, the effectiveness and impacts are high. In terms of efficiency, a longer time was necessary for the preparation period, including the amount of time required for the loan agreement to be effectuated, before commencement of the construction works. This, coupled with the implementation of additional construction works, meant that the Project period greatly exceeded the original schedule. Furthermore, the Project cost had increased and surpassed the plan at appraisal time due to increases in construction costs, land acquisition and compensation and changes in the original plan due to the effects of urbanization. Thus, the efficiency is low. As for sustainability, no major problems have been observed in the institutional, technical and financial aspects of the operation and maintenance of the Project. Thus, the sustainability is high.

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

4.2 Recommendation

4.2.1 Recommendation to the Executing Agency

None.

4.2.2 Recommendation to JICA

None.

4.3 Lessons Leaned

(1) Utilization of JICA's Technical Assistance for the Implementation of Japanese ODA Loan Projects

Under the Project, it took a long time from the signing date of the loan agreement to the commencement of the construction works. In order to prevent delays in procedures when no consultant is employed, it is recommended that JICA proactively introduce and promote "technical assistance for the implementation of Japanese ODA loan projects", which is a JICA

technical assistance scheme for ODA loans to ensure smooth project implementation, and that executing agencies timely utilize the scheme.

(2) Alignments with Other JICA Schemes

A technical cooperation project called the " Human Resource Development Project for Water Resources, P.R.C" was carried out during the implementation period of the Project. When relevant projects are implemented in parallel with a project, synergy effects can be expected if those engaged in the project are arranged so as to participate in the relevant projects as trainees and/or if the activities of both projects are aligned for the implementation of some activities.

(3) Incorporation of a Coordination Mechanism among Relevant Organizations during the Project Implementation Period

As rapid economic development and urbanization progress, situations may arise where Project scopes planned at the time of appraisal may not necessarily meet the development needs of infrastructure, as was seen from the comparison of the plan and actual Outputs of the Project. For example, it was reported that the surrounding area of a drainage canal, which was originally planned under the Project, turned later into an industrial zone with the progress of urban development. Consequently, construction sections were changed and the relevant works were carried out with the city's own funds. At the planning stage, it is necessary to discuss, in advance, the ways in which project scopes can be adjusted in a timely manner (for example, with the establishment of a platform for periodic meetings between central and local governments and JICA) even if changes that are not sufficiently expected at the time of appraisal emerge during a project implementation period.

Comparison of the Original and Actual Scope of the Project

Item	Original	Actual
1.Project Outputs	Refer to Table 8	Refer to Table 8
2.Project Period	January 2000 - December 2004 (57 months)	March 2000 - March 2011 (133 months)
3.Project Cost		
Amount paid in foreign currency	1,250 million yen	8,897 million yen
Amount paid in local currency	19,260 million yen (= 1,284 million yuan)	12,919 million yen (= 926 million yuan)
Total	20,508 million yen	21,816 million yen
Japanese ODA loan portion	11,000 million yen	8,926 million yen
Exchange rate	1 yuan = 15 yen (As of October 1999)	1 yuan = 13.944 yen (Annual average from 2000 to 2011)

People's Republic of China

Ex-Post Evaluation of Japanese ODA Loan

"Inland Higher Education Project (Regional Vitalization, Market Economy Reform Support, and Environmental Conservation) (Xingjian Uygur Autonomous Region)"

External Evaluator: Naomi Murayama, OPMAC Corporation

0. Summary

The objective of this project (hereinafter referred to as "the Project") was to improve higher education in Xingjian Uygur Autonomous Region (hereinafter referred to as "XUAR") quantitatively and qualitatively by supporting the construction of buildings, the procurement of equipment and the training of teachers in the target universities. This objective was consistent with China's development plan and development needs as well as with Japan's ODA policy at the time of both the appraisal in 2003 and the ex-post evaluation; therefore its relevance is high. The effectiveness and impact of the Project was high because quantitative indicators (building areas, amount of educational equipment) and qualitative indicators (number of key faculties and laboratories, number of research papers, etc.) have improved. Moreover, there are many cases of good practice in the utilization of buildings, equipment and training supported by the Project. The outputs were essentially completed in line with the initial plans, and the project cost was within the plan. The project period, however, was significantly longer than planned; therefore the efficiency of the project is fair. No major problems have been observed in all institutional, technical and financial aspects of the operation and maintenance system and its current status is very good; therefore the 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

General Laboratory Building
Xinjiang Agricultural University

1.1 Background

The XUAR government aimed at permeation of a market economy and further economic development with a 9.0% annual average GDP growth rate and industrial adjustments in "the 10th XUAR Five-Year Plan (2001-2005)". The XUAR government recognized the necessity of expanding higher education in order to attain its objective. It announced a policy to raise the higher education enrollment rate from 12.8% in 2001 to 14.8% in 2005 and the number of students in higher education from around 218 thousand in 2001 (out of this total, 110 thousand were ordinary higher education students), to about 231 thousand by 2005 (with approximately 138 thousand ordinary higher education students).

1.2 Project Outline

The objective of the Project was to upgrade higher education in both quality and quantity for eight important institutes[1] in XUAR by supporting the construction of school buildings, the procurement of educational equipment and the training of teachers in Japan, thereby contributing to regional vitalization, market economy reform and environmental conservation.

Loan Approved Amount/ Disbursed Amount	4,598 million yen / 4,524 million yen
Exchange of Notes Date/ Loan Agreement Signing Date	March, 2003 / March, 2003
Terms and Conditions	Interest rate: 2.2% (0.75% for training component) Repayment period: 30 years (40 years for training component) (Grace period) (10 years) Conditions for procurement: General untied
Borrower / Executing Agency	The Government of the People's Republic of China / Xingjian Uygur Autonomous Region People's Government
Final Disbursement Date	July, 2011
Feasibility Studies, etc.	1. F/S: "Feasibility Study Report" (China International Engineering Consulting Corporation in XUAR, May 2002) 2. JICA report: 1) "FY 2001 Special Assistance for Project Implementation(SAPI) for the Higher Education Project in China" (August 2003) 2) "Special Assistance for Project Implementation (SAPI) for a Higher Education Project in the People's Republic of China" (March 2004) 3) "SAPI for a Higher Education Project in China" (May 2005) 4) "The Supervision Survey Report on JICA Loaned Higher Education Project" (2010)

[1] The target universities are1) Xinjiang Agricultural University, 2) Xinjiang Medical University 3) Xinjiang Normal University, 4) Xinjiang University of Finance and Economics (former Xinjiang Institute of Finance and Economics), 5) Xinjiang Arts College, 6) Ili Normal University, 7) Kashgar Teachers' College, 8) Changji Institute

2. Outline of the Evaluation Study

2.1 External Evaluator

Naomi Murayama, OPMAC Corporation

2.2 Duration of Evaluation Study

Duration of the Study: August, 2013 – November, 2014

Duration of the Field study: December 2, 2013 – December 27, 2013,
March 9, 2014 – March 17, 2014

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

3.1 Relevance (Rating: ③[3])

3.1.1 Relevance to the Development Plan of China

At the time of appraisal, China was admitted to the World Trade Organization (hereinafter referred to as "WTO") in December 2001 and has been aiming at high rates of economic growth, and openness and reform through industrial structural adjustment. On the other hand, disparities between coastal and inland areas, and between urban and rural areas, have been issues in China. To address increasing environmental issues, not only the government initiatives but also more comprehensive approaches were needed, including human resource development and research on environmental conservation by higher educational institutions.

It was expected that the Project would contribute largely to regional vitalization, market economy reform and environmental conservation by human resource development through supporting tertiary education in one of China's inland areas. The Project objectives complied with "the 10th Five-Year Plan for National Economic and Social Development", "the 10th Five-Year Plan for Education", "China Western Development", "the 10th XUAR Five-Year Plan" and "the 10th XUAR Five-Year Plan for Education" at the time of appraisal.

At the time of the ex-post evaluation, the "National Mid- and Long-Term Reform and Development Plan for the Education Sector (2010-2020)" had been formulated in addition to "the 12th Five-Year Plan for National Economic and Social Development", "the 12th Five-Year Plan for Education", "China Western Development", "the 12th XUAR Five-Year Plan" and "the 12th XUAR Five-Year Plan for Education". In line with these plans, China has been promoting human resource development and environmental conservation for further economic growth, together with further openness and reform.

3.1.2 Relevance to the Development Needs of China

At the time of the appraisal, the quantitative demand for higher education was growing, against the background of an increase in the number of secondary graduates and the government

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

[3] ③: High, ②: Fair, ①: Low

policies for the increase in the number of higher education students. However, insufficient capacity of facilities and teaching staff at universities was an issue. In order to address the issue, the enhancement of higher education from the aspects of infrastructure, human resources and finance was needed. The Project supported the enhancement of higher education; therefore it was consistent with the development needs of China.

Table 1: Number of Post-secondary Students and Tertiary Enrollments in XUAR

Unit: thousand

	2006 (Target)	2006 (Actual)	2012 (Actual)
Post-secondary students	85.5	115.4	135.1
Tertiary enrollments	80.3	81.1	104.3
Ordinary tertiary enrollments	41.0	59.2	78.0

Source: Xingjian Uygur Autonomous Region People's government
Note: Higher education institutions (tertiary) include vocational technical schools, short-term higher education, four-year universities, and graduate schools. Ordinary tertiary institutes include only four-year universities and graduate schools. In this chart, these indicate institutions excluding graduate schools.

In XUAR, along with the increase of secondary graduates, tertiary enrollments had increased more than the demand estimation at the time of appraisal. In particular, the number of ordinary tertiary enrollments had increased about 32% between 2006 and 2012 (Table 1).

The target universities were selected for reasons as shown in Table 2 at the time of appraisal. These universities were still important institutions for human development in XUAR at the time of the ex-post evaluation.

Table 2: Selection reasons for the target universities

University	Selection Reasons
Xinjiang Agricultural University	It is the only higher education institute for agriculture with multi-faculties in Xinjiang and plays an important role in making agriculture and pastoral farming more sophisticated.
Xinjiang Medical University	It is the only medical university with regular faculties in Xinjiang.
Xinjiang Normal University	It is the only normal "university" and a focal point of bilingual education and teacher training in Xinjiang.
Xinjiang University of Finance and Economics	It is the only ordinary higher education institute for finance and economics in Xinjiang. It also one of the key universities designated by the Xinjiang government.
Xinjiang Arts College	It is the only ordinary higher education institute for art in the northwest.
Ili Normal University	It is a higher education institute to foster bilingual teachers for schools in the pasturelands.
Kashgar Teachers' College	It is the only teacher training institute with regular faculties in the southern part of Xinjiang.
Changji Institute	It is located in a Muslim autonomous prefecture and plays an important role in fostering and training bilingual teachers.

Source: Responses to the questionnaire

At the time of Project implementation, the higher education budget of XUAR was limited. On the other hand, the development of buildings and equipment at universities was an urgent

issue in order to address the increasing need for higher education. From this point of view, the timing of the Project implementation was very effective. As of 2012, the higher education budget of XUAR had increased more than twelvefold from the budget before Project implementation (FY 2001). The buildings and equipment developed under the Project served as a stepping stone to the further development of the higher education institutes in XUAR (Table 3).

Table 3: Higher Education Budget in XUAR

Unit: RMB thousand

FY 2001	FY 2006	FY 2012
391,750	639,640	4,802,570

Source: Responses to the questionnaire

3.1.3 Relevance to Japan's ODA Policy

Japan's ODA Charter at the time of appraisal placed importance on assistance in the Asian region and assistance in human resource development; therefore the project objectives were consistent with Japan's ODA policy.

Furthermore, the Country Assistance Program for China, the Medium-Term Strategy for Overseas Economic Cooperation Operations and the Country Assistance Strategy for China at the time of appraisal made human resource development a priority from the viewpoint of support for openness and reform (market rules), environmental conservation, and regional development (including progress in Japan-China exchanges). The project objectives were therefore also consistent with Japan's aid policies.

This project has been highly relevant to the country's development plan and development needs, as well as to Japan's ODA policy. Therefore its relevance is high.

3.2 Effectiveness[4] (Rating: ③)

3.2.1 Quantitative Effects (Operation and Effect Indicators)

In this ex-post evaluation study, the evaluator analyzed the quantitative effects using the indicators directly related to the three Project components, i.e. building construction, the provision of educational equipment and training. Specifically, for quantitative improvement, contributions of the Project to increases in the number of students were evaluated by analyzing the areas of school buildings (floorage), the monetary value per student of educational equipment and the utilization rate of school buildings and educational equipment. For qualitative improvements, the educational environment was analyzed by floorage per student and the monetary value per student of educational equipment. The contribution made by the Project to aspects of education and research was then evaluated based on the number of key faculties, key laboratories, research papers, research projects and so forth.

[4] The sub-rating for Effectiveness is to be dealt with in consideration of Impact.

3.2.1.1 Improvements in Quantity

(1) Changes in the number of students

In China, the number of higher education institutes and university students has sharply increased since the release of the "Action Plan for Educational Vitalization Facing the 21st Century" in 1998, which aimed at an increase in the university enrollment rate from 9.8% in 1998 to 15.0% in 2010. In the meantime, the number of higher education institutes in XUAR increased from 37 in 2001 to 54 in 2012 and the number of students in XUAR increased 1.7 times, from 218 thousand in 2001 to 379 thousand in 2012.

The number of students at the target universities steadily increased and, except for Kashgar Teachers' College, the universities had attained their targets as of 2012. This can be attributed to the fact that the universities were able to respond to the increase in students thanks to facilities equipped by the Project and because of an increase in budget allocation from the Chinese government. The Education Department decides on a student quota for each higher education institute every year based on the number of teachers, the equipment, facilities, building areas and regional factors, in order to secure the quality of education. In the case of Kashgar Teachers' College, the building area as of 2012 had not expanded as much as estimated at the time of appraisal and therefore the student quota had also not increased as much as estimated at the time of appraisal (Table 4).

Table 4: Increase in students at the target universities

Unit: person

	Baseline (2001)	**Target (2006)**	**Actual (2006)**	**Actual (2012)**	**Increase compared to baseline**	**Growth rate (%) (2001 -2012)**
Xinjiang Agricultural University	11,004	16,200	17,073	22,857	11,853	107.7
Xinjiang Medical University	6,466	8,000	9,259	14,045	7,579	117.2
Xinjiang Normal University	9,671	13,500	14,266	17,372	7,701	79.6
Xinjiang University of Finance and Economics	6,809	12,600	12,819	16,411	9,602	141.0
Xinjiang Arts College	975	2,900	2,576	3,463	2,488	255.2
Ili Normal University	4,767	8,030	9,133	11,600	6,833	143.3
Kashgar Teachers' College	7,541	13,371	11,239	11,720	4,179	55.4
Changji Institute	5,011	6,000	6,480	7,255	2,244	44.8
Total	52,244	80,601	82,845	104,723	52,479	100.4

Source: Responses to the questionnaire

(2) Changes in school building areas

To meet the increase in university students mentioned above (1), each target university constructed teaching and laboratory buildings and so on. The school building areas of most target universities increased drastically. As of 2012, a year after the Project completion, more

than half of the target universities had attained the target (Table 5)[5]. Xinjiang Arts College, Xinjiang University of Finance and Economics, Kashgar Teachers' College and Changji Institute, where school building areas were small compared to the target as of 2012, have started enhancing their new campuses and constructing new school buildings so that these school building areas will be expanded

Table 5: Changes in school building areas at the target universities

Unit: m^2

	Baseline (2001)	Target (2006)	Actual (2012)	Growth rate (%) (2001-2012)	Project area	Project share (%)
Xinjiang Agricultural University	83,172	130,998	331,537	298.6	16,100	4.86
Xinjiang Medical University	82,985	177,832	209,605	152.6	14,051	6.70
Xinjiang Normal University	90,035	148,158	239,127	165.6	6,744	2.82
Xinjiang University of Finance and Economics	149,653	204,653	197,884	32.2	13,037	6.59
Xinjiang Arts College	39,597	82,152	40,094	1.3	9,556	23.83
Ili Normal University	25,331	54,230	102,947	306.4	16,700	16.22
Kashgar Teachers' College	90,015	123,908	99,743	10.8	8,100	8.12
Changji Institute	47,000	79,000	62,275	32.5	9,143	14.68

Source: Responses to the questionnaire

Although the Project buildings do not necessarily account for a large share of the building areas of each university, the Project has largely contributed to an enhancement of the floorage of those universities which originally had small school building areas. Ili Normal University, especially, was in danger of being closed in the face of the "Undergraduate University Teaching Level Evaluation[6]" conducted by the Ministry of Education of China in 2007 as it did not reach the standard. However, the university was able to attain the standard by developing facilities under the Project. This, the only higher education institute located in a minority area, was able to survive thanks to the Project, which enabled it to continue to provide the minority with chances to receive higher education. The Project played a significant role in this.

(3) Changes in the monetary value of educational equipment

In XUAR, the monetary value of educational equipment per student increased drastically. The Undergraduate University Establishment Standards of China, of the Ministry of Education of the People's Republic of China, has the following requirements: that the monetary value of

[5] All the universities have continuously reconstructed their school buildings. At times when school buildings had just been demolished or were under constructions, the school building areas decreased temporarily. Therefore, it is difficult to make a simple comparison with the target because changes in the floorage depend on the point of time when data was collected.

[6] The evaluation system for higher education introduced by the Ministry of Education of China. Once every five years, school operations and the quality of education are evaluated. The first phase of evaluation was conducted from 2003 to 2008. The results are evaluated on a four-point scale. Only Xinjiang Normal University was evaluated as "good" while the others were evaluated as "excellent".

educational equipment per student for science faculties is not less than RMB 5,000; for literature and social faculties, not less than RMB 3,000; for gymnastic and art faculties, not less than RMB 4,000. None of the target universities met this requirement before Project implementation. After Project completion, however, all the target universities met this requirement (Table 6).

Table 6: Monetary value of educational equipment

Unit: RMB

	Baseline (2001)	Actual (2006)	Actual (2012)
Xinjiang Agricultural University	1,900	4,800	7,960
Xinjiang Medical University	2,394	7,148	9,911
Xinjiang Normal University	1,277	4,308	8,772
Xinjiang University of Finance and Economics	861	1,896	5,003
Xinjiang Arts College	2,000	4,500	12,000
Ili Normal University	1,732	2,830	5,673
Kashgar Teachers' College	1,610	3,850	6,400
Changji Institute	n.a.	2,158	7,313

Source: Responses to the questionnaire

The total amount of educational equipment at each target university greatly increased (Table 7). The increase in the total amount of educational equipment at Xinjiang Arts College, for which the amount had been extremely small as of 2001, is outstanding. Moreover, the Project share of the total amount of educational equipment as of 2012 was also large. Even at Xinjiang Normal University, where the Project share was smallest among the target universities, it was still 19.5%. At Xinjiang University of Finance and Economics, which had the largest share, it was 60.3%. The Project share at the target universities overall was 30.9%. It can thus be seen that the amount of educational equipment at the target universities before Project implementation had been very much limited but was drastically increased thanks to the implementation of the Project. The Project made a large contribution in improving the educational and research environment.

Table 7: Total amount of educational equipment

Unit: RMB thousand

	Baseline (2001)	Actual (2012)	Growth rate (%) (2001-2012)	Project equipment	Project share (%)
Xinjiang Agricultural University	15,710	182,000	1,058.5	42,000	23.1
Xinjiang Medical University	66,180	139,210	110.4	50,730	36.4
Xinjiang Normal University	27,920	240,910	762.9	47,080	19.5
Xinjiang University of Finance and Economics	12,720	50,810	299.4	30,620	60.3
Xinjiang Arts College	220	74,610	33,813.6	23,410	31.4
Ili Normal University	7,100	65,810	826.9	20,710	31.5
Kashgar Teachers' College	12,150	75,080	517.9	33,550	44.7
Changji Institute	1,240	53,050	4,178.2	24,560	46.3

Source: Responses to the questionnaire

Furthermore, the Project played a role in the granting of the honorable title in the "Undergraduate University Teaching Level Evaluation" in 2007 and, to some extent, in the upgrading from Xinjiang "College" of Finance and Economics to Xinjiang "University" of

Finance and Economics in 2007. School facilities were drastically improved by the Project. As a result, the target universities received good ratings. This led to increases in the budget granted from the government to the target universities. Thus, the education and research environments were further improved in a virtuous cycle created by the Project.

(4) Utilization rate of school buildings and educational equipment

As mentioned above, the school building areas and the monetary value of educational equipment increased as each target school quantitatively responded to the increase in students. However, effectiveness cannot be discussed if buildings and equipment are not actually utilized.

The utilization rate of major school building is 100% at all the target universities, which is very high. Especially, the equipment for education such as PCs and multimedia facilities is utilized very well at all the target universities. Although the utilization rate of equipment such as atomic absorption spectrometers is not so high, the average utilization rate of important and expensive research apparatus is more than 80% and thus it can be said that the equipment is sufficiently utilized.

As far as quantitative improvement is concerned, as seen above, the number of students increased, school building area, and the monetary value of educational equipment per student increased. The utilization rates of major school buildings and major equipment were also very high. In light of the above, it can be said that the construction of buildings and the procurement of equipment under the Project contributed largely to quantitative improvement.

3.2.1.2 Improvements in Quality

(1) Floorage and monetary value of educational equipment per student

The Undergraduate University Establishment Standards of China required that the 2006 national standard of floorage per student was more than 30 m^2[7]. While the students at the target universities have increased drastically, the floorage per student has also improved greatly from the baseline (Table 8). Xinjiang University of Finance and Economics and Xinjiang Arts College did not achieve their targets. However, as mentioned above, it is difficult to make comparisons with the target due to demolition and reconstruction of school buildings, the timing of reconstruction, and changes in the floorage calculation method. Those universities which currently do not achieve the national standard have plans to extend their campuses or construct new school buildings and their floorage per student is expected to improve.

The Project had a positive effect in increasing the monetary value of equipment per student, as seen in Table 6. In light of the above, the educational environment can be said to be moving toward improvement.

[7] For education and administration buildings at ordinary universities, the floorage per student for departments of science, engineering, agriculture and medicine is more than $20m^2$, the floorage per student for departments of humanities, social sciences, and management is more than $15m^2$, and the floorage per student for departments of physical education and arts is more than $30m^2$.

Table 8: Floorage per student

Unit: m^2

	Baseline (2001)	Target (2006)	Actual (2012)	
			Floorage per student	Increase in the floorage per student through the Project
Xinjiang Agricultural University	7.4	7.8	14.5	0.70
Xinjiang Medical University	12.0	17.8	22.9	1.00
Xinjiang Normal University	9.2	10.5	13.8	0.39
Xinjiang University of Finance and Economics	21.7	15.5	12.6	0.79
Xinjiang Arts College	40.6	28.2	22.9	2.76
Ili Normal University	5.3	6.7	10.2	1.44
Kashgar Teachers' College	11.9	9.2	20.7	0.69
Changji Institute	9.4	13.2	17.1	1.26

Source: Responses to the questionnaire

(2) Changes in the number of key faculties and key laboratories

In China, since "Some opinion concerning the development of higher education institutions and key faculties" was proclaimed by the State Education Commission in 1993, the state or provincial governments have designated faculties and laboratories which closely relate to national development strategies and public welfare. These are labeled key faculties and key laboratories and supporting funds are intensively provided by the government in order to raise education and research to an international level (Table 9, Table 10)[8].

Table 9: Number of key faculties

	Baseline	Target	Actual	
	2001	2006	2006	2012
Xinjiang Agricultural University	NL: 0 PML: 2	NL: 1 PML: 4	NL: 1 PML: 6	NL: 2 PML: 10
Xinjiang Medical University	NL: 0 PML: 3	NL: 1 PML: 4	NL: 0 PML: 5	NL: 0 PML: 11
Xinjiang Normal University	NL: 0 PML: 0	NL: 0 PML: 1	NL: 0 PML: 2	NL: 0 PML: 7
Xinjiang University of Finance and Economics	NL: 0 PML: 0	NL: 0 PML: 1	NL: 0 PML: 2	NL: 0 PML: 6
Xinjiang Arts College	NL: 0 PML: 2	NL: 0 PML: 2	NL: 0 PML: 1	NL: 0 PML: 2
Ili Normal University	NL: 0 PML: 0	NL: 0 PML: 1	NL: 0 PML: 0	NL: 0 PML: 3
Kashgar Teachers' College	NL: 0 PML: 0	NL: 0 PML: 1	NL: 0 PML: 0	NL: 0 PML: 2
Changji Institute	NL: 0 PML: 0	NL: 0 PML: 1	NL: 0 PML: 0	NL: 0 PML: 0

Source: Responses to the questionnaire
Note: NL (National Level): National key faculty, PML (Provincial or Ministerial Level): Provincial or ministerial key faculty

Although, as of 2006, few universities had attained their targets, by 2012 most of the universities, except Xinjiang Medical University (National Level) and Changji Institute (Ministerial Level), had gone well beyond target. Moreover, lecturers participating in training in Japan played a leading role in establishing a key faculty (fine arts) at Xinjiang Arts College (Box).

[8] National key faculties are designated by the State government. Provincial or ministerial key faculties are designated by provincial governments or ministries such as the Ministry of Education.

Box: Open communication through culture and arts —Academic Exchange between Xinjiang Arts College and Tokyo National University of Fine Arts and Music—

Exchange between Xinjiang Arts College and Tokyo National University of Fine Arts and Music began when Professor Zourem from Xinjiang Arts College, who had been studying as a visiting research fellow in Japan[9], transferred to the laboratory of oil painting material at Tokyo National University of Fine Arts and Music and was supervised by (the then) Professor Ichiro Sato[10]. After Professor Zourem went back to Xinjiang Arts College, she became an associate dean of the Department of Fine Arts and she offered to conclude an academic exchange agreement between Xinjiang Arts College and Tokyo National University of Fine Arts and Music through Professor Sato. Professor Sato had the experience of being entrusted with a UNESCO project for the protection of Cultural Landscape and Archaeological Remains in the Bamiyan Valley and had also received a trainee, Professor Shi Xiao Ming (research of the material and technique of the Silk Road Kizil stone cave mural painting), from Xinjiang Arts College, under the Project. The (then) President, Ikuo Hirayama, also promoted this plan actively. Both universities concluded the "Agreement on International Exchange for Art" in 2005. At first, this agreement was only effective between the Art Department and Xinjiang Arts College. However, after Assistant Professor Nurugri came to study at the Music Department as a trainee under the Project, the effectiveness of the Agreement developed to encompass the whole university.

Symposium "The Future of Research on the Kizil Cave Murals" (photo credit: Tokyo National University of Fine Arts and Music)

Since the conclusion of the agreement, both universities have been actively engaged in exchange. The Department of Fine Arts has conducted collaborative research on Kizil stone cave mural painting (Tokyo National University of Fine Arts and Music received the scientific research fund) for the last six years and a symposium on the research activities on Kizil stone cave mural painting was held at Tokyo National University of Fine Arts and Music in commemoration of the fifth anniversary of the conclusion of the agreement (photo). The Kizil stone cave mural painting research team of Tokyo National University of Fine Arts and Music visits Xinjiang every year for research and intensive courses at Xinjiang Arts College. Through training under the Project and the collaborative research which has followed the Project, Xinjiang Arts College has continued to carry out research on painting materials and Kizil stone cave mural painting and to make efforts in human resource development for protection and repair. The Department of Fine Arts of Xinjiang Arts College was accredited as an autonomous level key faculty. Professor Shi played a leading role in the accreditation as a key member of faculty. He is now active as Department Director. Moreover, Assistant Professor Nurugri, who studied vocal music under (the then) Professor Yukio Tatara[11]for one year as a trainee under the Project, took the entrance exam for the master course for foreigners (major in solo performance) on the advice of Professor Tatara, completed the two year master course at her own expense and took a master's degree. After she went back to Xinjiang Arts College, she made efforts to establish and operate Experiment and Teaching Pilot Center for Performing Arts[12] with Assistant Professor Dirana who also studied dancing as a trainee under the Project at Japan Women's College of Physical Education. Currently, this Center is accredited as an excellent level autonomous experimental model center.

For Tokyo National University of Fine Arts and Music, the collaboration with Xinjiang Arts College is more than imperative in research and protection of the ethnic music and arts such as archeological site in Xinjiang. Xinjiang Arts College is an important partner in understanding the different culture by open communication through arts without sticking to national borders, religion and ethnic groups, and globalizing genuinely by sharing original art as respecting unique culture mutually not valued from the western point of view.

[9] This study cost was not taken from the Japanese ODA Loan fund.

[10] Current professor emeritus at Tokyo National University of Fine Arts and Music

[11] Currently professor emeritus at Tokyo National University of Fine Arts and Music

[12] Experiment and Teaching Pilot Center for Performing Arts is mainly used as a place for practice for students of drama at Xinjiang Arts College. This includes musical, ballet and other theatrical performance.

The number of accredited key laboratories increased gradually but they were on a steady rise except at Kashgar Teachers' College and Changji Institute. In particular, the key laboratories related to the Project are the physics key laboratory at Ili Normal University and the geography key laboratory at Xinjiang Normal University as well as the Experiment and Teaching Pilot Center for Performing Arts at Xinjiang Arts College, mentioned in the Box. In addition, there is equipment procured under the Project at Xinjiang Minority Ethnic Music and Dance Research Center, Xinjiang Arts College. The enhancement of equipment had an impact on the accreditation of the key laboratories.

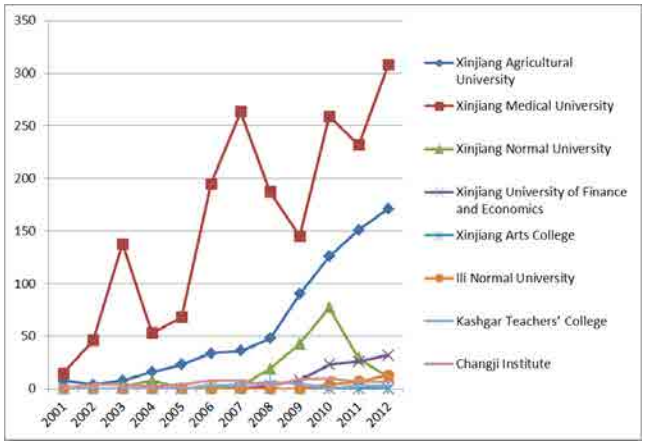
Table 10: Number of key laboratories

	Baseline	Actual	
	2001	2006	2012
Xinjiang Agricultural University	NL: n.a. PML: n.a.	NL: 1 PML: 6	NL: 2 PML: 8
Xinjiang Medical University	NL: n.a. PML: n.a.	NL: 0 PML: 3	NL: 0 PML: 7
Xinjiang Normal University	NL: 0 PML: 0	NL: 0 PML: 0	NL: 0 PML: 1
Xinjiang University of Finance and Economics	NL: 0 PML: 0	NL: 0 PML: 0	NL: 0 PML: 4
Xinjiang Arts College	NL: 0 PML: 0	NL: 0 PML: 0	NL: 0 PML: 1
Ili Normal University	NL: 0 PML: 0	NL: 0 PML: 0	NL: 0 PML: 1
Kashgar Teachers' College	NL: 0 PML: 0	NL: 0 PML: 0	NL: 0 PML: 0
Changji Institute	NL: 0 PML: 0	NL: 0 PML: 0	NL: 0 PML: 0

Source: Responses to the questionnaire
Note: NL (National Level): National key laboratory, PML (Provincial or Ministerial Level): Provincial or ministerial key laboratory

(3) Number of research papers, research projects, prizes awarded etc.

The number of research papers published in international scholarly journals such as Science Citation Indicators (SCI) has been basically increasing at the target universities, although it has fluctuated year by year (Figure 1).



Source: Responses to the questionnaire
Note: SCI (Science Citation Indicators), EI (Engineering Index), ISTP (Index to Scientific & Technical Proceedings)

Figure 1: Number of articles in SCI, EI, and ISTP

Although the number was less than twenty at all the target universities before the Project implementation, an increase in articles since 2006 to 2008 has been an outstanding feature. More high-quality research papers have been written thanks to facilities being expanded by the Project and larger research budgets being allocated than before Project implementation. As mentioned before, the Project has had a

relatively large effect on the expansion of facilities and therefore it can be said that the Project has contributed to the increase in research papers to some extent.

The number of research projects has increased in the last decade at all the target universities (Table 11). Among these research projects there are some projects which used apparatus procured under the Project and where the research teams included participants of training under the Project. Therefore, it can be said that the Project has contributed to implementing these research projects to some extent. At Xinjiang Agricultural University and Ili Normal University, there are research projects of the National Social Sciences Foundation and the National Natural Science Foundation of China. Equipment procured by the Project is utilized in these projects and lecturers who participated in training in Japan play a leading role. For example, in a project of the National Natural Science Foundation of China, "Junggar Desert Ecology of seed plants in Asteraceae short-lived" at Xinjiang Agricultural University, "Methods for obtaining high-efficiency regeneration plants of the ephemeral plant Lachnoloma lehmannii growing in early spring" was studied and the results of the research received a patent for invention.

Table 11: Number of research projects

	Baseline (2001)	**Actual (2006)**	**Actual (2012)**
Xinjiang Agricultural University	NL: 0 PML: 0	NL: 9 PML: 24	NL: 50 PML: 24
Xinjiang Medical University	NL: 5 PML: 13	NL: 15 PML: 12	NL: 85 PML: 180
Xinjiang Normal University	NL: 5 PML: 1	NL: 17 PML: 14	NL: 46 PML: 130
Xinjiang University of Finance and Economics	NL: 2 PML: 3	NL: 8 PML: 6	NL: 11 PML: 47
Xinjiang Arts College	NL: 0 PML: 0	NL: 1 PML: 2	NL: 0 PML: 6
Ili Normal University	NL: 0 PML: 0	NL: 2 PML: 3	NL: 25 PML: 28
Kashgar Teachers' College	NL: 0 PML: 0	NL: 0 PML: 1	NL: 4 PML: 9
Changji Institute	NL: 0 PML: 0	NL: 0 PML: 7	NL: 2 PML: 19

Source: Responses to the questionnaire
Note: NL (National Level): National research project, PML (Provincial or Ministerial Level): Provincial or ministerial research project

The number of social services, one of the so-called "university's three missions" (education, research and social service), demonstrate an upward trend, although this depends on the university (Table 12). One example related to the Project is the vocational training and examination service for the banking sector and tax authority at Ili Normal University. This utilizes equipment procured under the Project.

Table 12: Number of social services

	Baseline (2001)	Actual (2006)	Actual (2012)
Xinjiang Agricultural University	n.a.	152	213
Xinjiang Medical University	4	4	4
Xinjiang Normal University	n.a.	14	24
Xinjiang University of Finance and Economics	n.a.	15	62
Xinjiang Arts College	0	0	2
Ili Normal University	0	2	4
Kashgar Teachers' College	0	0	0
Changji Institute	n.a.	0	4

Source: Responses to the questionnaire
Note: The definition of social services is in accordance with the Higher Education Law in China (passed by the 4th meeting of the 9th Standing Committee of the National People's Congress, on August 29, 1998).

Many of the target universities received the autonomous level "Prize for Progress in Science and Technology". However, these are not considered to have a direct relation with the Project, although equipment procured under the Project is utilized partially in some cases the equipment used was mainly procured through universities' own funds or using a government budget.

Both faculties at undergraduate schools and courses at graduate schools have basically shown an upward trend (Table 13). In particular, the increase in master's courses is outstanding, influenced by the government policy which emphasizes research. Universities or schools able to grant doctoral degrees are also gradually increasing. There are some contributions by the Project, such as the master's course in optics established by a professor who studied optics in Japan under the Project and who played a leading role in the establishment of the course.

Table 13: Number of undergraduate faculties and graduate courses

	Undergraduate			Master's course			Doctoral course		
	Baseline	Actual		Baseline	Actual		Baseline	Actual	
	2001	2006	2012	2001	2006	2012	2001	2006	2012
Xinjiang Agricultural University	43	50	60	28	36	74	6	6	18
Xinjiang Medical University	15	15	21	28	49	64	3	4	25
Xinjiang Normal University	16	24	26	13	43	96	0	0	0
Xinjiang University of Finance and Economics	9	19	32	9	15	27	0	0	3
Xinjiang Arts College	4	5	7	0	0	0	0	0	0
Ili Normal University	6	7	8	0	0	6	0	0	0
Kashgar Teachers' College	10	16	23	0	4	11	0	0	0
Changji Institute	2	19	23	0	0	2	0	0	0

Source: Responses to the questionnaire

As far as qualitative improvement is concerned, the educational environment is gradually improving and floorage and the monetary value of equipment per student show an upward trend. As for the development of school buildings and equipment, there has been a substantial

improvement, especially in educational equipment. Meanwhile, the project has contributed to the improvement of floorage to some extent. The Project has had a profound effect on the increase in the designation of key faculties and laboratories. The Project also contributed to the increase in the number of research papers and patents as many of these used equipment procured under the Project and employed lecturers who participated in training courses under the Project. Therefore, the Project has played a significant role in improving the quality of education and research.

3.2.2 Quantitative Effect

Qualitative effects of the project are (1) the enhancement of the reputations of schools through an upgrade in the educational environment (effects of building construction and equipment procurement) and (2) improvements in the education system with institutional change (the effects of training).

(1) Effects of building construction and equipment procurement

Qualitative effects of the Project are 1) good results on "Undergraduate University Teaching Level Evaluation" and 2) upgrades from college to university. In the "Undergraduate University Teaching Level Evaluation" conducted by the Ministry of Education of China, each target university received good results due to improvements in floorage per student and in the rate that experiments are conducted through enhancements of equipment. Xinjiang "College" of Finance and Economics was upgraded to Xinjiang "University" of Finance and Economics and, through the implementation of the Project, the improved educational, research and administrative environment were awarded "Excellent" in "Undergraduate University Teaching Level Evaluation".

Industry-academia partnership, Xinjiang Arts College

(2) Effects of training

As far as effects of training are concerned, there are some outstanding examples such as improvement of teaching methods and university management. As for teaching methods, a professor at the Department of Japanese and Russian Languages, College of Foreign Languages, Xinjiang Normal University, was awarded a prize in the teaching method contest for the departments of foreign languages and is highly appreciated by his students. Many teaching and administrative staff from the related institutes in Xinjiang participated in the Seminar for Administrators in Japan. It was not only that the participants could broaden their perspective but also that some good practices were created from what they learnt in the seminar. For instance,

Xinjiang Arts College introduced a support system for students' job hunting and the college now has the top employment rate for graduates in Xinjiang. Moreover, the College established an office for industry-academia partnership by using examples in Japan as reference and has a good track record in partnership such as food package design by the Department of Design.

3.3 Impact

3.3.1 Intended Impacts

(1) Impact on higher education at provincial level

All the quantitative indicators, such as number of higher education institutions, the number of students at higher education institutions and higher education enrollment ratio as a whole in XUAR, increased (Table 14). The XUAR Education Department has not kept statistics about the qualitative indicators on the whole XUAR, such as floorage per students and monetary value of educational equipment. As there are many higher education institutions in XUAR, it is considered unlikely that the Project has had an impact on all the higher education institutions in XUAR in terms of both quantitative improvement and qualitative improvement.

Table 14: Impact on higher education at autonomous level

Purpose	Indicators	Baseline (2001)	Target (2006)	Actual (2006)	Actual (2012)
Quantitative improvement	Number of higher education institutions	37	42	52	54
	Number of students at higher education institutions (thousands)	218	238	285	379
	Higher education enrollment ratio (%) (=Appropriate age enrollment/ Appropriate age population)	12.8	15.0	15.0	27.3

Source: Responses to the questionnaire

(2) Impact on regional vitalization

At the time of appraisal, an impact on regional vitalization was expected through the dispatch of school teachers and doctors to rural areas, the provision of human resources to key industries, and the development of human resources through vocational training and adult education. As far as the dispatch of human resources is concerned, the number has been increasing recently, in particular from teachers' training institutions, because the government has promoted the fostering of teachers in rural areas as part of government policy. Xinjiang Agricultural University has dispatched agriculture instructors to rural areas and Xinjiang Medical University conducts a program for training rural physicians. These examples are related to the Project in that equipment procured under the Project is utilized and trainers in charge of rural support were participants in training in Japan.

As far as the provision of human resources to key industries is concerned, the evaluator can confirm that students have enhanced both their capacity to conduct experiments and their

practical abilities through development of the experimental facilities of the Project and that graduates are active in key industries such as the petrochemical industry. This can therefore be evaluated as an impact.

As for vocational training and adult education, the number of universities which have courses for vocational training was decreasing as specialized higher education institutions for vocational training have been established. Even those universities which have courses for vocational training as of the ex-post evaluation have found their number of students decreasing. On the other hand, there is a need for Uygur adults to learn Mandarin. Therefore, the number of students for adult education is increasing in a wide range of areas, centering on Mandarin. Moreover, some universities conduct continuing education for doctors as well as short-term training in response to the needs of municipal government and enterprises. In many cases, there is a connection to the Project in the utilization of equipment and facilities such as multimedia educational apparatus, teaching buildings, and other experimental equipment procured under the Project.

(3) Impact on the strengthening of market rule

When the evaluator checked the number of graduates from departments related to the market economy, it could be confirmed that these had increased at most of the universities. However, their exact role after graduation at their places of employment and their performance was unclear, so it could not be confirmed whether or not this has led to the strengthening of market rule.

(4) Impact on environmental conservation

There are some good practices at the target universities as shown in Table 15. These examples are connected to the Project in that equipment and buildings procured under the Project are utilized and that trainers were participants in training in Japan.

Table 15: The contributions of the target universities to environmental conservation and public health

	Good practices
Graduates	- There are a large number of graduates who became civil servants in environmental protection departments and who implement pollution control (Xinjiang Normal University, Xinjiang University of Finance and Economics etc.)
Research	- “Study of the analysis of water heavy metal in arsenic poisoning disease and the relationship between water heavy metal and pathogeny” etc. (Xinjiang Medical University) - “Study on the underground resources of the Ili river valley wetland and its protection and recovery” etc. (Ili Normal University)
Regional efforts	- “Design of the master plan for the project for environmental conservation and tourism development around Salim lake” etc. – to formulate a development plan that protects ecosystems and landscape with harmonization between people and nature while avoiding adverse effects on the natural environment at the Design Laboratory. (Xinjiang Arts College)

Source: Responses to the questionnaire

3.3.2 Other Impacts

(1) Impacts on the natural environment

The Environmental Impact Assessment (hereinafter referred to as “EIA”) was conducted prior to project implementation in accordance with Chinese regulations. “Three-Stage Simultaneous implementation” was envisioned (i.e. the regulation that environmental protection facilities should be designed, constructed and put into production simultaneously with the main construction structures). Based on this regulation, noise-abatement measures, and measures for appropriate sewage treatment and waste disposal were conducted by each university during the implementation period. After project completion, there have been few emissions that have had an impact on the environment, although some of the universities release flue gas and sewage from experiments after treatment. However, there is no negative environmental impact.

(2) Land Acquisition and Resettlement

The project was carried out on existing university properties, and thus there was no land acquisition or relocation of residents.

(3) Mutual understanding between Japan and China

It can be said that participants in the training in Japan were able to gain a deep understanding of Japan through human development program and academic exchange with Japanese universities. The most outstanding case is the exchange between Xinjiang Arts College and Tokyo National University of Fine Arts and Music (Box). Other cases of exchange between Chinese universities and Japanese universities that are related to the Project are as follows: 1) Xinjiang Medical University established the Graduates' Association of Japan- Xinjiang Medical University in 2006, which actively promotes partnership and exchange with higher education institutions in Japan, and 2) Xinjiang Agricultural University, Xinjiang University of Finance and Economics, and Kashgar Teachers’ College continue academic exchange and student exchange programs with Japanese universities.

This project has largely achieved its objectives. Therefore its effectiveness and impact is high.

3.4 Efficiency (Rating: ②)

3.4.1 Project Outputs

The Project included the construction of school buildings, the enhancement of educational and research equipment, and the training of higher education personnel. The outputs of each component are as follows:

Table 16: Comparison of Outputs (planned and actual)

Items	Planned	Actual (achievement rate)
Buildings	8 universities total:90,000 m^2	8 universities total: 93,700 m^2 (104.1%)
Equipment	8 universities	8 universities: mostly as planned
Training	8 universities total:127 staff	8 universities total: 236 staff (185.8%)

Source: JICA appraisal documents for the planned, Responses to the questionnaire for the actual data

There was no drastic re-examination of the plan for building construction although floorage was expanded depending on the needs of each university.

As for educational equipment, there is no big difference between the plan and the actual, although the model was changed for some of the digital equipment due to production ending during the process of procurement.

As regards the training component, at the commencement stage of the Project, there were a lot of participants in mid- and long term disciplinary training while in the second half, participants in the Seminar for Administrators increased. The Education Department, wanted many executives to be aware of global levels, and wanted to advance university reform, following education department policy. Then the departments promoted participation in seminars on the part of administrators. There were some cases where disciplinary training was not taken up as some of the target universities had difficulty in contacting the receptive institutions in Japan. There were also cases where a candidate's language ability (Japanese or English) was not adequate for the master course. However, there were cases which led to a large-scale collaborative research project like Xinjiang Arts College, as mentioned in the Box. Although it is difficult to compare the difference between plan and actual for the number of trainees and contents of the training, it can be said that the training component also was generally implemented as planned.

3.4.2 Project Inputs

3.4.2.1 Project Cost

Actual project costs amounted to 6,385 million yen (of this, the actual loan disbursement amounted to 4,524 million yen[13]) against the estimated costs of 6,390 million yen (of this, the planned loan amounted to 4,598 million yen). The actual costs were lower than planned (99.9%). While the appreciation of the yen against the Chinese yuan was about two yen during Project implementation, an average inflation rate was kept under 4% in China. Therefore, the Project was conducted as planned in an efficient way.

[13] According to data provided from the executing agency, this was JPY 4,528 million. As the executing agency received the fund in Chinese yuan through the central government, the difference between this and the data provided by JICA depends on what the exchange rate was when the executing agency closed an account.

3.4.2.2 Project Period

The Project period planned at the time of appraisal was 39 months, or from January 2003 to March 2006. The actual Project period was 103 months, or from January 2003 to July 2011, which was longer than planned: equivalent to 264.1 % of the original plan. The reasons for the delays are as follows:

1) In some cases of equipment procurement, enterprises made a successful bid with the lowest price. However, at the contract stage, it turned out that the supplier could not fulfill the contract in a practical sense and ended up failing to do so, meaning that a rebid had to be conducted.
2) When the procurement procedure was delayed for the above reason, some equipment such as PCs, had their speck upgraded so that the universities could not purchase equipment which was on the original list. In these cases, equipment had to be reselected from scratch.
3) Xinjiang is susceptible to bad weather during the winter time. This led to some delays in transporting the equipment.
4) During project implementation, riots occurred in the target region (in July 2009). This also affected to the transportation of the equipment.

In addition, the duration of the training component was planned from April 2003 to March 2006 at the time of appraisal. However, in light of the lead time searching for receptive institutions, the necessary time for procedure and trainees' language handicaps, the planed period for mid- and long term training was much too short for participants to pursue degrees at graduate school.

3.4.3 Results of Calculations of Internal Rates of Return

Due to the nature of the Project, a quantitative analysis of the internal rate of return was not possible.

In light of the above, although the project cost was within the plan, the project period significantly exceeded the plan. Therefore efficiency of the project is fair.

3.5 Sustainability (Rating: ③)

3.5.1 Institutional Aspects of Operation and Maintenance

The hard assets such as buildings constructed and equipment procured under the Project are managed by each target university and supervised periodically by the autonomous government (the Education Department). Each target university establishes the regulations and the systems for operation and maintenance (O&M) and there are no systemic flaws in O&M. The Audit Office, which is equivalent to the Board of Audit of Japan, conducts annual

inspections for the management at each university and the supervision of the Department of Education.

3.5.2 Technical Aspects of Operation and Maintenance

Each university periodically conducts a routine maintenance check. O&M manuals are prepared for equipment. Posters including the user policies and operation procedures are put on the walls near equipment.

Although repair staffs are allocated within the universities, in cases where the staff cannot repair the equipment, breakdowns are reported to the laboratories and facility service center. After screening, the university decides whether or not to outsource the repair. Especially in case of precision equipment, equipment is not repaired at the universities but by the manufactures. There is no problem with daily maintenance.

3.5.3 Financial Aspects of Operation and Maintenance

Local universities in China, generally speaking, borrow the required funds for the expansion of campuses from commercial banks and the excessive borrowing has been an issue at some of universities. The central government conducted research on this issue in 2012 and most outstanding amounts have been paid by the government in place of the universities, which are prohibited from borrowing from commercial banks for the time being.

The necessary O&M costs at the target universities are allocated by each university. If there is a shortage in the budget for O&M, the shortage is made up using the autonomous government budget. However, there is no problem with the financial status of the target universities as revenues basically exceed expenses. Also, there is no evidence that equipment lies neglected without maintenance and therefore, it is thought that the necessary resources for O&M are being provided.

Table 17: Income and expenditure at each target university (annual)

Unit: RMB million

	2010	**2011**	**2012**
Xinjiang Agricultural University	Income: 570.20 Expenditure: 485.71 (O/M: 0.20)	Income: 509.90 Expenditure: 428.85 (O/M: 0.40)	Income: 580.94 Expenditure: 516.28 (O/M: 0.40)
Xinjiang Medical University	Income: 571.95 Expenditure: 433.38 (O/M: 0.35)	Income: 681.03 Expenditure: 666.39 (O/M: 0.32)	Income: 567.56 Expenditure: 554.16 (O/M: 0.28)
Xinjiang Normal University	Income: 609.85 Expenditure: 449.39 (O/M: 12.90)	Income: 742.06 Expenditure: 596.08 (O/M: 7.87)	Income: 566.84 Expenditure: 637.04 (O/M: 11.62)
Xinjiang University of Finance and Economics	Income: 336.32 Expenditure: 270.73 (O/M: 9.60)	Income: 343.19 Expenditure: 301.96 (O/M: 11.06)	Income: 270.33 Expenditure: 274.47 (O/M: 12.10)
Xinjiang Arts College	Income: 110.16 Expenditure: 76.18 (O/M: 0.45)	Income: 95.41 Expenditure: 107.24 (O/M: 0.62)	Income: 184.42 Expenditure: 140.09 (O/M: 0.39)

	2010	2011	2012
Ili Normal University	Income: 180.09 Expenditure: 143.89 (O/M: 2.09)	Income: 246.99 Expenditure: 163.53 (O/M: 2.51)	Income: 246.14 Expenditure: 187.07 (O/M: 6.64)
Kashgar Teachers' College	Income: 179.58 Expenditure: 122.95 (O/M: 0.69)	Income: 230.05 Expenditure: 173.22 (O/M: 0.46)	Income: 266.87 Expenditure: 237.36 (O/M: 0.39)
Changji Institute	Income: 147.39 Expenditure: 118.99 (O/M: 1.36)	Income: 149.15 Expenditure: 136.64 (O/M: 2.08)	Income: 187.64 Expenditure: 133.56 (O/M: 4.02)

Source: Responses to the questionnaire
Note: The O/M (Operation and Maintenance cost) at some universities refers only to the maintenance costs for equipment procured under the Project.

3.5.4 Current Status of Operation and Maintenance

At all the target universities, the buildings and equipment are well maintained. All the universities have inventory books and maintenance logs for the major equipment. End-of-life equipment, such as PCs, has already been updated. Valuable equipment is well maintained and the utilization ratio is high. In order to raise the utilization ratio, the education department has established a platform for sharing equipment and this is open to other universities.

No major problems have been observed in the institutional, technical and financial aspects of the operation and maintenance system. Therefore sustainability of the project effect is high.

4. Conclusion, Lessons Learned and Recommendations

4.1 Conclusion

The objective of the Project was to improve higher education in XUAR quantitatively and qualitatively by supporting the construction of buildings, the procurement of equipment and the training of teachers in the target universities. This objective was consistent with China's development plan and development needs as well as with Japan's ODA policy at the time of both the appraisal in 2003 and the ex-post evaluation; therefore its relevance is high. The effectiveness and impact of the Project was high because quantitative indicators (building areas, amount of educational equipment) and qualitative indicators (number of key faculties and laboratories, number of research papers, etc.) have improved. Moreover, there are many cases of good practice in the utilization of buildings, equipment and training supported by the Project. The outputs were essentially completed in line with the initial plans, and the project cost was within the plan. The project period, however, was significantly longer than planned; therefore the efficiency of the project is fair. No major problems have been observed in all institutional, technical and financial aspects of the operation and maintenance system and its current status is very good; therefore the sustainability of the project effects is high.

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

4.2 Recommendations

None.

4.3 Lessons Learned

[Setting the Project period for the Higher Education Project]

The original project period of three years was obviously too short for this kind of higher education project which includes equipment procurement which require adjustments among the target universities, and a training components under which participants pursue degrees. The project period should be set with adequate consideration of the time necessary for preparation time required for the degree.

[Avoidance of bids through unbalanced unit prices]

In some cases of equipment procurement, enterprises made a successful bid with the lowest price. However, at the contract stage, it turned out that the supplier could not fulfill the contract in a practical sense and ended up failing to do so meaning that a rebid had to be conducted. Guidelines for Procurement under Japanese ODA Loans (April, 2012) explains that if a bid contains a seriously unbalanced (unreasonably low or high) unit price for certain goods or services to be provided, the Borrower is expected to ask the bidder concerned for clarification of such an offer in order to ensure appropriate execution during the contract stage, before concluding the evaluation.

Therefore, the executing agency needs to have an appropriate response to the results of the clarification with the bidder.

Comparison of the Original and Actual Scope of the Project

Item	Original	Actual
1.Project Outputs	8 target universities	8 target universities
1) school buildings	8 buildings such as teaching buildings 90,000 m^2	8 buildings such as teaching buildings 93,700 m^2
2) equipment	Animal nutrition analysis, folk music inheritance, environmental pollutants analysis etc.	As planned
3) training	127 staff from 8 target universities	236 staff from 8 target universities
2.Project Period	January 2003 – March 2006 (39 months)	January 2003 – July 2011 (103 months)
3.Project Cost		
Amount paid in foreign currency	4,598 million yen	4,528 million yen
Amount paid in local currency	1,792 million yen (119.5 million RMB)	1,857 million yen (137.6 million RMB)
Total	6,390 million yen	6,385 million yen
Japanese ODA loan portion	4,598 million yen	4,528 million yen
Exchange rate	1 RMB= 15 yen (As of September 2002)	1 RMB = 13.5 yen (As of April 2009)

People's Republic of China

Ex-Post Evaluation of Japanese ODA Loan

"Inland Higher Education Project (Regional Vitalization, Market Economy Reform Support, and Environmental Conservation (Jilin Province))"

External Evaluator: Hiroshi Oita, OPMAC Corporation

0. Summary

The objective of this project (hereinafter referred to as "the Project") was to improve the quality and quantity of higher education in the designated 8 universities (hereinafter referred to as "the University(ies)") under the Education Department of Jilin Province, by providing equipment and training for teachers and administration staff through the Japanese ODA loan and by expanding the facilities of the Universities through the provincial budget and the internal funds of the Universities. The Project was implemented based on the development policy for higher education in China and met the high needs of higher education. The Project was also consistent with Japanese ODA policy to China, and therefore the relevance of the Project is high. It was also noted that the timely arrangement of the procurement of equipment and training in Japan under the Project increased the opportunities for experiments and research which led to an increase in the number of academic papers. Thus, effectiveness and impact of the Project are high. With regard to project cost, the procurement of equipment and training were implemented almost as planned within the original budget. However, the implementation period was far beyond the planned period because of delays in both training and procurement. Because of this, the efficiency of the Project is fair. The equipment procured has been well maintained from the point of view of the institutional, technical and financial aspects of each University. Even at the time of ex-post evaluation, the equipment is well operated and maintained and kept in a very good condition. The sustainability of the Project is therefore regarded as high.

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

1. Project Description

Project Location
(Jilin Province)

Library
Changchun University of Chinese Medicine

1.1 Background

In the early 2000s, China drifted into a globalization of its economy. The country had been attempting to catch up with international standards and was able to join the World Trade Organization in December 2001, having applied in 1995. It was also an urgent issue for China that it met the needs for human development at an international level. With regard to higher education under "the 9th 5 year plan (1996 – 2000)" China had initiated the "211 Project[1]" which planned to create more than 100 prioritized universities as it moved into the 21st century. In Jilin province, Jilin University, Northeast Normal University and Yanbian University, which are under the control of the Ministry of Education, were included in this project. In May 1998 the "985 Project[2]" was started to establish world-class research type universities. Under this project, selective support was centered on well-known universities in order to create research centers of excellence that could be ranked with the predominant universities of the world. In addition, in December 1998, the Ministry of Education produced the "Action Plan for the Promotion of Education toward the 21st century" which was approved by National Cabinet in January 1999. This set the target of raising the percentage of students proceeding to higher education from 9.8% in 1998 to 15% in 2010. The rapid development of information and communication technology worldwide since the mid-1990s has required human resource development in technology in China and China has recognized the necessity of higher education. Furthermore, the July 2001 decision to hold the Beijing Olympics in 2008 and the December 2002 decision to hold the Shanghai World Exposition in 2010 were cause that triggered the acceleration of internationalization in China.

On the one hand, the internationalization of China was in line with its reforms and market-opening policy but on the other hand, at this time there were emerging internal issues such as the improvement of disparities and the environment. The Project was implemented to tackle the problems of internationalization, disparities and the environment from the point of view of human resource development through strengthening and expanding higher education.

1.2 Project Outline

The objective of the Project was to upgrade higher education in both quality and quantity for the important 8 Universities in Jilin Province by supporting the construction of school

[1] "211 Project" was named according to the government target of establishing more than 100 universities with high priority into the 21st century. The decision for this project was made by the Ministry of Education in 1993. The target of the project was to develop excellent human resources with a high level of knowledge through continuous investment in the selected universities and faculties over more than 10 years, as well as to establish a scientific technology basis for experts who can solve the various problems arising in the course of nation building and social development. (refer to "Present state and tendency of higher education in China" 2010 edition, by the China Research and Communication Center of the Japan Science and Technology Agency)

[2] "985 Project" was a national project which aimed at establishing a set of world first-class and internationally well-known research type universities. On May 4, 1998, at a ceremony commemorating the 100 year anniversary of Beijin University, the then President Jiang Zemin proposed that China should have first-class universities of a world advanced level in order to achieve modernization. Based on this message, the project was started as "985 Project" because of the date. (refer to the same above)

buildings, the procurement of education equipment and training of teachers and management staff in Japan, thereby contributing to regional vitalization, and support for market economy reform and environmental conservation.

The target 8 Universities were: 1) Beihua University, 2) Changchun University of Science and Technology, 3) Changchun University of Technology, 4) Changchun Institute of Technology, 5) Changchun University of Chinese Medicine[3], 6) Jilin Agricultural University, 7) Jilin Teachers' Institute of Engineering and Technology and 8) Tonghua Normal University.

Loan Approved Amount/ Disbursed Amount	4,530 million yen / 4,441 million yen
Exchange of Notes Date/ Loan Agreement Signing Date	March, 2003 / March, 2003
Terms and Conditions	Interest Rate: 2.2% (0.75% for training portion) Repayment Period: 30 years (40 years for training portion) (Grace Period) (10 years) Conditions for Procurement: General Untied
Borrower / Executing Agency(ies)	Government of the People's Republic of China / Jilin Provincial People's Government
Final Disbursement Date	January, 2012
Feasibility Studies, etc.	1) "Utilization of Loan in Japanese Yen by Jilin Province Higher Learning Institutions for Talents Cultivation" Feasibility Study, Jilin Province Project Consultancy Company, dated October 2002 2) Special Assistance for Project Implementation to Inland Higher Education Project in China, dated May 2005

2. Outline of the Evaluation Study

2.1 External Evaluator

Oita Hiroshi, OPMAC Corporation

2.2 Duration of Evaluation Study

Duration of the Study: August, 2013 – November, 2014

Duration of the Field Study: October 29, 2013 – November 12, 2013

March 10, 2014 – March 15, 2014

[3] In 2006 Changchun College of Traditional Chinese Medicine changed its name to Changchun University of Chinese Medicine after approval by the Ministry of Education.

3. Results of the Evaluation (Overall Rating: A[4])

3.1 Relevance (Rating: ③[5])

3.1.1 Relevance to the Development Plan of China

At the time of appraisal it was noted that, as a national target in the 10th 5 Year Plan (2001-2005), the enrolment rate[6] of higher education would increase to around 15% in 2005. The 10th 5 Year Plan of Jilin Province also aimed to raise the enrolment rate of higher education to 20%. In reality, the enrolment rate of China was 15% in 2002 and 26.5% in 2010. In Jilin Province the rate reached 28% in 2005 and 37% in 2011.

At the time of the ex-post evaluation, it was confirmed that the 12th 5 Year Plan of the National Education Project (2011-2015) set the targets of a 36% enrolment rate of higher education in 2015 and 40% in 2020. In Jilin Province, the enrolment rate of higher education will be raised from 41% in 2012 to 55%[7] in 2015. Since China has been strengthening technical innovation and high technology in the 12th 5 Year Plan (2011-2015), human resource development remains one of the important policy measures in higher education.

3.1.2 Relevance to the Development Needs of China

At the time of appraisal the need for higher education in China has been expanding in tandem with the spread of compulsory education for 9 years, which was established in 1986. In Jilin Province intake rate at primary and junior secondary schools was substantially 100% and intake rate at senior secondary schools[8] was 45.2% in 2001. This rate has been increasing year by year and it was 98% in 2012, which means that almost all students at junior secondary schools went on to senior secondary schools (Table 1). The policy target mentioned above and the expansion of the Universities quota corresponding to this policy and social needs of higher education resulting from economic development were thought to be the reason for the increase in enrolment in higher education.

Based on the national and provincial policies for higher education and the needs as described above, the target Universities will continue to play an important role as the key universities in Jilin Province for the development of human resources. From this point of view the Project is consistent with development needs.

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[4] A: Highly satisfactory, B: Satisfactory, C: Partially satisfactory, D: Unsatisfactory

[5] ③: High, ② Fair, ① Low

[6] "enrolment rate" means the ratio of the number of students in higher education institutions against the population between the age 18 and 22.

[7] According to the 12th 5 Year Plan of Education Development Project of Jilin Province (2011-2015), the target enrolment rate in 2015 was initially set at 40% but since this target was achieved in 2012 as 41%, the education department has reset its internal target as 55%.

[8] In China, that which corresponds to a junior high school in Japan is called a "junior secondary school". A high school is called a "senior secondary school".

Table 1: Achievements and Targets of Education in Jilin Province

Unit: %

	2001	2005	2012	2015 (Target)
Primary school intake rate	99.7	99.9	99.8	100
Junior secondary school intake rate	98.3	99.2	99.3	100
Senior secondary school intake rate	45.2	61.5	98	99
Higher education (university) enrolment rate	16.7	28	41	55

Source: Jilin Province Education Department

3.1.3 Relevance to Japan's ODA Policy

The Japanese government set out its "Economic Cooperation Program for China" in October 2001, which showed the direction of ODA towards China as follows:

1) Cooperation for the resolution of environmental and other global issues;
2) Assistance for Open and Reform Policy (assistance for encouraging stronger ties between the Chinese and international economies);
3) Promotion of mutual understanding (strengthening of i) the dispatch of experts to China, ii) the acceptance of trainees from China, iii) support for Chinese students studying in Japan, iv) youth exchange v) cultural exchange programs, vi) academic exchange and vii) university-level exchange programs; the preparation of an environment for receiving overseas students; and policy recommendations and human capacity development to promote tourism etc.);
4) Assistance for poverty alleviation;
5) Support for private sector activities; and
6) Promotion of multilateral cooperation.

Among the above the Project contributed to dealing with 1) cooperation for the resolution of environmental and other global issues, 2) assistance for Open and Reform Policy and 3) promotion of mutual understanding. Thus it can be said that the Project was consistent with the policy of the Japanese government.

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

3.2 Effectiveness[9] (Rating: ③)

3.2.1 Quantitative Effects (Operation and Effect Indicators)

At the time of the appraisal, the operation and effect indicators were 1) an increase in the number of students enrolled in the 8 Universities and 2) an increase in the enrolment rate for higher education in Jilin Province. Whereas the scope of the Project covered the procurement of

[9] Sub-rating for Effectiveness is to be included in the consideration of Impact.

equipment for education and research as well as training in Japan, there is no direct relationship between the Project and the indicators. Therefore in addition to these indicators, the monetary value of education and research equipment, the monetary value of equipment per student and the operational rate of equipment were analyzed from the point of view of quantity. From the quality point of view, the floorage per student for the education environment, and the number of key disciplines and key laboratories, the number of research projects, the number of research papers and the number of master and doctor courses were analyzed for the level of education and research.

3.2.1.1 Improvement in Quantity

(1) Number of Students and Enrolment Rate

An increase of 37 thousand students and an enrolment rate of 21% were estimated as the original target for the year of completion of 2006. The actual increase in the number of students was 44 thousand and the enrolment rate was 29% in 2006, both of which exceeded the original estimate (Table 2 and Table 3). At the time of the ex-post evaluation, it was confirmed that the total number of students for the 8 Universities was 125 thousand in 2012, an increase of 12 thousand from 2006. The enrolment rate also increased to 41% in 2012 which indicates a higher popularity of higher education.

Table 2: Increase in the Number of Students

Unit: 1,000 people

Number of Students in the 8 Universities	Baseline 2001 actual	Target 2006 (Year to be completed)	Increment form 2001	Actual 2012 (Year of completion)
Target	-	105	37	-
Actual	69	113	44	125

Source: JICA appraisal data and Department of Education in Jilin Province

Table 3: Rise in the Enrolment Rate of Higher Education Institutions

Unit: %

Enrolment rate of higher education in Jilin Province	Baseline 2001 Actual	Target 2006 (Year to be completed)	Actual 2012 (Year of completion)
Target	-	21	-
Actual	16.9	29	41

Source: JICA appraisal data and Department of Education in Jilin Province

The increase in the number of students as well as in the enrolment ratio were in accordance with the policy measures for the quantitative expansion of higher education as mentioned in "3.1 Relevance" above. Although the increase in the figures for each University varied depending upon the total floorage and the number of teachers, almost all the Universities had exceeded the original target in 2006. At the time of the ex-post evaluation it was also found that the number of students had further increased by 2012 (Table 4).

Table 4: Number of Students in each University

Unit: 1,000 people

	Baseline a. 2001	Target b. 2006	Increment (b-a)	Actual c. 2006	Increment (c-a)	Actual d. 2012	Increment (d-c)
Beihua University	15.8	20.9	5.1	21.3	5.5	23.4	2.1
C.U of Science & Technology	10.7	17.2	6.6	19.1	8.4	20.8	1.7
C.U of Technology	11.5	14.6	3.1	17.7	6.2	18.8	1.0
C. Institute of Technology	10.4	13.4	3.0	13.7	3.3	14.0	0.3
C.U of Chinese Medicine	3.7	7.5	3.8	7.3	3.6	10.3	3.1
Jilin Agricultural University	8.5	17.0	8.5	17.3	8.8	18.1	0.7
Jilin Teachers' Institute of E &T	4.3	7.4	3.1	7.6	3.3	8.5	0.9
Tonghua Normal University	4.0	7.1	3.1	8.6	4.7	11.2	2.6
Total	68.9	105.1	36.3	112.5	43.7	124.9	12.4

Note: C: Changchun, C.U: Changchun University, E&T: Engineering and Technology
Source: JICA appraisal data (2001) and answers to questionnaires from each University (2006 and 2012)
Note: The result of figures added or subtracted sometimes differ due to round off.

(2) Amount of Education and Research Equipment

From the view point of Project effectiveness, since the main target of the Japanese ODA loan was to supply equipment, 1) the share of the amount for equipment provided by the Japanese ODA loan over the total amount of equipment in each University and 2) the amount of equipment per student in each University were studied in order to confirm the effectiveness of the supply of equipment from the point of view of improvement of the quantitative aspect. Data collected from each University showed that the share of equipment provided under the Project was 16.2% on average in 2012 (Table 5). This implies that the equipment procured under the Project played an important role in education and research at the Universities.

Table 5: Total Amount of Equipment in the Universities

Unit: 1,000 RMB

	2006	2012		b/a (%)
		a. Total amount of equipment	b. Amount of equipment procured by yen Loan	
Beihua University	168,660	260,780	59,680	22.9
C.U of Science & Technology	207,620	415,840	32,230	7.8
C.U of Technology	98,020	253,960	42,740	16.8
C. Institute of Technology	135,290	248,120	40,380	16.3
C.U of Chinese Medicine	69,530	138,220	54,770	39.6
Jilin Agricultural University	136,440	342,590	28,680	8.4
Jilin Teachers' Institute of E &T	60,260	98,450	21,310	21.6
Tonghua Normal University	42,040	96,200	20,770	21.6
Total	917,860	1,854,160	300,560	16.2
Average	114,730	231,770	37,570	16.2

Source: Answers to questionnaires from each University
Note: There were no base and target figures set at the time of appraisal

With regard to the amount of equipment per student, compared to the amount at the time of the appraisal in 2001, the amount had increased not only by the target year of 2006 when the construction of buildings in the Universities was complete, but also by 2012 when the Project was completed (Table 6). This means that students had more chance to use the equipment. Although it is difficult to measure appropriately the effectiveness of the Project in terms of the use of equipment by students, it can be said that equipment provided by the Project has been well used considering the quite high rate of usage for major equipment, even in 2012 (Table 7). At the time of the ex-post evaluation it was confirmed through hearings with teachers and site visits that equipment provided by the Project showed a high usage rate and that most equipment was used even now in all the Universities, contributing sufficiently to education and research[10].

Table 6: Amount of Equipment per Student

Unit: RMB

	2001	2006	2012
Beihua University	4,800	7,478	10,609
C.U of Science & Technology	5,469	5,984	14,973
C.U of Technology	1,533	4,000	9,400
C. Institute of Technology	5,321	8,110	15,359
C.U of Chinese Medicine	654	8,000	13,822
Jilin Agricultural University	5,027	8,179	13,316
Jilin Teachers' Institute of E &T	2,699	5,966	9,272
Tonghua Normal University	1,897	4,234	5,538

Source: JICA appraisal data (2001) and answers to questionnaires from each University (2006 and 2012)

Table 7: Rate of Usage of Equipment

Unit: %

2012 (1)	2012 (2)
100	95
98	96
98	100
100	100
95	98
98	95
98	95
97	100

Source: Answers to questionnaires from each University
Note: Equipment in use
(1) at price base, (2) rate of operation

Japanese made processing machine for experiments at Changchun University of Technology

3.2.1.2 Improvement in Quality

(1) Floorage per Student

With regard to the quantitative effects of the Project, changes in the floorage per student

[10] Many computers were included among the equipment. Even after 5 years following the installation of these computers, many are still used for education purposes.

were studied from the viewpoint of improvement of the study environment, in the qualitative aspect. Whereas the scope of the Project consisted of the procurement of equipment and training, each University expanded its buildings using local funds. At the time of the appraisal only Beihua University planned to expand its school buildings[11] although all the other Universities had also expanded floorages using their own funds or the budget from the province (Table 8). From historical data of the floorage of each University, it can be seen that the Universities expanded their school buildings continuously and on a large scale to 2012, even after the target year of 2006. This expansion, funded by the Universities themselves, was a precondition for effective use of the equipment procured under the Project.

Table 8: Total Floorage of School Buildings

Unit: m^2

	2001	2006		2012
		Target	Actual	
Beihua University	138,382	217,187	294,530	793,377
C.U of Science & Technology	86,885	234,885	644,861	637,000
C.U of Technology	171,434	220,376	256,415	420,078
C. Institute of Technology	125,840	180,840	163,153	463,367
C.U of Chinese Medicine	44,214	96,164	113,634	336,392
Jilin Agricultural University	94,636	143,636	187,133	754,860
Jilin Teachers' Institute of E &T	51,347	72,247	70,410	188,796
Tonghua Normal University	30,411	63,011	57,912	285,142
Total	743,149	1,228,346	1,788,048	3,879,012

Source: JICA appraisal data (2001, 2006 target) and answers to questionnaires from each University (2006 actual and 2012)
Note: School buildings include class rooms, rooms for experiments libraries, gymnasiums, halls, etc.

With regard to the floorage per student, 5 Universities out of the 8 met the target in the target year of 2006. In 2012 the figure had improved further. However, the baseline of the floorage per student set by the Ministry of Education in 2006 was not less than $30m^2$. The number of the Universities which had already met this target in 2012 was 5 out of 8 (Table 9). Although the education environment for students has

Table 9: Floorage per Student

Unit: m^2

	2001	2006		2012
		Target	Actual	
Beihua University	8.7	10.1	13.8	33.9
C.U of Science & Technology	7.6	12.0	33.8	30.6
C.U of Technology	14.6	13.8	14.5	22.4
C. Institute of Technology	12.1	13.5	11.9	33.1
C.U of Chinese Medicine	11.4	12.2	15.7	32.6
Jilin Agricultural University	10.8	8.0	10.8	41.8
Jilin Teachers' Institute of E &T	12.0	9.7	9.3	22.3
Tonghua Normal University	7.7	8.9	6.7	25.5
Average	10.5	11.1	15.9	30.3

Source: JICA appraisal data (2001, 2006 target) and answers to questionnaires from each University (2006 actual and 2012)

[11] At the time of appraisal, Beihua University had a plan to expand the facility by $9,800m^2$ which was included in the scope of the Project.

improved in terms of quantity as a whole, the improvement is not sufficient on the basis of individual Universities. There is still a need for each University to improve the education environment further.

(2) Research Opportunities and their Outcomes

By using equipment provided by the Project effectively, the level of education and research was raised. In order to measure the outcome of this improvement, increases in the number of key disciplines, key laboratories, research projects and papers were counted as indicators. The number of key disciplines, key laboratories and papers appearing in the Science Citation Index (SCI), which covers academic magazines and theses in the field of science and technology, were used as the basis for judging the outcome of education and research. The increases in key disciplines and key laboratories imply that the national or provincial government or the Department of Education have supported key education and research by injecting budget. This has led to the improvement in the level of education and research (Table 10 and Table 11). In addition, the increase in the number of research projects and the number of papers appearing in SCI showed that a lot of experiments had been made using the equipment and that the outcome of these experiments had been made public (Table 12 and Table 13). It is difficult to make a concrete evaluation of the extent to which the Project contributed to the increase, but the data showed that the numbers have increased in all the Universities since the appraisal up to the present. During this period it is estimated that equipment provided by the Japanese ODA loan was used for experiments and research. In particular it was a very good time for the Universities to improve their education and research systems during this period as the procurement of equipment and the training in Japan under the Project coincided with the increase in the number of students and the expansion of the campuses in the Universities.

Changchun University of Technology
Key Discipline

Key Discipline/Key Laboratory in Changchun University of Science and Technology

Table 10: Number of Key Disciplines

	2001	2006		2012 Actual
		Target	Actual	
Beihua University	NL: 0 PL: 4	NL: 2 PL: 12	NL: 1 PL: 6	NL: 1 PL: 6
C.U of Science & Technology	NL: 1 PL: 11	NL: 4 PL: 14	NL: 1 PL: 12	NL: 1 PL: 14
C.U of Technology	NL: 0 PL: 8	NL: 2 PL: 15	NL: 0 PL: 9	NL: 0 PL: 8
C. Institute of Technology	NL: 0 PL: 0	NL: 0 PL: 3	NL: 0 PL: 1	NL: 0 PL: 3
C.U of Chinese Medicine	NL: 0 PL: 5	NL: 1 PL: 7	NL: 0 PL: 8	NL: 0 PL: 22
Jilin Agricultural University	NL: 3 PL: 9	NL: 5 PL: 14	NL: 0 PL: 11	NL: 0 PL: 13
Jilin Teachers' Institute of E &T	NL: 0 PL: 0	NL: 0 PL: 2	NL: 0 PL: 1	NL: 0 PL: 3
Tonghua Normal University	NL: 0 PL: 1	NL: 0 PL: 5	NL: 0 PL: 1	NL: 0 PL: 3
Total	NL: 4 PL: 38	NL: 14 PL: 72	NL: 2 PL: 49	NL: 2 PL: 72

Source: JICA appraisal data (2001, 2006 target) and answers to questionnaires from each University (2006 actual and 2012)
Note: NL: National Level, PL: Provincial Level

Table 11: Number of Key Laboratories

	2006 Actual	2012 Actual
Beihua University	NL: 0 PL: 1	NL: 0 PL: 3
C.U of Science & Technology	NL: 1 PL: 1	NL: 1 PL: 10
C.U of Technology	NL: 0 PL: 1	NL: 1 PL: 11
C. Institute of Technology	NL: 0 PL: 0	NL: 0 PL: 2
C.U of Chinese Medicine	NL: 0 PL: 5	NL: 3 PL: 20
Jilin Agricultural University	NL: 0 PL: 14	NL: 1 PL: 19
Jilin Teachers' Institute of E &T	NL: 0 PL: 0	NL: 0 PL: 2
Tonghua Normal University	NL: 0 PL: 0	NL: 0 PL: 1
Total	NL: 1 PL: 22	NL: 6 PL: 68

Source: Answers to questionnaires from each University

Table 12: Number of Research Projects

	2001 Baseline	2006 Actual	2012 Actual
Beihua University	NL: n.a PL: n.a	NL: 2 PL: 89	NL: 11 PL: 124
C.U of Science & Technology	NL: 21 PL: 52	NL: 61 PL: 219	NL: 49 PL: 559
C.U of Technology	NL: 2 PL: 53	NL: 9 PL: 169	NL: 23 PL: 263
C. Institute of Technology	NL: n.a PL: n.a	NL: 0 PL: 11	NL: 3 PL: 53
C.U of Chinese Medicine	NL: 5 PL: 7	NL: 8 PL: 71	NL: 9 PL: 78
Jilin Agricultural University	NL: 8 PL: 22	NL: 38 PL: 43	NL: 69 PL: 143
Jilin Teachers' Institute of E &T	NL: 0 PL: 2	NL: 4 PL: 49	NL: 10 PL: 62
Tonghua Normal University	NL: 2 PL: 12	NL: 6 PL: 60	NL: 6 PL: 68

Source: Answers to questionnaires from each University

Table 13: Papers published in SCI

	2001	2006	2012
Beihua University	14	74	265
C.U of Science & Technology	12	109	330
C.U of Technology	8	47	276
C. Institute of Technology	1	48	139
C.U of Chinese Medicine	3	12	16
Jilin Agricultural University	n.a	22	241
Jilin Teachers' Institute of E &T	26	38	54
Tonghua Normal University	2	29	34

Source: Answers to questionnaires from each University

(3) Status of Master Courses and Doctor Courses

The equipment provided by the Project is also used for education and research in post-graduate courses. The establishment and upgrading of post-graduate courses leads to a development of human resources with a higher level and thus becomes one of the targets of universities. The current status of the post-graduate courses in the Universities is shown in Table 14 and Table 15.

Table 14: Number of Master Courses

	2001	2006	2012
Beihua University	16	38	56
C.U of Science & Technology	23	44	83
C.U of Technology	14	22	69
C. Institute of Technology	0	0	13
C.U of Chinese Medicine	14	22	25
Jilin Agricultural University	23	47	76
Jilin Teachers' Institute of E &T	0	0	0
Tonghua Normal University	0	3	3
Total	90	176	325

Source: JICA appraisal data (2001), answers to questionnaires from each University (2006 and 2012) and Jilin Province Education Department

Table 15: Number of Doctor Courses

	2001	2006	2012
C.U of Science & Technology	4	11	25
C.U of Chinese Medicine	0	2	10
Jilin Agricultural University	5	13	21
Total	9	26	56

Source: JICA appraisal data (2001), answers to questionnaires from each University (2006 and 2012) and Jilin Province Education Department
Note: There is no doctor course in the other Universities

3.2.2 Quantitative Effect[12]

(1) Realization of Practical and Higher Education and Research

The equipment for education and research procured under the Project enhanced experiments and training in the Universities, and enabled research at a higher level, mainly in the field of engineering. Such education and research in the post-graduate courses as well as co-research with industries contributed to human development in line with the purpose of the Project as well as to regional vitalization, support for market economy reform and environmental conservation. Reports on the utilization of equipment and on the participants who attended training are listed in Attachment 1.

(2) Improvement of Education Methods

One of the components of the Project was training in Japan. There were teachers who learned Japanese teaching methods and applied these to their own classes. In particular, interest in presentations made by individual students in a seminar style and study by groups with different themes became a trigger for changing teaching methods from lecture-centered education to student-centered education. In addition, the hearings from teachers at the time of the ex-post evaluation made it clear that teachers could utilize the equipment more effectively after their return from training in Japan where they were able to learn methods of experiment using the equipment procured by the Japanese ODA loan.

3.3 Impact

3.3.1 Intended Impacts

(1) Influence on Higher Education in Jilin Province

The 8 Universities under the Project are those which were given priority in Jilin Province. At the time of the appraisal there were 36 higher education institutions, and this number increased to 58 in 2012. Concerning the number of students, students at the 8 Universities constituted nearly 30% of the total number of students in the province (Table 16). The data did not tell us whether or not the Project had had any impact on higher education in the province through the 8 Universities. The Universities have different characteristics. There are science oriented universities (Changchun University of Science and Technology, Changchun University of Technology, Changchun Institute of Technology), teaching oriented universities (Jilin Teachers' Institute of Engineering and Technology, Tonghua Normal University) and a medical university (Changchun University of Chinese Medicine). It can be said that the Project has had a certain influence on higher education through papers published in the respective areas.

[12] The quantitative effect was confirmed through interviews with the 8 Universities. In each University explanations were given by vice presidents, deans, participants in training, and people in charge of operation and maintenance of equipment and heads of university management.

Table 16: Indicators of Higher Education in Jilin Province

Indicator	2001	2006	2012
(1) Number of higher education institutions	36	43	58
(2) a. Number of students in higher education institutions (1000 people)	248	378	522
b. Number of students in the 8 Universities (1000 people)	69	113	125
b/a (%)	28	30	24
(3) Enrollment rate of higher education (%) (=Number of enrolled of relevant age/ Number of population of relevant age)	17	29	41
(4) Floorage per Student (m^2/person) (=Total floorage/Total number of students)	29	34	39
Same in the 8 Universities (m^2/person)	11	16	30

Source: Jilin Province Education Department and answers to questionnaires from each University

(2) Contribution to Regional Vitalization, Support for Market Economy Reform and Environmental Conservation

Regional vitalization, support for reform of the market economy and environmental conservation, which are listed as impacts of the Project have been achieved through research at the Universities or by graduates who studied in the Universities. For example, at Beihua University there have been about 20 thousand graduates for the last 7 years who studied subjects related to the major industries in Jilin Province such as metallurgy, chemical industry, pharmacy, medicine, mechanical engineering, biology and architecture. The Changchun University of Chinese Medicine has contributed a lot to the region in the areas of nursing, medicine and medical treatment. The Universities also use equipment procured under the Project in their vocational education and adult education and this has enhanced the technical capacity of students who attended the courses. Although it is difficult to see actual individual examples which show this contribution, it can be said that the Project as a whole has contributed to the province through the increase in the enrollment rate, the improvement in the education environment, the increase in publications in official papers, and the application of advanced teaching and research technology acquired through training in Japan, as mentioned above.

3.3.2 Other Impacts

(1) Impacts on the Natural and Social Environment

It was confirmed at the time of the appraisal of the Project that the Department of Education had received the approval of the Environment Protection Department of Jilin Province for its Environmental Impact Assessment before implementation of the Project. Since the Project was composed mainly of equipment, there was nothing that affected the natural or social environment during implementation of the Project. Even the expansion of buildings and other construction works for the installation of large equipment were conducted within the boundary of the Universities. Therefore there was no resettlement in this Project. After the instalment of equipment, there was no issue of environmental pollution through the use of the

equipment. With regard to the construction of buildings in the Universities which was not a component of the Japanese ODA loan, there were also no environmental problems of land acquisition or environment, including resettlement, as from the beginning the construction took place only within the University areas.

(2) Agreements with Japanese Universities

Agreements with Japanese universities were concluded by 4 Universities as mentioned in Table 17. Since the Changchun University of Technology already had exchange with Niigata University of Management before starting the Project, it sent its staff and teachers to Niigata University of Management for training in university management under the Project. This arrangement made the relationship between the two universities stronger. In another example of exchange, Changchun University of Chinese Medicine signed an agreement with Niigata University of Pharmacy and Applied Life Science during the implementation period of the Project and sent staff there for training. In cases such as these the Project contributed directly and indirectly to the strengthening of ties or the promotion of agreements.

Table 17: Agreements with Japanese Universities

Name of University	Japanese Counterpart University and Agreement Date
C.U of Science & Technology	Nagasaki University of Foreign Studies, September 2008
C.U of Technology	Niigata University of Management, October 1999
C.U of Chinese Medicine	Niigata University of Pharmacy and Applied Life Science, September 2007
	Tokyo University of Pharmacy and Life Science, May 2013
Jilin Agricultural University	Fuji University, November 2002
	University of Tsukuba, February 2009
	Iwate University, September 2011

Source: Answers to questionnaires from each University

As can be seen above, this Project has largely achieved its objectives. Therefore its effectiveness and impact are high.

3.4 Efficiency (Rating:②)

3.4.1 Project Outputs

The procurement of education and research equipment and training in Japan were covered by the Japanese ODA loan under the Project. Expansion of school buildings was included in the scope of the Project only at Beihua University. However, the cost of the expansion was financed through the provincial budget or the budget of the University itself. Other Universities also expanded their buildings but the expansion was not explicitly included as part of the scope of the Project at the time of the appraisal (refer to Table 8). Beihua University had planned to expand its floorage by 9,800 m^2 but this was reduced to 5,511m^2 as it was necessary to maintain an evacuation passage in the said area. Later the University expanded its floorage further using

its own resources. Therefore the final increase in floorage was more than that which was within the scope of the Project.

The education equipment was procured based on a request list submitted by each University. Changes were made to the technical specifications of equipment for which the technology changes rapidly like computers at the bidding or contract stage. As a whole, the procurement of equipment was in accordance with the original plan. With regard to the number of participants in training, this was 177 at the time of the appraisal, although the actual number turned out to be 176, almost as planned. However, the training period was shorter than in the original plan. The reason for this difference was that it took time to gather information on Japanese universities and because the teachers could not take long periods of leave for training due to their campus duties. There were no Japanese teachers dispatched to the Universities using the Japanese ODA loan funds, but some Japanese teachers were received using the funds of Universities themselves, or they were dispatched using the funds of the Japanese universities; for example lectures on material technology in Changchun University of Technology, and the case of Japanese language teachers in Tonghua Teacher's College. Out of 176 participants, 93 took courses in the administration and management of universities and most of these (78 participants) visited Ritsumeikan University in Japan for that purpose. Many participants took this course which Ritsumeikan University had established for the Project (Table 18) .

Table 18: Number of Participants in Training

Name of University	Plan	Actual	
	Total	Total	Of which administration training
Beihua University	33	31	9
C.U of Science & Technology	21	9	4
C.U of Technology	23	33	26
C. Institute of Technology	19	34	29
C.U of Chinese Medicine	37	31	9
Jilin Agricultural University	20	22	8
Jilin Teachers' Institute of E &T	14	8	3
Tonghua Normal University	10	8	5
Total	177	176	93

Source: Jilin Province Education Department and answers to questionnaires from each University

3.4.2 Project Inputs

3.4.2.1 Project Cost

The total project cost was originally planned at 5,707 million Japanese yen of which the ODA loan amount was 4,530 million Japanese yen. The actual project cost was 4,585 million Japanese yen of which the ODA loan amount was 4,441 million Japanese yen. The actual project cost was 80% of the original total and 98% of the Japanese ODA loan total, both of which were within the limits of the plan. The foreign currency portion of the Project was used for education equipment and training and all of this was covered by the Japanese ODA loan. At the planning stage, the installation and other incidental expenses for the equipment were to be covered by local budgets but in reality all these expenses were covered by the foreign currency

portion of the contract. With regard to the construction costs of building in Beihua University, local budget was appropriated to cover all the construction costs. The other Universities also constructed buildings using their own budgets but this construction was not included in the scope of the Project. (Table 19, Table 20)

Table 19: Planned Project Cost

Unit: million Japanese yen

Item	Foreign Currency		Local Currency		Total	
	Total	Of which Japanese ODA Loan	Total	Of which Japanese ODA Loan	Total	Of which Japanese ODA Loan
Building Construction	0	0	255	0	255	0
Education/Research Equipment	4,045	4,045	866	0	4,911	4,045
Personnel Training	175	175	0	0	175	175
Price Escalation	94	94	1	0	95	94
Physical Contingency	216	216	55	0	271	216
Total	4,530	4,530	1,177	0	5,707	4,530

Source: JICA appraisal data

Table 20: Actual Project Cost

Item	Foreign Currency (million yen)		Local Currency (million RMB)		Total (million yen)	
	Total	Of which Japanese ODA Loan	Total	Of which Japanese ODA Loan	Total	Of which Japanese ODA Loan
Building Construction	0	0	10.4	0	144	0
Education/Research Equipment	4,300	4,300	0	0	4,300	4,300
Personnel Training	137	137	0	0	137	137
Disbursement Charges	4	4	0	0	4	4
Total	4,441	4,441	10.4	0	4,585	4,441

Source: Jilin Province Education Department; Data provided by JICA
RMB: Ren Min Bi
Note: The "Disbursement Charges" are charged to the borrower at the time of disbursement by JICA at 0.01% of the disbursed amount. There were covered by the loan.

The amount for education equipment procured was 255 million Japanese yen more than in the original plan. This was due to changes in part of the specification of the equipment and was also the result of additional procurement for equipment to be used in the new library at Changchun University of Chinese Medicine (Table 21) .

Table 21: Cost of Equipment in each University

Unit: million Japanese yen

	Plan	Actual
Beihua University	899	857
C.U of Science & Technology	569	566
C.U of Technology	466	535
C. Institute of Technology	527	601
C.U of Chinese Medicine	609	781
Jilin Agricultural University	426	400
Jilin Teacher's Institute of E &T	275	281
Tonghua Normal University	273	280
Total	4,045	4,300

Source: Jilin Province Education Department
Note: The results of addition differ due to round off.

3.4.2.2 Project Period

Although the loan agreement of the Project was concluded in March 2003, the starting point of the Project was set in January 2003 when construction began on school buildings at Beihua University. The original implementation period was 39 months from January 2003 to March 2006, whereas the actual implementation period was 108 months, ending in December 2011 with the completion of installment for additional procurement. This was 277% of the original schedule and thus significantly longer than planned (Table 22) .

Table 22: Implementation Period

	Original Plan	Actual
Building Construction	January 2003 – September 2003	January 2003 – December 2006
Education/Research Equipment	April 2003 – December 2005	April 2003 – December 2011
Personnel Training	April 2003 – March 2006	April 2003 – November 2010
Project Period	January 2003 – March 2006 (39 months)	January 2003 – December 2011 (108 months)

Source: Answers to questionnaires from each University

The original disbursement period of the Project ended in July 2010 but the period was extended for one year and 6 months to January 2012 because the installation of equipment and the dispatch of trainees to Japan had not been completed. The delay in procurement was caused by the time consuming process of the preparation of bidding packages, and bidding by each University did not take place. It took time to make decisions on the specifications of equipment, on the packaging[13] of the same kind of equipment for a bid while collecting requests from all the Universities, and on the preparation of bidding documents. It was also necessary to revise the specifications of some of the equipment because of the delay in bidding. The delay in training was caused by the selection of Japanese universities appropriate for the specialties of trainees, by the Great Sichuan Earthquake (May 2008) and by a new type of influenza, all of which meant it took time for dispatch added to which were the strict formalities for overseas trips and the postponement of trips.

3.4.3 Results of Calculations of Internal Rates of Return

Due to the nature of the project, a quantitative analysis of the internal rate of return was not possible.

Although the project cost was within the plan, the project period exceeded the plan significantly. Therefore efficiency of the project is fair.

[13] There were 15 packages in total and the bidding was made by each package.

3.5 Sustainability (Rating: ③)

3.5.1 Institutional Aspects of Operation and Maintenance

The maintenance of equipment procured by the Project is the responsibility of the office of assets or the office of equipment in each University. These offices label the equipment, sometimes with a bar code for inventory control, post important notices for the use of the equipment in each room and assign people in charge of the operation and maintenance of the equipment. The people assigned to the operation and maintenance of the equipment are usually the teachers or researchers who use the equipment. In some cases they keep operation records for the equipment. The provincial education department monitors the Universities and the Universities are obliged to report on the condition of their assets conditions regularly. In this way the operation and maintenance system is established not only in each University but between the Universities and the province.

Barcode for inventory management in Changchun University of Chinese Medicine

Operation and management rules posted in Beihua University

3.5.2 Technical Aspects of Operation and Maintenance

Since experts such as the teachers or researchers who use the equipment are responsible for the equipment, minor repairs are done by these experts themselves. At the end of the guarantee period of equipment, the Universities ask suppliers to conduct regular maintenance and major repairs which the experts in the Universities cannot handle. According to the hearings at the Universities, there was no serious problems at the time of the ex-post evaluation as the Universities continued to receive technical support for the equipment from the suppliers.

3.5.3 Financial Aspects of Operation and Maintenance

The operation and maintenance costs for the equipment are covered by the university budget. A certain level of operation and maintenance budget is secured by each University (Table 23). In addition, subsidies from the provincial government and commission fees from industries are used for operation and maintenance. Since the income of each University has been stable and the provincial budget for higher education has been increasing, there seems to have

been no shortage in expenditure for operation and maintenance. With regard to the depreciation of equipment, although the operation period of the equipment is set, the equipment will be used as long as it works without consideration made to depreciation.

Table 23: Income and Expenditure of the Universities

Unit: RMB1,000

	2010	2011	2012
Beihua University	income: 486,540 outlay: 429,190 (O/M:810)	income: 491,440 outlay: 401,650 (O/M:920)	income: 733,280 outlay: 661,540 (O/M:830)
C.U of Science & Technology	income: 421,750 outlay: 365,490 (O/M:14,340)	income: 1042,680 outlay: 1018,650 (O/M:13,580)	income: 913,180 outlay: 637,920 (O/M:9,700)
C.U of Technology	income: 318,420 outlay: 306,770 (O/M:3,000)	income: 427,320 outlay: 449,430 (O/M:3,000)	income: 497,430 outlay: 461,560 (O/M:3,800)
C. Institute of Technology	income: 256,430 outlay: 237,130 (O/M:3,100)	income: 299,010 outlay: 298,290 (O/M:3,200)	income: 380,600 outlay: 347,250 (O/M:3,300)
C.U of Chinese Medicine	income: 198,660 outlay: 169,640 (O/M:N/A)	income: 296,970 outlay: 299,790 (O/M:N/A)	income: 365,590 outlay: 325,360 (O/M:N/A)
Jilin Agricultural University	income: 970,650 outlay: 864,770 (O/M:1,050)	income: 837,860 outlay: 547,240 (O/M:1,220)	income: 679,450 outlay: 589,380 (O/M:1,110)
Jilin Teachers' Institute of E &T	income: 134,930 outlay: 121,650 (O/M:300)	income: 141,280 outlay: 138,860 (O/M:380)	income: 215,640 outlay: 150,050 (O/M:400)
Tonghua Normal University	income: 133,190 outlay: 115,840 (O/M:2,540)	income: 195,380 outlay: 186,880 (O/M:4,320)	income: 227,530 outlay: 197,090 (O/M:23,040)

Source: Answers to questionnaires from each University
Note: O/M: Operation and Maintenance (the figures in parenthesis are included in the outlay total)

3.5.4 Current Status of Operation and Maintenance

Since each University has set up a firm operation and maintenance system, the equipment has been kept in a good condition. The ex-post evaluation mission confirmed at the site survey that rooms where the equipment is installed and their surroundings were kept clean and neat. This may be because the instructions of administrators were fully disseminated. The equipment was installed more than 5 years ago, but even the old type of computers are still used for education. Therefore the condition of equipment remains good.

Old type computers still used in Tonghua Normal University

No major problems have been observed in the institutional, technical and financial aspects of the operation and maintenance system. Therefore the sustainability of the project effect is high.

4. Conclusion, Lessons Learned and Recommendations

4.1 Conclusion

The objective of this Project was to improve the quality and quantity of higher education in the designated 8 Universities under the Education Department of Jilin Province, by providing equipment and training for teachers and administration staff through the Japanese ODA loan and by expanding the facilities of the Universities through the provincial budget and the internal funds of the Universities. The Project was implemented based on the development policy for higher education in China and met the high needs of higher education. The Project was also consistent with Japanese ODA policy to China, and therefore the relevance of the Project is high. It was also noted that the timely arrangement of the procurement of equipment and training in Japan under the Project increased the opportunities for experiments and research which led to an increase in the number of academic papers. Thus, effectiveness and impact of the Project are high. With regard to the project cost, the procurement of equipment and training were implemented almost as planned within the original budget. However, the implementation period was far beyond the planned period because of delays in both training and procurement. Because of this, the efficiency of the Project is fair. The equipment procured has been well maintained from the point of view of the institutional, technical and financial aspects of each University. Even at the time of ex-post evaluation, the equipment is well operated and maintained and kept in a very good condition. The sustainability of the Project is therefore regarded as high.

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

4.2 Recommendations

None

4.3 Lessons Learned

"Consideration of an Efficient Procurement Method for Education Equipment"

In this Project, the education equipment was originally to be procured by each University but later this was changed to the procurement of the same kind of equipment for all the Universities through bidding on a package basis. As a result it took time to complete the bidding packages based on the request from all the Universities and to install the equipment in each University after bidding. This was economical from the procurement cost aspect but not efficient from the point of view of speedy procurement as the longer procurement time resulted in the obsolescence of specifications. Therefore the discretion to make their own decisions on the part of each University should be respected and consultation on efficient procurement methods should be made at the time of appraisal, not only with executing agencies like the education department but also with the institutions that use the equipment.

Comparison of the Original and Actual Scope of the Project

Item	Original	Actual
1. Project Outputs	8 universities in Jilin Province	Same as planned
(1) Construction of Buildings (using provincial and university funds)	9,800m^2 in Beihua University	5,511m^2 in Beihua University and more in other 7 Universities
(2) Education Facilities	Equipment for education, experiments and research	Same as planned
(3) Training	Total 177 participants	Total 176 participants
2.Project Period	January 2003 – March 2006 (39 months)	January 2003 – December 2011 (108 months)
3.Project Cost		
Amount paid in foreign currency	4,530 million yen	4,441million yen (Note 1)
Amount paid in local currency	1,177 million yen (78.5 million RMB)	144 million yen (10.4 million RMB)
Total	5,707 million yen	4,585 million yen
Japanese ODA loan portion	4,530 million yen	4,441 million yen
Exchange rate	1 RMB = 15 yen (As of September 2002)	1 RMB = 13.8 yen (Average between 2003 and 2006) (Note 2)

RMB: Ren Min Bi
Note 1: The actual amount paid in local currency is the cost for construction of 5,511m^2
Note 2: The exchange rate between the RMB and the Japanese yen is the average rate related to the period of construction of buildings in Beihua University

Attachment 1

Comments on Equipment procured by the ODA Loan and on Training in Japan

University	Comments
Beihua University	● The facilities in the construction engineer training center are used for the human resource development of students and post graduates, research by professors, innovation activities and the enhancement of the practical capacity of students. ● Innovation activities of students using the facilities procured through the Japanese ODA loan resulted in their winning second prize at the national level and third prize at the provincial level in the 2009 University Student Electronic Contest.
Changchun University of Science & Technology	● A part of the facilities is used for the tests entrusted to the university by outside entities. This helps revitalize the local economy. ● Fluorescence spectrophotometer has played an important role in education and scientific research. For the purpose of using this equipment in the division of materials, an experiment project, the "measurement of luminescence performance of materials" was added to the course related to the physical performance of materials. The equipment also contributed to the preparation of graduation theses, scientific innovation activities, and the finalization of theses for degrees. The number of treatises which were open to public was more than 10. Teachers carried out 8 national and provincial scientific projects using the equipment and published 20 or more treatises.
Changchun University of Technology	● The teachers who underwent training in Japan participated in the installation, adjustment and preparation for new experiments with the equipment procured by the Japanese ODA loan after their return home as well as being actively involved in the effective use of the equipment.
Changchun Institute of Technology	● The Project accelerated improvements in the environment for practical education, human development and scientific research. The equipment introduced through the Project raised the capacity of the laboratories to a much higher level, improved the environment for human development, and deepened the education contents, methods and means. As a result, the capacity of students for practice, innovation and technology was enhanced. This improvement in human quality made the competitiveness of students in the market much better after their graduation. ● The trainees made good use of their knowledge and experience in the daily education and scientific research and adopted both Japanese advanced technology and management method in their field of expertise after their return from training in Japan
Changchun University of Chinese Medicine	● Through training in Japan participants upgraded their expertise by using advanced equipment and facilities and learned technology and management models of effective Japanese medical care. The participants gained inspiration for the modernization of research approaches and management models in Chinese medicine and pharmacy, and contributed to the improvement of education, scientific research, human development, school management, etc. at the university.
Jilin Agricultural University	● The University provided scientific research institutions and industries with technical support such as R & D for new products by using the advanced equipment and facilities introduced through the Project. This improved local economic growth. At the same time, the facilities continuously lifted the scientific research level of the University, the outcome of which is scientific technology used for actual production. ● The 15 teachers who participated in the training in Japan were young and were the backbone of the University. They are always in charge of regular courses and most of them teach students in a master or doctor courses. They were able to deepen their expertise through the training, which is reflected in approaches to experiments, methods of research and test methods. These teachers played an active role on the front line of education after their return from training. They initiated the outcomes of their training in Japan and stimulated willingness to learn on the part of students.
Jilin Teachers' Institute of Engineering and Technology	● Participants learned about the internal management of higher education institutions in Japan and could show an example for their own management. Training deepened the relations and friendship between the participants and Japanese teachers, as well as between the two universities, and built a basis for future interaction.
Tonghua Normal University	● The scanning electron microscope and the transmission electron microscope which were procured under the Project were used for research works for graduation theses and helped students develop their practical capacity. The teachers conducted scientific research using these sets of equipment and issued 3 SCI papers in their specialized areas.

Source: Answers to questionnaires from each University

People's Republic of China

Ex-Post Evaluation of Japanese ODA Loan Project

"Inland Higher Education Project (Regional Vitalization, Market Economy Reform Support, and Environmental Conservation) (Anhui Province)"

External Evaluator: Takako Haraguchi, OPMAC Corporation

0. Summary

This project aimed to improve teaching and research at ten major universities in Anhui Province through the development of their education/research equipment as well as providing training for teachers. Relevance of the project was evaluated to be high, as it was in line with (i) the higher education policies of China and Anhui Province, (ii) development needs for quantitative and qualitative enhancement of the universities, and (iii) Japan's assistance policies. Effectiveness/impact was also high, based on the observations that the project satisfied such needs, improved education activities by enabling more experiments, and improved research activities through outcomes achieved from advanced equipment and training, and thereby contributed to the promotion of the key industries as well as environmental conservation. Efficiency of the project was evaluated to be fair on the whole: although the project cost was within the plan, the project period significantly exceeded the planned period due to delays in procurement. Sustainability was evaluated to be high, with no problem observed in institutional, technical and financial aspects, and due to the good status of operation and maintenance of the facilities and equipment developed by the project.

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

1. Project Description

Project Location

Process control experiment equipment at Anhui University of Science and Technology

1.1 Background[1]

In China, together with the remarkable economic development, several development issues have arisen such as narrowing internal disparity between coastal and inland areas, reducing poverty, preparing for joining in the World Trade Organization (WTO) and handling global issues. To deal with these issues, the Chinese government put a high priority on development of human resources that were essential for the accelerated efforts towards developing a market economy and narrowing economic gaps under the policy to strengthen reform and promote openness. Accordingly, the government set out a target to increase the higher education enrollment ratio to 15% as well as adopting a policy to strengthen higher education institutions (HEIs) in inland areas.

Anhui Province is located in the mid-eastern part of China with a total population of 63,250,000 persons (2001) and a total area of approx. 140,000 km^2. The province achieved high economic growth with an average annual gross domestic product (GDP) increase rate of 8.8% in the years 1996-2000, during the 9^{th} 5-year Plan. However, per capita GDP (5,221 yuan in 2001) still remained below the national average (7,543 yuan). The provincial government aimed to promote a market economy and further economic development in the 10^{th} 5-year Plan in Anhui Province (2001-2005). Also, the 5-year Plan for Education in Anhui Province (2001-2005) planned to increase the number of students in higher education to around 650,000 persons and the enrollment ratio to more than 13% by 2005. However, in order to achieve such targets, existing constraints in the "hardware" aspects (such as school facilities and equipment), "software" aspects (teachers) as well as financial aspects of HEIs (totaling 54 institutions in 2001) had to be addressed.

Under such conditions, this project specified three development issues, namely, (i) regional vitalization, (ii) market economy reform support, and (iii) environmental conservation of Anhui Province, and aimed to contribute to human resource development in order to address such issues by enhancing quality and quantity of higher education at major universities in the province.

1.2 Project Outline

The objective of this project was to quantitatively and qualitatively enhance higher education at ten major universities in Anhui Province (Hefei University of Technology, Anhui University, Anhui Agricultural University, Anhui Medical University, Anhui Normal University, Anhui University of Science and Technology, Anhui University of Technology, Huaibei Normal University, Anhui Polytechnic University, Anhui University of Finance and

[1] This project is one of the (Inland) Higher Education Projects funded by Japanese ODA loans targeted to universities in 22 provinces, municipalities or autonomous regions in inland China.

Economics)[2] by developing educational infrastructures such as equipment (improvement of the hardware aspects) and teachers' training (strengthening of the software aspects), thereby contributing to regional vitalization, market economy reform support, and environmental conservation of the province.

Loan Approved Amount/ Disbursed Amount	4,478 million yen / 4,091 million yen	
Exchange of Notes Date/ Loan Agreement Signing Date	March 2003 / March 2003	
Terms and Conditions	Interest Rate	2.2% (0.75% for training component)
	Repayment Period (Grace Period)	30 years (40 years for training component) (10 years)
	Conditions for Procurement:	General untied
Borrower / Executing Agency	The government of People's Republic of China / Anhui Provincial People's Government (Education Bureau)	
Final Disbursement Date	July, 2011	
Feasibility Studies, etc.	- "Feasibility Study Report", Hefei University of Technology, 2002. - "Special Assistance for Project Implementation (SAPI) for Higher Education Project in China", Japan International Cooperation Agency (JICA), 2003, 2004 and 2005. - "The Supervision Survey Report on JICA Loaned Higher Education Project", JICA, 2010.	

2. Outline of the Evaluation Study

2.1 External Evaluator

Takako Haraguchi (OPMAC Corporation)

2.2 Duration of Evaluation Study

Duration of the Study: August 2013 – November 2014

Duration of the Field Study: October 27 – November 28, 2013 and March 23-31, 2014[3]

[2] The names of the universities are those as of today. The following universities had different names at the time of the appraisal of this project: (i) Huaibei Normal University: formerly known as Huaibei Coal Industry Teacher's College (renamed in 2010); (ii) Anhui Polytechnic University: formerly known as Anhui University of Technology and Science (renamed in 2010); and (iii) Anhui University of Finance and Economics: formerly known as Anhui Institute of Finance and Trade (renamed in 2004).

[3] The field study period included the periods for ex-post evaluation of the Inland Higher Education Project (Regional Vitalization, Market Economy Reform Support, and Environmental Conservation) (Henan Province) and the Inland Higher Education Project (Regional Vitalization, Market Economy Reform Support, and Environmental Conservation) (Heilongjiang Province).

3. Results of the Evaluation (Overall Rating: A[4])

3.1 Relevance (Rating: ③[5])

3.1.1 Relevance to the Development Plan of China

The objective of this project is consistent with the five-year plans for economic and social development and the five-year plans for the education sector at both the national and provincial levels, as well as other education-related development strategies, which all aim at quantitative and qualitative development of higher education both at the times of appraisal and ex-post evaluations of this project (Table 1). While there were no large policy changes between the appraisal and ex-post stages, in recent years more importance has been given to higher education development. Also, the key industries of Anhui Province have shifted to those that require higher technologies.

Table 1: Main objectives of development plans related to this project

	At the time of appraisal	At the time of ex-post evaluation
National level development plan	The 10th 5-year Plan for National Economic and Social Development (2001–2005): To increase higher education enrollment ratio to around 15% by 2005.	The 12th 5-year Plan for National Economic and Social Development (2011-2015): To emphasize higher education for promoting industrial advances (quantitative targets include 87% of junior secondary graduates to go on to senior secondary school)
National level education sector plan	The 10th National 5-year Plan for Education (2001-2005): To increase student enrollment in HEIs to 16,000,000 by 2005; to develop human resources that have high skills in high technology, biotechnologies, manufacturing technologies etc. that are necessary for industrial structural adjustment; to strengthen support to HEIs that are relatively at a high level in western area; to strengthen support to fostering of teachers.	The 12th National 5-year Plan for Education (2011-2015) and National Mid- and Long-term Reform and Development Plan for Education Sector" (2010–2020): To increase higher education enrollment ratio from 26.5% in 2010 to 40% in 2020; to increase student enrollment in HEIs from 29,790,000 in 2009 to 33,500,000 by 2015; to develop HEIs in midwestern area with special focus on development of departments that are competitive and fostering of teachers.
Provincial level development plan	The 10th 5-year Plan for Economic and Social Development in Anhui Province (2001-2005): To achieve annual economic growth rate of 8.5% by 2005; develop the key industries including machinery maintenance industry, electronic and electric industry, construction material industry, etc.	The 12th 5-year Plan for Economic and Social Development in Anhui Province (2011-2015): To increase GDP to more than two times the 2010 level; to develop key industries including the strategic emerging industry, modern service industry, modern transportation infrastructure, efficient energy industry, new material industry, advanced manufacturing, modern construction business, and modern agriculture, etc.

[4] A: Highly satisfactory, B: Satisfactory, C: Partially satisfactory, D: Unsatisfactory

[5] ③: High, ② Fair, ① Low

	At the time of appraisal	At the time of ex-post evaluation
Provincial level education sector plan	The 10th 5-year Plan for Education in Anhui Province (2001-2015) To increase higher education enrollment ratio from 10.5% in 2001 to 13.2% in 2005; to increase student enrollment in HEIs to around 650,000 (including around 450,000 in regular HEIs[6]).	The 12th 5-year Plan for Education in Anhui Province (2011-2015) To increase higher education enrollment ratio from to 36% in 2015; to increase the student enrollment in HEIs to more than 1,500,000.

Sources: JICA appraisal documents; respective documents of the mentioned development plans.

3.1.2 Relevance to the Development Needs of China

Development needs were observed for the quantitative and qualitative enhancement of education at the 10 targeted universities at the times of both the appraisal and ex-post evaluations.

At the time of the appraisal, there was a need for quantitative expansion of higher education in order to narrow the economic gap mentioned in "1.1 Background" and following the increase of primary and secondary education in Anhui Province (school intake rates in 2001 were 98.6% for primary education and 86.6% for secondary education). It was forecasted that the number of new entrants in regular HEIs would increase from 100,000 in 2001 to 140,000 in 2005. The 10 universities targeted by this project were either leading universities or subject to high priority development, all under the jurisdiction of Anhui Province[7], but their financial resources for developing the hardware (facilities and equipment) and software (teachers' training) aspects to address such increasing demand were limited. Also, there were few opportunities provided for the teachers to visit overseas.

At the time of the ex-post evaluation, although the real GDP growth rate had been higher than 10% since 2004, the need for narrowing the economic gap still existed in Anhui Province: provincial per capita GDP was 28,792 yuan in 2012, which was 75% of the national average. The number of new entrants to regular HEIs in the province continued to increase from 220,000 in 2006 to more than 300,000 in 2012, and the need for quantitative and qualitative enhancement of HEIs remains high. The 10 targeted universities have continued to be the leading provincial universities. On the other hand, the need for hardware development seemed to have been more satisfied compared to the time of the appraisal, due to increased financial injection to provincial universities following the above-mentioned higher education development policies. The Education Bureau of Anhui Province, the executing agency of this

[6] Regular (or standard) HEIs is a term referring to universities and colleges, including undergraduate programs of comprehensive universities and single-department colleges, specialized colleges (similar to junior colleges in Japan), and graduate programs. Adult higher education and higher vocational education institutions are not included. (Note for English translation only: in this report, "universities" include both universities and colleges that grant undergraduate or higher academic degrees unless otherwise mentioned.)

[7] According to the executing agency, Hefei University of Technology, Anhui University, Anhui Agricultural University, Anhui Medical University, Anhui Normal University, Anhui University of Science and Technology and Anhui University of Technology were selected as they had already been at a certain level at the time of appraisal, and this project aimed to further develop those leading universities. On the other hand, Huaibei Normal University, Anhui Polytechnic University and Anhui University of Finance and Economics were selected as they had potential to be top level universities in the future given priority development.

project, now puts more emphasis on the need to develop the software aspects such as improving the quality of teachers.

3.1.3 Relevance to Japan's ODA Policy

At the time of the appraisal, Japan's Country Assistance Policy for China, the Medium-term Strategy for Overseas Economic Cooperation Operations and the Country Assistance Strategy put priorities on human resources development from the viewpoint of support for openness and reform and post-WTO economic reform, and on assistance in the inland China from the aspect of narrowing the economic gap. The project objective was consistent with such aid policies of Japan. The Country Assistance Strategy upholds "regional vitalization and exchange", "market economy reform support", and "environmental conservation" as important areas of human resource development.

This project has been highly relevant to China's development plans, development needs as well as Japan's ODA policies, and therefore its relevance is evaluated to be high.

3.2 Effectiveness[8] (Rating: ③)

3.2.1 Quantitative Effects (Operation and Effect Indicators)

The number of students as well as various teaching and research-related indicators designated at the appraisal showed improvement between before and after this project. The set targets were achieved at the same as or better levels than expected. The effects of this project cannot be assessed by these indicators alone, since they measure operation and effects not only of this project but also of other projects (school building construction, equipment procurement, etc.) that were implemented around the same time by the province or target universities themselves. Nevertheless, by observing the use of the equipment developed and the activities of the teachers trained in Japan under this project, it was confirmed that this project constituted some factors which contributed to the improvement of the indicators.

(1) Quantitative expansion of teaching and research[9]

The number of students as well as the size of the facilities and equipment increased. The

[8] Sub-rating for Effectiveness was given with consideration of Impact. Taking into consideration the project objective and plan set at appraisal, this ex-post evaluation was designed based on the following definition of the key elements of effectiveness and impact of this project:
- Effectiveness: quantitative and qualitative enhancement of teaching and research at the targeted universities;
- Intended impact: enhancement of teaching and research at the provincial level, and contribution to provincial-level development in the areas of regional vitalization, market economy reform support and environmental conservation;
- Other impacts: strengthening of exchanges and cooperation with universities in Japan.

[9] In the appraisal, the target year for evaluating the quantitative indicators was set at 2006. However, due to the delays in project implementation (see "3.4 Efficiency"), the ex-post evaluation set the actual comparison year at 2012, a year after the project was actually completed (i.e. the equipment procurement competed).

equipment developed under this project were well utilized, and therefore it can be said that they played the expected role as part of the response to the quantitative expansion of teaching and research.

First, the number of students increased far beyond the planned level at all targeted universities (Table 2). In 2012, each university enrolled around twice the number of students than in 2001.

The floor area of school buildings increased to more than threefold, which was also at a higher pace than planned, during the period from 2001 to 2012 (average of the targeted universities). As this project did not cover building construction, such increase was due to other development works funded by the province or the targeted universities (mainly private borrowing). However, the expanded area of school buildings has played a fundamental role in bringing about desired effects of this project.

Table 2: Number of students
(Total number of graduate, undergraduate and single depatment college students)

Unit: Person

	Actual 2001	Planned 2006 (Planned year of completion)	Actual 2006 (Planned target year)	Actual 2012 (A year after project completion)
Hefei Univ. of Technology	17,107	30,500	29,160	36,280
Anhui Univ.	14,568	21,982	22,786	27,093
Anhui Agricultural Univ.	10,818	20,000	18,650	20,283
Anhui Medical Univ.	6,883	10,056	10,787	12,841
Anhui Normal Univ.	13,914	33,207	N.A.	34,182
Anhui Univ. of Science and Technology	11,003	19,280	N.A.	23,692
Anhui Univ. of Technology	11,367	20,000	18,962	26,835
Huaibei Normal Univ.	8,116	14,841	14,520	17,409
Anhui Polytechnic Univ.	6,797	10,200	10,169	17,416
Anhui Univ. of Finance and Economics	9,230	15,000	16,096	21,055
Total	109,803	195,066	N.A.	237,086

Sources: JICA internal documents; responses to the questionnaire from the executing agency.

The monetary value of educational and research equipment[10] increased, although the portion procured by this project was slightly below the planned value (Table 3). The reasons the indicator did not reach the target at some universities are considered to be cancellation of procurement of some equipment (see "3.4 Efficiency) and arrival of the useful life of some other equipment such as personal computers that were installed at an early stage of project implementation. The total value substantially increased as well (mainly due to investments

[10] At appraisal, this indicator was not designated as an operation and effect indicator for this project. However, in the ex-post evaluation the indicator was considered necessary for confirming how the project responded to the quantitative expansion of teaching and research, and therefore the data was collected including those from before the project.

made by the provincial government and the universities themselves). While the equipment procured by this project now constitute only a part of the total value, the provincial Education Bureau and the targeted universities commented that they were particularly important during the project implementation stage when making large-scale investments on their own were difficult, and they continued to play a meaningful role at the time of ex-post evaluation.

The equipment developed by this project have generally been well used, while some equipment such as personal computers made in 2006 were replaced with new ones due to obsolescence. All targeted universities except Anhui Medical University answered that the utilization rates of major equipment procured under this project were almost 100%. According to Anhui Medical University, the rate is around 60% because there were equipment that had never been used: in one case, the equipment had already been obsolete when it arrived, due to the procurement delays (see "3.4 Efficiency"), and thus they could no longer be used for research which the university needed to conduct with the most advanced equipment (to pursue such research, the university used the ones which it purchased using its own budget); in another case, the equipment arrived without the necessary parts, and thus could not be used, because those parts were not clearly mentioned in the procurement list.

All target universities named many equipment as being useful, including laboratory analytical instruments, experimental equipment for teaching, computers and networking equipment. On the visits made to each target university for ex-post evaluation, the evaluator made observations of major equipment focusing on the more expensive or highly-used ones, and confirmed that they were being utilized. Several universities registered large laboratory equipment to laboratory equipment sharing platforms[11] found within or outside of the universities for higher utilization.

In this project, some universities conducted additional (Phase 2) procurement using contingencies, etc. of the ODA loan. The decision on whether or not to participate in the Phase 2 procurement and selection of equipment to be procured were left to each university. In the originally-planned (Phase 1) procurement, many universities selected numerous types and volumes of equipment so that they would reach as many faculties/laboratories as possible. As a result, the procurement procedures became complicated which delayed the process. Given such experience, the Phase 2 procurement tended to select a limited number of large equipment. Accordingly, the equipment under the Phase 2 procurement were newer and their necessities were better examined, which led to the tendency that in the ex-post evaluation, they were more frequently named as "useful equipment" compared to those under the Phase 1 procurement[12]. At the same time, the provincial Education Bureau pointed out that the Phase 1 procurement played

[11] A system to which laboratories register their equipment for use by other faculties (schools) or outside institutions. In some cases, the equipment were concentrated to an integrated laboratory named such as Testing Center, and in other cases, the equipment were installed at individual laboratories, which allowed outside researchers to use them upon request.

[12] Anhui Medical University mentioned above did not participate in the Phase 2 procurement.

an important role as well, because everyone at the targeted universities strongly needed equipment during the procurement period, and the approach to distribute cheaper equipment to a wider user base was therefore also justifiable.

Table 3: Total monetary values of educational and research equipment

Unit: thousand yuan

	University total		Portion under this project	
	Actual as of end 2001	Actual as of end 2012	Planned 2006	Actual as of end 2012
Hefei Univ. of Technology	84,000	660,550	26,330	40,870
Anhui Univ.	89,130	416,080	29,490	29,010
Anhui Agricultural Univ.	79,200	257,240	52,260	43,760
Anhui Medical Univ.	15,430	441,920	25,290	33,960
Anhui Normal Univ.	N.A.	N.A.	N.A.	17,960
Anhui Univ. of Science and Technology	22,550	209,240	40,820	29,180
Anhui Univ. of Technology	56,290	N.A.	34,670	23,450
Huaibei Normal Univ.	21,660	143,670	24,230	10,410
Anhui Polytechnic Univ.	9,720	147,000	35,720	25,640
Anhui Univ. of Finance and Economics	13,010	85,970	13,560	10,390
Average	241,670	512,810	31,370	26,460

Sources: JICA internal documents; responses to the questionnaire from the executing agency.

PCs installed at the Provincial Computer Basic Experimental Teaching Center and used by 4,000 students every year. They are planned to be replaced with new ones shortly. (Huaibei Normal University)

Nuclear magnetic resonance (NMR) analyzer installed at the large laboratory equipment platform. The equipment is frequently used.

(Hefei University of Technology)

Language laboratory classroom developed in 2011 and in good condition.

(Anhui University of Finance and Economics)

(2) Qualitative enhancement of teaching and research

It was found that the average school building area and the monetary value of equipment per student satisfied the national standard at most targeted universities, implying that the quality of teaching/research environment was ensured to a certain degree (Table 4. Per-student school building area is not subject to analysis for assessment of effectiveness of this project, because building construction was not included in the project scope).

Table 4: School building area (teaching, research and administration) per student and monetary value of educational equipment per student

Units: m^2 or yuan

	School building area per student (m^2) [1)]		Value of educational equipment per student (yuan) [2)]	
	Actual 2001	**Actual 2012**	**Actual 2001**	**Actual 2012**
Hefei Univ. of Technology	33.3	54.9	N.A.	18,207
Anhui Univ.	28.8	45.8	6,757	15,357
Anhui Agricultural Univ.	22.8	27.6	N.A.	12,682
Anhui Medical Univ.	9.1	16.8	2,242	24,551
Anhui Normal Univ.	5.6	23.1	N.A.	7,252
Anhui Univ. of Science and Technology	9.5	24.9	N.A.	8,831
Anhui Univ. of Technology	26.5	49.5	2,857	7,126
Huaibei Normal Univ.	11.2	7.1	3,577	7,735
Anhui Polytechnic Univ.	10.5	10.3	N.A.	8,400
Anhui Univ. of Finance and Economics	18.9	21.8	1,409	4,080
Average	14.5	28.2	3,368[3)]	11,422

Source: Responses to the questionnaire from the executing agency.
Notes: 1) The national standards of per student school building area of regular undergraduate schools are as follows: total school building area including canteens and dormitories should be "more than $30m^2$", and teaching, research and administration building area should be "more than $20m^2$" in natural science faculties, "more than $15m^2$" in humanity and social science faculties and "more than $30m^2$" in physical education and art faculties (Interim Provisions for Establishment of Regular Undergraduate Schools, No.18 [2006]).
2) The national standard for value of educational equipment per student is "more than 5,000 yuan" for laboratory equipment in faculties of science and technology such as science, engineering, agriculture and medicine, "more than 3,000 yuan" for humanity and social science faculties, and "more than 4,000 yuan" for physical education and art faculties according to the above-mentioned Interim Provision No.18 [2006].
3) Average of the universities for which data was available.

Various indicators to measure the achievements of progress in the areas of teaching and research, such as the number of key disciplines and key laboratories[13], the number of faculties/departments and graduate programs, the number of research projects and social (community) services[14] projects, the number of published research papers, the number of awards, the number of patents granted, etc., showed increasing trends (Table 5).

Such improvements are the outcome of the overall higher education development policies mentioned in "3.1 Relevance". Although some universities commented that for some indicators, it was difficult to give examples of direct contribution of this project[15], the majority of interviewees acknowledged that the improvement of the indicators was partly attributable to the outcome of this project through utilization of the equipment procured under the project and/or involvement of teachers who received training in Japan in teaching/research activities under this

[13] Key disciplines and key laboratories are ones that the state or a local government designates as a base for teaching or research activities and to which resources are preferentially distributed. In this ex-post evaluation, the number of these was used as indicators to show high quality of disciplines and laboratories.
[14] As Social (or community) services, the number of research, testing, etc. commissioned by external organizations (government, companies, etc.) and the number of training courses conducted for those organizations were counted.
[15] There was one comment that this project mainly procured basic educational equipment, and teachers only learned about basic concepts or research in Japan as the duration of the training was only around 6 months in most cases, and therefore there was no research outcome that could be said to be a direct outcome of this project.

project. Below are some examples.

- Example of key laboratories: The Key Laboratory of Metallurgical Emission Reduction and Resources Recycling of the School of Metallurgy and Resources has been a key laboratory co-constructed by Anhui Province and the Ministry of Education since 2010, and holds the equipment procured under this project such as the thermal analyzer and a Fourier transform infrared spectrometer as part of its laboratory equipment. One of the leading researchers of the laboratory is an ex-participant in the teachers' training in Japan. Also, the experiment center of the School of Material Engineering is designated as the Provincial Key Laboratory of Metal Materials and Processing, where equipment worth 7 million yuan out of a total 12 million yuan are ones (scanning electron microscope, various testing instruments, etc.) procured under this project. (Anhui University of Technology)

Servo-hydraulic universal testing machine of the Key Laboratory of Metal Materials and Processing, School of Material Engineering (Anhui University of Technology)

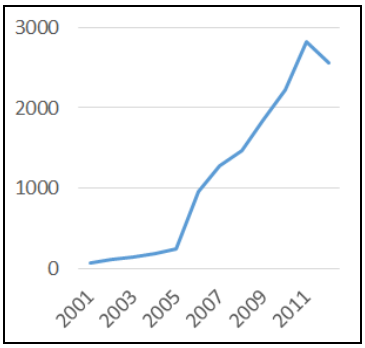
- An example of winning research projects: The large equipment sharing platform named the Analysis and Testing Center which was established based on the equipment procured under this project. The Center has acquired a number of research project such as ones from the National Natural Science Foundation. (Anhui Polytechnic University)


A floor of the large equipment platform. The equipment on this floor were all procured under this project.
(Anhui Polytechnic University)

- An example of social services: At the tea laboratory of the School of Tea and Food Science, students use the equipment developed by this project in provision of testing service such as componential analysis entrusted by outside organizations (Anhui Province is a well-known tea production area). (Anhui Agricultural University)

- An example of research papers: In the teachers' training in Japan, a teacher learned about environmental statistics that was a new field of research in China at that time. After his return to China, he formulated a team of researchers in the same field to continue follow-ups of the research he conducted in Japan, and published a number of research papers in domestic and international journals. Before going to Japan, he had not published many papers in international journals. (Anhui University of Finance and Economics)

- An example of patented research: Patents were granted to the "multi-functional USB hub" (2012) and some other research products within which equipment developed under this project were used. Some patented products of the School of Chemistry and Material Science are already in the marketplace. (Huaibei Normal University)
- An example of setting up of a new program: The undergraduate program of Japanese was established under the initiative of two teachers who returned from training in Japan (one of them took the post of the head of the program). By the time of ex-post evaluation, the program had enrolled up to the third year students. (Anhui University of Finance and Economics)



Sourse: Prepared based on responses to the questionnaire from target universities.

Figure 1: Total number of internationally- published research papers by each of the targeted universities

Table 5: Trend of major teaching/research indicators (total of the targeted universities)

Indicator	Actual 2001 or 2006 [1)]	Actual 2012
Number of key disciplines (state level)	4	8
Number of key disciplines (provincial/ministerial)	79	173
Number of key laboratories (state level)	5 (2006)	7
Number of key laboratories (provincial/ministerial)	40 (2006)	125
Number of undergraduate faculties/departments [2)]	328	464
Number of master's degree programs	206	799
Number of doctorate degree programs	82	216
Number of research projects (state level)	142 (2006)	586
Number of research projects (provincial/ministerial)	412 (2006)	1,047
Number of social services projects [3)]	206 (2006)	831
Number of award-winning researches (state level)	8 (2006)	6
Number of award-winning researches (provincial/ministerial)	201 (2006)	385
Number of patented research outcomes	61 (2006)	921

Source: JICA internal documents; responses to the questionnaire from the executing agency.
Notes: 1) Where the data of 2001 were eigher non-available or not comparable with the ex-post data due to difference in counting, the data of 2006 were used. 2) The number of undergraduate faculties/departments is a total of the seven universities that provided the data. 3) The number of social services projects is a total of the five universities that provided the data.

3.2.2 Qualitative Effects[16]

(1) Effects on enhancement of teaching and research at each targeted university

Regarding effects of the hardware components, it was confirmed from interviews with the provincial Education Bureau and targeted universities as well as document review that the educational/ experimental facilities and equipment developed under this project have contributed to the improvement of the following aspects to a certain extent.

- The national undergraduate education level evaluation by the Ministry of Education[17]: during the implementation period of this project, five of the targeted universities underwent the national undergraduate education level evaluation, and all of them were evaluated as "Excellent". They commented that the equipment procured by this project contributed to such evaluation results through improvement of teaching conditions.
- Upgrading of "college" to "university"[18]: Anhui Institute of Finance and Trade (Anhui University of Finance and Economics) was upgraded from a "college" to a "university" in 2004, and so were Huaibei Coal Industry Teacher's College (Huaibei Normal University) and Anhui University of Technology and Science (Anhui Polytechnic University) in 2010. They commented that the facilities and equipment developed by this project contributed to expansion of facilities and equipment that became necessary as they became "universities".
- Improvement of conditions for teaching and experiments: all targeted universities commented that they were able to eliminate shortages of facilities and equipment due to the rapid increase in students and that they became capable of providing more practical education by acquiring additional equipment and increasing the proportion of laboratory

[16] In this ex-post evaluation, it was difficult to exclude effects of activities that were not under this project from the planned quantitative indicators. Therefore, while taking the trends of the indicators into consideration, qualitative information (collected by document review, questionnaires and interviews) was used to understand how specifically this project is related to such trends. The evaluator conducted individual or group interviews in a semi-structured manner with the provincial Education Bureau (executing agency) and, at each targeted university, with persons in charge of the project implementation as well as ex-participants in teachers' training in Japan. In total, 103 persons from the 10 universities (including 40 ex-participants in teachers' training in Japan) were interviewed. With respect to interviews with universities in Japan that accepted teachers for training from the targeted universities, the evaluator visited one of them and contacted several more universities by telephone or e-mail.

[17] An evaluation conducted by the Ministry of Education of China to assure quality of higher education. 198 universities and 87 universities were evaluated in 2007 and 2008, respectively. The evaluation criteria are multifaceted including university management, teaching staff, students, facilities and equipment, academic disciplines/graduate programs, etc. The assessment is made in four levels, "Excellent", "Good", "Qualified", and "Not Qualified".

[18] According to the Higher Education Law, the Provisional Regulations on the Establishment of Regular Higher Education Institutions, and the Interim Provisions for Establishment of Regular Undergraduate Schools, undergraduate schools of regular HEIs can take the name of either "college" (学院/*xueyuang*) or "university" (大学/*daxue*) in Chinese. The requirements for "university", such as minimum size (number of students), minimum number of faculties, number of teaching staff with degree, etc.), are higher than those for "college". (Note for English translation only: in their English names, colleges (学院) use various words including "college", "university" and "institute".)

classes. For example, the School of Computer Science and Technology of Anhui University newly created three laboratories using the equipment procured by this project, and provide more than 1,800 undergraduate students with experimental education every year. The rate of experiments (actual hours divided by planned hours of classes of experimental teaching) became 100%. At the same university, practical skills of students who used the Physics and Chemistry Laboratory of the School of Chemistry and Chemical Engineering improved, as the equipment procured by this project enabled experiments in smaller groups of 2-3 persons.

- Regarding the enhancement of research and social services, all targeted universities answered that the equipment developed by this project enabled them to construct key laboratories, acquire new research projects and provide new social services (however, at the universities that focused on procurement of basic educational equipment as noted in "3.2.1 Quantitative Effects", it was sometimes difficult to identify concrete cases of direct contribution of this project).

Plates of key laboratories, etc. that were established with contribution of equipment under this project.
(Anhui Medical University)

Fourier transform infrared (FT-IR) spectrometer and its log book.

(Anhui Normal University)

Confocal laser scanning microscopy of the School of Life Sciences. The condition of the equipment is good.
(Anhui University)

As to effects of the software component, ex-participants in the teachers' training in Japan provided the following comments. In each point, the numbers in ( ) represents the number of universities (out of the 10 universities) where the interviewed teachers said the project was "useful" for the concerned aspect.

- Teaching method (8 universities): teachers learned the state of undergraduate and graduate teaching in Japan. Although it is difficult to directly apply it to undergraduate education in China (because the number of undergraduate students is much higher), they are utilizing a part of what they learned in their teaching after returning from Japan. For example, some started allowing undergraduate students to conduct experiments with graduate students. For graduate students, some teachers introduced to them the seminar style and experiments in smaller groups.

- University management (10 universities): some ex-trainees have applied what they learned about university management to the extent possible. For example, teachers in charge of administration at Anhui Agricultural University attended the university management training courses and learned about university-industry collaboration. Inspired by Japan's platform-type organizations connecting teachers and companies, they created a liaison unit under the Office of Science and Technology, and the unit later became the New Rural Development Research Institute with dedicated staff members. The consignment fees from companies increased from 5 million yuan in 2007 to 35 million yuan in 2012.
- Operation of laboratory equipment (2 universities): some teachers learned how to operate advanced laboratory equipment. After returning to their universities, such experience and knowledge was useful when similar equipment was purchased either under this project or using other budget resources.
- Approach and style of research (8 universities): teachers were impressed by the attitude towards research in Japan, such as seriousness, attention to details, and thoroughness in pursuing the answer, and tried to incorporate such attitudes after returning to their respective universities.
- Contents and direction of research (5 universities): some teachers decided on research themes in Japan, and these determined the direction of their research thereafter. Many of them received a degree in those themes.
- Foundation for overseas activities (5 universities): training under this project provided a foundation for overseas training to some universities and participating teachers. It also opened a path to research in western countries and publication of papers in international journals.

Besides such positive responses, all targeted universities pointed out that the 6-month duration of training, which was applied to the majority of teachers, was too short for participants to deepen their specialization skills. Also, some of the interviewed teachers were not able to visit Japan because they did not receive replies of acceptance from the universities in Japan that they had contacted, and another teacher could not reach a common understanding with his advisor in Japan on the research plan, and the training ended only with the research half completed. There seem to be no difference in name recognition between the universities that had such "unsuccessful" cases and the universities where teachers were smoothly accepted by Japanese host universities. Some teachers who received replies of acceptance pointed out that the Japanese universities they had contacted seemed to have been interested in the research plans attached to the letter of request for acceptance, which implies that whether the research plan is accepted or not may have been an important factor for successful training.

Another good practice observed was the effect of combination of the hardware and software components (for example, at Anhui Medical University, all ex-participants in the teachers' training have been engaged in teaching and research activities using the equipment procured under this project).

The table below summarizes notable effects, including those mentioned above, of the project on teaching and research at each targeted university.

Table 6: Qualitative effects at each targeted university

Hefei University of Technology	The Center of Analysis and Measurement (large equipment platform) was the first institution in Anhui Province that purchased an X-Ray Photoelectron Spectroscopy (XPS) instrument, which the Center shares with other universities. It takes samples from outside institutions not only in Anhui Province but also in Henan Province (through the mail) for analysis using the equipment developed under this project. The School of Electric Engineering and Automation is engaged in university-industry collaboration through providing technical assistance to more than 20 photovoltaic power generation companies (many outcomes of the collaboration have been put into practical use). As such, there are good practices of use of the equipment. For expensive equipment including those procured under this project, the university has a fund for maintenance and management of large equipment to secure a maintenance budget. As for the training in Japan, there was no problem in finding host universities: teachers received acceptance notices from the universities, including the most advanced laboratories that they wanted to attend. Some ex-participants in the training continue academic exchanges with highly-reputed professors in Japan.
Anhui University	There are some good practices derived from training in Japan, such as effects of training on teaching skills at the Japanese language program (improvement of teaching methods and publication of research papers) and introduction of the teaching and university management concept learned in Japan. As for the equipment, the university purchased a large volume of basic equipment in Phase 1 procurement, whose installation was delayed due to very cumbersome tender documents, and thus caused obsolescence and cost increase over time. Nevertheless, the procured equipment brought benefits such as alleviation of a shortage in quantity of experimental teaching equipment, and upgrading of the laboratory of the School of Journalism and Communication to a state experimental teaching model center. In the Phase 2 procurement, the university purchased large equipment, and the process was completed more smoothly than the Phase 1 procurement. While the information on the status and results of use of the Phase 2 equipment have not been aggregated (as the equipment have just been delivered or transferred to the new campus at the time of ex-post evaluation), the income from collection of user fees increased between 2012 and 2013: the income from sharing of equipment within the university increased from 1 million yuan to 1.8 million yuan, and the income from testing services for outside institutions increased from 480 thousand yuan to 700 thousand yuan.
Anhui Agricultural University	The good practices include inter-university exchanges and establishment of a unit in charge of university-industry collaboration after attending the training in Japan, utilization of the large equipment sharing platform at the School of Tea and Food Science (indirect contribution to provision of social services), and impacts of the purchase of a transmission electron microscope HT7700 for the first time in China. In the Phase 1 procurement, the university purchased a large volume of inexpensive equipment to be distributed to many laboratories without any past experience in such a large-scale procurement, and that resulted in delivery delays and consequent obsolescence of some equipment. Based on such difficult experiences, the university purchased large equipment in the Phase 2 procurement, which went very smoothly. The key to successful procurement is considered to be to narrow the list to large equipment by setting a minimum price.
Anhui Medical University	As it took 10 years to procure equipment worth 30 million yuan and therefore some of the equipment were already outdated when they arrived, the university considers that the success rate of this project was only around 60%. Due to the prolonged duration of the Phase 1 procurement, the university did not participate in the Phase 2 procurement. Nevertheless, there are useful equipment that are frequently operated, and benefits such as promotion of key laboratories and increase in research paper publication outputs were observed. Although the number of participants in teachers' training in Japan was less than planned due to unsuccessful matching with universities in Japan in some cases, there were other cases where combination of the training in Japan and procurement of equipment contributed to good research results.

Anhui Normal University	The equipment procured under this project were utilized and contributed to construction of key laboratories and new academic programs at the College of Life Sciences and the College of Environmental Science and Engineering. Effects of the equipment were observed such as improvement of teaching environment, production of graduates who gained practical skills (30% of them became teachers), and inviting teachers of rural primary and secondary schools for observation of the equipment during summer vacation. As for the training in Japan, teachers were accepted by the Japanese universities which they desired to attend. They said that they learned many things in Japan, and after returning to China, they incorporated some of them such as the research style (used when writing research papers) and the ways of graduate teaching and university management.
Anhui University of Science and Technology	Located in an area where the coal industry is flourishing, the university has a number of coal-related departments/academic programs. Ex-participants in teachers' training in Japan are engaged in research in the area of environment such as coal desulfuration and reduction of automobile exhaust gas, based on the research they conducted in Japan. The equipment procured under this project are mainly installed at mechanical and material-related laboratories, and used for many research and production of research papers. Also, exchanges with Japanese universities were reinforced by the training in Japan. One of the exchanges lead to the conclusion of an inter-university agreement. Joint research has been continuing as well.
Anhui University of Technology	The university is located in Maanshan City where steel production is a main industry. Many graduates are employed by steel companies including Japanese companies. The equipment procured under this project were concentrated at a large equipment platform, and most of them are highly used. The project contributed to production of graduates who had received practical education, and those graduates are reported to be highly evaluated in their workplace. In some cases graduates recommended the microscope the university purchased under this project to the steel manufacturing companies where they were employed with, and those companies purchased the same model. As for teachers' training in Japan, many teachers stayed at the host universities that they chose on the internet: even though they had no acquaintance with those universities in the past, they were smoothly accepted, and produced the results in the education and research aspects. There were no clear cases of contribution to society as those results are all related to basic teaching and research. Besides, a software platform developed at the School of Economics and the School of Management improved practical skills of students.
Huaibei Normal University	The university is still dealing with problems that some equipment experienced, such as the transmission electron microscope which had a problem from the time of manufacturing. Nevertheless, the operation and maintenance system was observed to be functioning properly. Some equipment were cancelled or adjusted following a delay in procurement, and the procured PCs are getting old and will soon be replaced. It was found that the project was beneficial in various aspects: the equipment indirectly contributed to the key industry and fostered middle school and high school teachers through improvement of the teaching environment. Also, the number of publication of research papers increased by using the large equipment (which were incorporated in the equipment sharing platform in 2009), the teachers trained in Japan became capable of operating advanced equipment and improved their teaching styles, and social services were provided.
Anhui Polytechnic University	The university is conscious of asset management and well aware of the effects of this project. It minimized negative effects of the delays in procurement by adjusting the procurement plan, and produced educational and research effects such as construction of the Analysis and Testing Center (the general-purpose platform) and establishment of a key laboratory with equipment related to spinning, a main industry of the area. The training in Japan was mainly in the field of university management. After returning to China, ex-participants incorporated the knowledge they acquired such as student-centered curriculums (e.g. increase of courses in the liberal arts as elective courses to respond to interests of individual students) and financial management in consideration of cost effectiveness.
Anhui University of Finance and Economics	The university is specialized in economics, accounting and law, and is one of only 10-20 universities in China which has a Certified Public Accountant (CPA) course. This project mainly procured educational equipment such as language laboratory classrooms and servers, etc. that benefit the whole university. The delay in procurement was handled by adjusting the procurement plan, and the specifications of the PCs and data servers are still sufficient. As a result of the training in Japan, the undergraduate program of Japanese was established (the head of the program is an ex-participant), a research team and a new course in the field of environmental statistics were established (the training under this project contributed to a certain extent), and the teaching and management styles were improved.

Sources: Prepared based on responses to the questionnaire from targeted universities, interviews with them, information from their websites, etc.

3.3 Impact

3.3.1 Intended Impacts

(1) Enhancement of teaching and research at the provincial level

Table 7 shows selected higher education indicators at the provincial level. Improvement is seen in the quantitative indicators such as higher education enrollment rate that were planned at appraisal (however, data were not available for some indicators). As the targeted universities of this project are all top ranked among regular HEIs of the province in terms of size and other criteria[19], it can be said that they have lead such improvement.

Table 7: Higher education indicators of Anhui Province

	Actual 2001	Planned 2006	Actual 2006	Actual 2012
Number of regular HEIs	54	70	83	107
Number of students enrolled in regular HEIs	530,000	700,000	830,000	1,250,000
Enrollment rate in HEIs	11%	14%	31%	36%
School building area per student (average of targeted universities) (m^2/person)	31 m^2	30 m^2	N.A.	N.A.

Sources: Prepared based on JICA internal documents, responses to the questionnaire from the executing agency, provincial statistics, etc.

(2) Contribution to regional vitalization, market economy reform support, and environmental conservation

Regarding the three development issues intended at appraisal, namely, (i) regional vitalization, (ii) market economy reform support and (iii) environmental conservation, sufficient quantitative data to show the overall trend could not be collected for ex-post evaluation. Also, some universities had little recognition that this project was planned to address those issues, and there were cases where the funds provided under this project were not allocated to the relevant fields. Nevertheless, at least certain cases of contribution of this project were observed in all targeted universities, including the ones that the facilities and equipment were used for research that would benefit the development and environment of the province and the concerned cities, and that teachers who were trained in Japan were playing important roles in the educational aspect (i.e. through development of good graduates) and the research aspect (through university-industry collaboration and social services). Many cases are reported particularly in the area of environment.

(i) Regional vitalization

First, regarding how the project provided human resources to the province's key industry

[19] For example, the total number of students of the 10 targeted universities accounted for 19% of the total number students of all of the 107 regular HEIs in the province (data are as of 2012). Also, according to "China Colleges and Universities Rankings 2012" of the Chinese Universities Alumni Association, all targeted universities were ranked between the 2nd and the 13th places in Anhui Province (the first place was held by the state-run University of Science and Technology of China).

(machinery maintenance industry, electronic and electric industry, construction material industry, etc.), the targeted universities did not have precise data on employment status of graduates. Therefore, the number of graduates who majored in those fields were evaluated instead. From the available data the number of such graduates (ranging between 100 and 2,000 persons depending on university) showed an increasing trend. In this relation, targeted universities also commented that a certain portion of the graduates are employed in the concerned industry, and this project contributes to regional vitalization indirectly through improvement of graduates' practical skills. For example, in Maanshan City where Anhui University of Technology is located, the steel industry is the main industry. Many of the graduates from the schools such as metallurgy, material science and chemical engineering are employed at steel plants. It was heard that those plants have the same equipment as the ones developed at the university under this project; therefore, the experience in the university is useful in their workplace. Moreover, some companies purchased the same models of equipment installed at the university under this project following recommendations by the graduates.

Transmission electron microscope (TEM), the first model bought in Anhui Province. After this, other universities and companies purchased the same model. (Anhui Agricultural University)

Utilization of the outputs of this project in vocational education and adult education was observed at four target universities. For example, Anhui University of Finance and Economics frequently uses the project equipment such as the language laboratory classrooms.

As for contribution through dispatch of teachers and doctors to rural areas, some universities commented that the project had indirect effects of producing graduates who would then work as rural teachers, though concrete examples were not confirmed. Furthermore, although it is a different case from dispatch of teachers, the scanning electron microscope procured by this project was shown to teachers of middle schools and high schools during summer vacation (Anhui Normal University).

(ii) Market economy reform support

The number of graduates in the related fields (i.e. economics, law, accounting, finance, etc.) are generally increasing (ranging between 100 and 1,000 persons depending on university). About half of the targeted universities acknowledged the indirect contribution of this project, mainly use of the equipment, to provision of human resources with higher practical skills. Among them, Anhui University of Finance and Economics pointed out that there was direct contribution through provision of human resources training (for government officials, specialist

personnel of companies, etc.), including training courses in the fields of finance and economics using the project equipment (for example, the School of Business provides courses in corporate investment and securities as well as joint training courses with companies).

(iii) Environmental conservation

The number of graduates in the environment-related fields is increasing (ranging between 100 and 1,000 persons depending on university). Four targeted universities acknowledged indirect contribution of this project to environmental conservation through providing graduates with higher practical skills. At the same time, those universities all reported concrete cases where research outcomes, university-industry collaboration and social services using the procured equipment and the ideas or methods that teachers learned in Japan contributed to environmental measures. For example, at Anhui University of Science and Technology, several ex-participants in teachers' training won state-level or provincial-level research projects in the fields of exhaust emission controls and coal vaporization with the use of the research results and perspectives they obtained in Japan. At Huaibei Normal University, the School of Life Sciences used the equipment procured by this project in research in environmental regional development of areas such as the Chang River area, the Huai River area, the Chao Lake area, the Ta-pieh Mountains area, and the Huaibei area. Also, Hefei University of Technology deployed the project equipment in a focused manner to establish the Research Center for Photovoltaic System Engineering, Ministry of Education, which is now engaged in a number of basic research, research and development, university-industry collaboration and social services (technical cooperation with companies, etc.) in the field of photovoltaic generation. However, these cases all warrant a long-term perspective until the research results would actually bring about impacts on the natural environment.

At appraisal, besides the fields that fall into the category of "environmental conservation" in the narrow sense (such as pollution control, waste management and natural resources management), more fields were classified as relevant fields. If we follow the classification in such broader sense by also including agricultural science and material science, etc., more cases of contribution may be observed even at the universities which did not acknowledge impacts on environmental conservation. For example, an ex-participant in teachers' training in Japan is continuing his research on separation of active component from natural products, research he started in Japan, using the equipment procured under this project and other equipment (Anhui Agricultural University).

3.3.2 Other Impacts

(1) Impacts on the natural environment

No negative impacts were observed. By the time of the appraisal, all targeted universities had completed the necessary domestic procedures of environmental clearance with the

environmental impact assessments (EIA) approved by the environmental protection department of the province or the cities where the universities are located. During the project implementation period as well as after project completion, each school said that it has been taking necessary measures of exhaustion, water discharge and noise control and that it implemented environmental monitoring as planned.

(2) Land acquisition and resettlement

As planned in the appraisal, there was no land acquisition and resettlement associated with this project.

(3) Strengthening of exchanges and cooperation with universities in Japan

Impacts of the project on strengthening of exchanges with universities in Japan were observed. In some cases new relationships were built with universities in Japan, and in other cases the existing relationships were strengthened after the project. However, there were not many cases of reaching official university-level cooperation, partly because many of the Japanese universities had already concluded agreements with other universities in China. Therefore, most of the exchanges seemed to be at the teacher (individual) or faculty levels, including invitation of teachers from Japan for lectures, sending students to Japan for study and joint research.

The outcomes of individual cases of exchange are described in Table 6. Overall, almost all of the interviewed ex-participants in the teachers' training under this project said that they had been strongly impressed by the elaborateness of teaching and research activities at universities in Japan and seriousness of the Japanese people, and had come to feel more familiar with Japan. Generally, western countries tend to be more preferred as the place to visit, but many teachers who participated in this project said that they talked about their research and life in Japan to their colleagues and students, who then gained a better understanding of Japan. Furthermore, one other impact of the training was found: based on a high recognition of effectiveness of the university management course, the Anhui Education Board concluded an agreement with Ritsumeikan University (host university in Japan) and sent administration/management personnel from HEIs in the province (2009 and 2011) in addition to the ones provided under this project.

This project has largely achieved its objectives, therefore its effectiveness and impact is evaluated to be high.

3.4 Efficiency (Rating: ②)

3.4.1 Project Outputs

The actual production of the outputs is summarized in "Comparison of the Original and

Actual Scope of the Project" on the final page of this report. The hardware outputs were mostly produced as planned, although there were cancellations of some equipment (because contracts were not concluded for some procurement packages or because production of some equipment was discontinued due to delay in project implementation), changes in location of some equipment, and additional procurement, i.e., the Phase 2 procurement using the remaining portion of the ODA loan. The software outputs were produced mostly as planned as well, although the number of teachers sent to Japan for training was slightly less than planned due to difficulties in arranging the training and several other reasons that resulted from the delay in project implementation. Invitation of experts from Japan was cancelled as sending Chinese teachers to Japan was given higher priority.

3.4.2 Project Inputs

3.4.2.1 Project Cost

As shown in the table below, the total project cost was 5,605 million yen (of which the Japanese ODA loan was 4,091 million yen), which was within the plan (ratio against the plan: 95%). Although the originally-planned outputs were partially reduced, the overall level of project cost was more or less the same as the plan due to price increase resulting from procurement delays and additional outputs (the Phase 2 procurement)[20].

Table 8: Planned and actual project costs

Unit: million yen

	Plan (appraisal)			Actual		
	Foreign currency	**Local currency**	**Total**	**Foreign currency**	**Local currency**	**Total**
1. Equipment	3,990	1,331	5,321	3,965	1,428	5,393
2. Training	182	0	182	125	85	211
3. Price contingency	93	3	96	0	0	0
4. Physical contingency	213	67	280	0	0	0
Total	4,478	1,401	5,879	4,091	1,514	5,605

Sources: JICA internal documents, responses to the questionnaire from the executing agency.
Notes: The exchange rates applied were: (planned) 1 yuan=15 yen; (actual) 1 yuan=13.8 yen. Due to rounding down of the fractions smaller than 1 million yen, the breakdown and total amounts may not match.

3.4.2.2 Project Period

As shown in Table 9, the actual project period was 100 months, which was significantly longer than the planned 36 months (ratio against the plan: 278%). According to the JICA internal documents and the executing agency, the main reasons included the complicated tender procedure (the Education Board and the targeted universities had not been accustomed to such

[20] The cost for training increased despite the decrease in the number of trainees. According to the provincial Education Board, it was mainly because (i) following the progress of conversion of Japanese universities to independent administrative entities, the host universities started to require payment of training fees, and (ii) the Ministry of Education of China raised the training and living expenses standards for short-term trainees abroad.

large-scale tenders, and universities planned to procure numerous items), changes in customs policy, shortage of funds of suppliers, and the complicated procedures in making requests for payment.

Table 9: Planned and actual project periods

	Plan (appraisal)	Actual
Signing on Loan Agreement	March 2003	March 2003
Procurement of equipment	December 2005	July 2011 (2nd procurement: 2010-)
Training	March 2006	March 2010
Project completion (lengths of months)	March 2006 (36 months)	July 2011 (100 months)

Sources: JICA internal documents, responses to the questionnaire from the executing agency.

3.4.3 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 was not possible.

Although the project cost was within the plan, the project period significantly exceeded the planned period, and therefore efficiency of the project is evaluated to be fair.

3.5 Sustainability (Rating: ③)

3.5.1 Institutional Aspects of Operation and Maintenance

As planned during the appraisal, the facilities and equipment developed under this project are operated and maintained by each targeted university, and the Education Bureau of Anhui Province, the executing agency, oversees them. All targeted universities added the developed facilities and the equipment to the universities' fixed assets, and established the operation and maintenance system with clearly defined responsibilities and procedures through establishing regulations such as the procedures for maintenance of large equipment and fund management, work regulations on experiment teaching, the procedures for fixed asset management, etc. The division of responsibilities among related organizations is clear, and there are no issues recognized with respect to the number of staff in charge of operation and maintenance.

3.5.2 Technical Aspects of Operation and Maintenance

No problem was observed in the technical aspects as all targeted universities regularly carry out maintenance and inspection of the facilities and equipment, and outsource repair works to contractors such as suppliers when necessary. To secure the skills necessary to operate and maintain large or sensitive laboratory equipment, the universities appoint full-time technical staff for each instrument or laboratory to manage the equipment in an integrated manner. At all targeted universities, the manuals and precautions are posted near individual instruments for

easy reference. Also, it was reported that teachers in charge of sensitive equipment receive technical training regularly from the manufacturers.

3.5.3 Financial Aspects of Operation and Maintenance

The targeted universities are all overseen by the provincial government. Their budgets consist of subsidies from the state or province and own income such as tuitions and fees. Although the financial data were only partially available, the budgets of the province and individual universities are generally stable or in an increasing trend, and revenues and expenses are well-balanced at each university (Tables 10 and 11). Based on the interviews, it can be said that the necessary budget for operation and maintenance is ensured in the university budget[21]. None of the main facilities and equipment developed under this project were found unused due to lack of budget for operations and repairs.

Table 10: Financial expenditure of Anhui Province

Unit: million yuan

	2009	2011	2012
Total expenditure	214,192	330,299	396,101
of which education sector	32,379	56,471	71,795

Source: Prepared based on statistics from provincial Education Bureau.

Table 11: Revenues, expenditures and operation and maintenance (O&M) expenses of the targeted universities

Unit: thousand yuan

	2010		2011		2012	
Hefei University of Technology	Income	1,075,798	Income	1,571,310	Income	1,597,467
	Expenditure	888,619	Expenditure	1,284,530	Expenditure	1,359,998
	of which O&M	2,400	of which O&M	2,400	of which O&M	2,400
Anhui University	Income	N.A.	Income	N.A.	Income	N.A.
	Expenditure	N.A.	Expenditure	N.A.	Expenditure	N.A.
	of which O&M	1,500	of which O&M	1,800	of which O&M	2,000
Anhui Agricultural University	Income	404,042	Income	590,919	Income	685,187
	Expenditure	373,514	Expenditure	549,027	Expenditure	646,532
	of which O&M	454	of which O&M	557	of which O&M	698
Anhui Medical University	Income	329,051	Income	453,345	Income	563,613
	Expenditure	325,622	Expenditure	401,718	Expenditure	496,581
	of which O&M	3,942	of which O&M	3,698	of which O&M	3,459
Anhui Normal University	Income	N.A.	Income	N.A.	Income	N.A.
	Expenditure	N.A.	Expenditure	N.A.	Expenditure	N.A.
	of which O&M	N.A.	of which O&M	N.A.	of which O&M	5,000
Anhui University of Science and Technology	Income	388,739	Income	482,092	Income	678,109
	Expenditure	373,190	Expenditure	470,251	Expenditure	538,180
	of which O&M	8,265	of which O&M	8,943	of which O&M	8,449

[21] Although the data were not available, all universities said that they use income from testing services and other services using equipment for maintenance of the equipment.

	2010		2011		2012	
Anhui University of Technology	Income	360,972	Income	487,762	Income	632,255
	Expenditure	364,582	Expenditure	486,960	Expenditure	592,719
	of which O&M	N.A.	of which O&M	N.A.	of which O&M	N.A.
Huaibei Normal University	Income	218,081	Income	305,839	Income	437,052
	Expenditure	218,081	Expenditure	305,839	Expenditure	437,052
	of which O&M	384	of which O&M	1,293	of which O&M	565
Anhui Polytechnic University	Income	167,180	Income	290,500	Income	392,640
	Expenditure	167,050	Expenditure	288,700	Expenditure	310,220
	of which O&M	1,150	of which O&M	2,700	of which O&M	3,160
Anhui University of Finance and Economics	Income	N.A.	Income	N.A.	Income	N.A.
	Expenditure	N.A.	Expenditure	N.A.	Expenditure	N.A.
	of which O&M	1,565	of which O&M	4,854	of which O&M	5,767

Source: Responses to the questionnaire from target universities.

3.5.4 Current Status of Operation and Maintenance

In all targeted universities, the equipment developed by this project are registered in the maintenance and management database. Based on observation and review of usage or inspection records, it was confirmed that the equipment were mostly in good condition. A user of equipment must record the usage as well as the conditions of the equipment every time they use it. Some of the equipment purchased in the Phase 1 procurement have already become old with increasing breakdowns, but such problems are handled either by self-repair or by outsourcing. Some cases were found where a universities selected equipment of the same manufacturer as those they purchased using their own budget, so that they could receive the same customer services for the project equipment and other purchased equipment together (Hefei University of Technology and others). All targeted universities systematically replace old equipment with new ones, and make effective use of the equipment, for example by changing the purpose of the old equipment from advanced research to education. Many of the equipment purchased in the Phase 2 procurement are still within the three-year warranty period. All universities said that there is no problem in purchase and stock of spare parts that are produced.

No major problems have been observed in the institutional, technical, and financial aspects of the operation and maintenance system. Therefore sustainability of the project effect is evaluated to be high.

4. Conclusion, Lessons Learned and Recommendations

4.1 Conclusion

This project aimed to improve teaching and research at ten major universities in Anhui Province through the development of their education/research equipment as well as providing training for teachers. Relevance of the project was evaluated to be high, as it was in line with (i) the higher education policies of China and Anhui Province, (ii) development needs for

quantitative and qualitative enhancement of the universities, and (iii) Japan's assistance policies. Effectiveness/impact was also high, based on the observations that the project satisfied such needs, improved education activities by enabling more experiments, and improved research activities through outcomes achieved from advanced equipment and training, and thereby contributed to the promotion of the key industries as well as environmental conservation. Efficiency of the project was evaluated to be fair on the whole: although the project cost was within the plan, the project period significantly exceeded the planned period due to delays in procurement. Sustainability was evaluated to be high, with no problem observed in institutional, technical and financial aspects, and due to the good status of operation and maintenance of the facilities and equipment developed by the project.

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

4.2 Recommendations

4.2.1 Recommendations to the Executing Agency

The targeted universities are recommended to continue the proper use of the facilities and equipment developed under this project in teaching and research, as well as to extend the knowledge that has been gained from exchanges with Japan.

4.2.2 Recommendations to JICA

The higher education human resources who were developed by this project and who have gained a good understanding of Japan (i.e. teachers of the targeted universities) should be regarded as resource persons for future cooperation projects with China. Therefore, information on those human resources should be maintained. Utilization of the (Inland) Higher Education Projects web site, which is currently operated for the provinces where the Projects are still being implemented, could be considered. Possible ways to utilize the website for the provinces where the (Inland) Higher Education Projects have been completed could include updating of the information on, and encouraging posting from, those "completed" provinces.

4.3 Lessons Learned

(1) Ensuring project impacts on development issues

At appraisal, this project intended to have impacts on three issues, namely, (i) regional vitalization, (ii) market economy reform support, and (iii) environmental conservation. However, some of the targeted universities had little recognition of such intent and thus did not fully include relevant department/programs as the targets of the project. In terms of the results, it can be said that the intent was realized as impacts on at least one of the three issues were observed at all targeted universities. In future projects that contain sub-projects to be implemented by different organizations as was the case with this project, more attention should be paid to arrangements to realize the intended impacts by sharing the goal (e.g. "market economy reform

support" and others in case of this project) among the implementing agencies of the sub-projects and aligning the project contents (e.g. selection of the target faculties/departments, types of equipment to be procured, and research fields of teachers to be sent to Japan, in case of this project) to that goal.

(2) Implementing procurement of equipment of many types and quantities by many organizations efficiently (a lesson learned from the Phase 2 procurement).

In this project, the Phase 2 procurement was completed more smoothly than the Phase 1 procurement (which was significantly delayed and resulted in the purchase of outdated equipment at higher prices), and the status of utilization of the procured equipment and their effects was higher. Some underlying factors include: the universities became familiar with international competitive bidding, they selected large equipment after narrowing down the list in terms of types and quantities with due consideration given to necessity, and they took the necessary procedures learned from the Phase 1 procurement. Therefore, in future projects where a number of organizations simultaneously procure varieties of equipment of large quantity, it would be important to decide on the period (duration) and method of the procurement with full consideration given to past procurement experience of each organization, as well as the types and volumes of the equipment to be procured.

(3) Making achievements in short-term teachers' training

In order to raise efficiency of short-term training such as half a year, the applicant teachers should prepare clear research plans in advance and show them to the host universities. Also, in order to produce large impacts, JICA could possibly prepare a system to support re-visits by ex-trainees to Japan and visits by Japanese advisors to China (e.g. approach the host universities in Japan and provide information and opportunities, etc.).

Comparison of the Original and Actual Scope of the Project

Item	Original	Actual
1. Project Outputs	Target: 10 universities in Anhui Province	Target: same as planned
(a) Hardware Procurement of educational equipment	Physics, biology, chemistry, engineering, environmental engineering, civil engineering, agriculture science, life science, public health, pharmacy, electronic engineering, electric engineering, economics (computer, etc.), multimedia, etc.	Areas of education: same as planned Phase 1 procurement: total 1,173 items, 7,443 pieces Phase 2 procurement (participated by 5 universities): total 141 items, 181 pieces
(b) Software Teachers' training in Japan or acceptance of experts from Japan	Total 166 persons (including 28 experts from Japan)	Total 145 persons sent to 36 Japanese universities or institutions (experts from Japan: none)
2. Project Period	March 2003 – March 2006 (36 months)	March 2003 – July 2011 (100 months)
3. Project Cost Amount paid in Foreign currency	4,478 million yen	4,091 million yen
Amount paid in Local currency	1,401 million yen (93 million yuan)	1,514 million yen (110 million yuan)
Total	5,879 million yen	5,605 million yen
Japanese ODA loan portion	4,478 million yen	4,091 million yen
Exchange rate	1 yuan = 15 yen (As of September 2002)	1 yuan=13.8yen (average during 2004-2011)

People's Republic of China

Ex-Post Evaluation of Japanese ODA Loan Project

"Inland Higher Education Project (Regional Vitalization, Market Economy Reform Support, and Environmental Conservation) (Henan Province)"

External Evaluator: Takako Haraguchi, OPMAC Corporation

0. Summary

This project aimed to improve teaching and research at eleven major universities in Henan Province through the development of their facilities and equipment as well as providing training for teachers. Relevance of the project was evaluated to be high, as it was in line with (i) the higher education policies of China and Henan Province, (ii) development needs for quantitative and qualitative enhancement of the universities, and (iii) Japan's assistance policies. Effectiveness/impact was also high, based on the observations that the project satisfied such needs, improved education activities by enabling more experiments, and improved research activities through outcomes achieved from advanced equipment and training, and thereby contributed to the promotion of the key industries as well as environmental conservation. Efficiency of the project was evaluated to be fair on the whole: although the project cost was within the plan, the project period significantly exceeded the planned period due to factors such as delays in the building construction following changes in location. Sustainability was evaluated to be high, with no problem observed in institutional, technical and financial aspects, and due to the good status of operation and maintenance of the facilities and equipment developed by the project.

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

1. Project Description

Project Location

Social Science Building of Zhengzhou University

1.1 Background[1]

In China, together with the remarkable economic development, several development issues have arisen such as narrowing internal disparity between coastal and inland areas, reducing poverty, preparing for joining in the World Trade Organization (WTO) and handling global issues. To deal with these issues, the Chinese government put a high priority on development of human resources that were essential for the accelerated efforts towards developing a market economy and narrowing economic gaps under the policy to strengthen reform and promote openness. Accordingly, the government set out a target to increase the higher education enrollment ratio to 15% as well as adopting a policy to strengthen higher education institutions (HEIs) in inland areas.

Henan Province is located in the mid-eastern part of China with a total population of 95,550,000 persons (2001) and a total area of approx. 167,000 km^2. The province achieved high economic growth with an average annual gross domestic product (GDP) increase rate of 12% in the years 1996-2000, during the 9^{th} 5-year Plan. However, per capita GDP (5,908 yuan in 2001) still remained below the national average (7,543 yuan). The provincial government aimed to promote a market economy and further economic development in the 10^{th} 5-year Plan in Henan Province (2001-2005). Also, the 5-year Plan for Education in Henan Province (2001-2005) planned to increase the number of students in higher education to around 1,100,000 persons and the enrollment ratio to 15% by 2005. However, in order to achieve such targets, existing constraints in the "hardware" aspects (such as school facilities and equipment), "software" aspects (teachers) as well as financial aspects of HEIs (totaling 91 institutions in 2001) had to be addressed.

Under such conditions, this project specified three development issues, namely, (i) regional vitalization, (ii) market economy reform support, and (iii) environmental conservation of Henan Province, and aimed to contribute to human resource development in order to address such issues by enhancing quality and quantity of higher education at major universities in the province.

1.2 Project Outline

The objective of this project was to quantitatively and qualitatively enhance higher education at eleven major universities in Henan Province (Zhengzhou University, Henan University, Henan Normal University, Henan Agricultural University, Henan University of Science and Technology, Henan Polytechnic University, Henan University of Economics and Law, Henan University of Traditional Chinese Medicine, Xinyang Normal University,

[1] This project is one of the (Inland) Higher Education Projects funded by Japanese ODA loans targeted to universities in 22 provinces, municipalities or autonomous regions in inland China.

Zhengzhou University of Light Industry, Shangqiu Normal University)[2] by developing educational infrastructures such as buildings and equipment (improvement of the hardware aspects) and teachers' training (strengthening of the software aspects), thereby contributing to regional vitalization, market economy reform support, and environmental conservation of the province.

Loan Approved Amount/ Disbursed Amount	4,699 million yen / 4,556 million yen
Exchange of Notes Date/ Loan Agreement Signing Date	March 2003 / March 2003
Terms and Conditions	Interest Rate: 2.2% (0.75% for training component) Repayment Period (Grace Period): 30 years (40 years for training component) (10 years) Conditions for Procurement: General untied
Borrower / Executing Agency	The government of People's Republic of China / Henan Provincial People's Government (Education Bureau)
Final Disbursement Date	July, 2011
Feasibility Studies, etc.	- "Feasibility Study Report", Henan Engineering Consulting Company, 2002. - "Special Assistance for Project Implementation (SAPI) for Higher Education Project in China", Japan International Cooperation Agency (JICA), 2003, 2004 and 2005. - "The Supervision Survey Report on JICA Loaned Higher Education Project", JICA, 2010.

2. Outline of the Evaluation Study

2.1 External Evaluator

Takako Haraguchi (OPMAC Corporation)

2.2 Duration of Evaluation Study

Duration of the Study: August 2013 – November 2014

Duration of the Field Study: October 27 – November 28, 2013 and March 23－31, 2014[3]

[2] The names of the universities are those as of today. The following universities had different names at the time of the appraisal of this project:
- Henan Polytechnic University: formerly known as Jiaozuo Institute of Technology (renamed in 2004);
- Henan University of Economics and Law: formerly known as Henan Institute of Finance and Economy (renamed in 2010).

[3] The field study period included the periods for ex-post evaluation of the Inland Higher Education Project (Regional Vitalization, Market Economy Reform Support, and Environmental Conservation) (Anhui Province) and the Inland

3. Results of the Evaluation (Overall Rating: A[4])

3.1 Relevance (Rating: ③[5])

3.1.1 Relevance to the Development Plan of China

The objective of this project is consistent with the five-year plans for economic and social development and the five-year plans for the education sector at both the national and provincial levels, as well as other education-related development strategies, which all aim at quantitative and qualitative development of higher education both at the times of appraisal and ex-post evaluations of this project (Table 1). While there were no large policy changes between the appraisal and ex-post stages, in recent years more importance has been given to higher education development. Also, the key industries of Henan Province have shifted to those that require higher technologies.

Table 1: Main objectives of development plans related to this project

	At the time of appraisal	At the time of ex-post evaluation
National level development plan	The 10th 5-year Plan for National Economic and Social Development (2001–2005): To increase higher education enrollment ratio to around 15% by 2005.	The 12th 5-year Plan for National Economic and Social Development (2011-2015): To emphasize higher education for promoting industrial advances (quantitative targets include 87% of junior secondary graduates to go on to senior secondary school)
National level education sector plan	The 10th National 5-year Plan for Education (2001-2005): To increase student enrollment in HEIs to 16,000,000 by 2005; to develop human resources that have high skills in high technology, biotechnologies, manufacturing technologies etc. that are necessary for industrial structural adjustment; to strengthen support to HEIs that are relatively at a high level in western area; to strengthen support to fostering of teachers.	The 12th National 5-year Plan for Education (2011-2015) and National Mid- and Long-term Reform and Development Plan for Education Sector" (2010–2020): To increase higher education enrollment ratio from 26.5% in 2010 to 40% in 2020; to increase student enrollment in HEIs from 29,790,000 in 2009 to 33,500,000 by 2015; to develop HEIs in midwestern area with special focus on development of departments that are competitive and fostering of teachers.
Provincial level development plan	The 10th 5-year Plan for Economic and Social Development in Henan Province (2001-2005): To achieve annual economic growth rate of 8% by 2005; develop the key industries including petro-chemistry, machine industry, Chinese medicine, etc.	The 12th 5-year Plan for Economic and Social Development in Henan Province (2011-2015): To achieve annual economic growth rate of 7% or higher by 2015; to develop the key industries including automobile industry, electronic information, equipment manufacturing, light industry, construction materials, chemical industry, non-ferrous metal industry, etc..

Higher Education Project (Regional Vitalization, Market Economy Reform Support, and Environmental Conservation) (Heilongjiang Province).

[4] A: Highly satisfactory, B: Satisfactory, C: Partially satisfactory, D: Unsatisfactory

[5] ③: High, ② Fair, ① Low

	At the time of appraisal	At the time of ex-post evaluation
Provincial level education sector plan	The 10th 5-year Plan for Education in Henan Province (2001-2015) To increase higher education enrollment ratio from 12% in 2001 to 15% in 2005; to increase student enrollment in HEIs to around 1,100,000 (including around 600,000 in regular HEIs[6]).	The 12th 5-year Plan for Education in Henan Province (2011-2015) To increase higher education enrollment ratio from 24.7% in 2011 to 36.5% in 2015.

Sources: JICA appraisal documents; respective documents of the mentioned development plans.

3.1.2 Relevance to the Development Needs of China

Development needs were observed for the quantitative and qualitative enhancement of education at the eleven targeted universities at the times of both the appraisal and ex-post evaluations.

At the time of the appraisal, there was a need for quantitative expansion of higher education in order to narrow the economic gap mentioned in "1.1 Background" and following the increase of primary and secondary education in Henan Province (school intake rates in 2001 were 99.6% for primary education and 97.1% for secondary education). It was forecasted that the number of new entrants in regular HEIs would increase from 140,000 in 2001 to 180,000 in 2005. The eleven universities targeted by this project were all leading universities under the jurisdiction of Henan Province, but their financial resources for developing the hardware (facilities and equipment) and software (teachers' training) aspects to address such increasing demand were limited. Also, there were few opportunities provided for the teachers to visit overseas.

At the time of the ex-post evaluation, although the real GDP growth rate had been higher than 10% since 2003, the need for narrowing the economic gap still existed in Henan Province: provincial per capita GDP was 31,723 yuan in 2012, which was 83% of the national average. The number of new entrants to regular HEIs in the province continued to increase from 340,000 in 2006 to more than 490,000 in 2012, and the need for quantitative and qualitative enhancement of HEIs remains high. The eleven targeted universities have continued to be the leading provincial universities. On the other hand, the need for hardware development seemed to have been more satisfied compared to the time of the appraisal, due to increased financial injection to provincial universities following the above-mentioned higher education development policies. The Education Bureau of Henan Province, the executing agency of this project, now puts more emphasis on the need to develop the software aspects such as improving the quality of teachers.

[6] Regular (or standard) HEIs is a term referring to universities and colleges, including undergraduate programs of comprehensive universities and single-department colleges, specialized colleges (similar to junior colleges in Japan), and graduate programs. Adult higher education and higher vocational education institutions are not included. (Note for English translation only: in this report, "universities" include both universities and colleges that grant undergraduate or higher academic degrees unless otherwise mentioned.)

3.1.3 Relevance to Japan's ODA Policy

At the time of the appraisal, Japan's Country Assistance Policy for China, the Medium-term Strategy for Overseas Economic Cooperation Operations and the Country Assistance Strategy put priorities on human resources development from the viewpoint of support for openness and reform and post-WTO economic reform, and on assistance in the inland China from the aspect of narrowing the economic gap. The project objective was consistent with such aid policies of Japan. The Country Assistance Strategy upholds "regional vitalization and exchange", "market economy reform support", and "environmental conservation" as important areas of human resource development.

This project has been highly relevant to China's development plans, development needs as well as Japan's ODA policies, and therefore its relevance is evaluated to be high.

3.2 Effectiveness[7] (Rating: ③)

3.2.1 Quantitative Effects (Operation and Effect Indicators)

The number of students as well as various teaching and research-related indicators designated at the appraisal showed improvement between before and after this project. The set targets were achieved at the same as or better levels than expected. The effects of this project cannot be assessed by these indicators alone, since they measure operation and effects not only of this project but also of other projects (school building construction, equipment procurement, etc.) that were implemented around the same time by the province or target universities themselves. Nevertheless, by observing the use of the facilities and equipment developed and the activities of the teachers trained in Japan under this project, it was confirmed that this project constituted some factors which contributed to the improvement of the indicators.

(1) Quantitative expansion of teaching and research[8]

The number of students as well as the size of the facilities and equipment increased. The facilities and equipment developed under this project were well utilized, and therefore it can be said that they played the expected role as part of the response to the quantitative expansion of teaching and research.

First, the number of students increased far beyond the planned level at all targeted

[7] Sub-rating for Effectiveness was given with consideration of Impact. Taking into consideration the project objective and plan set at appraisal, this ex-post evaluation was designed based on the following definition of the key elements of effectiveness and impact of this project:
- Effectiveness: quantitative and qualitative enhancement of teaching and research at the targeted universities;
- Intended impact: enhancement of teaching and research at the provincial level, and contribution to provincial-level development in the areas of regional vitalization, market economy reform support and environmental conservation;
- Other impacts: strengthening of exchanges and cooperation with universities in Japan.

[8] In the appraisal, the target year for evaluating the quantitative indicators was set at 2006. However, due to the delays in project implementation (see "3.4 Efficiency"), the ex-post evaluation set the actual comparison year at 2012, a year after the project was actually completed (i.e. the equipment procurement completed).

universities (Table 2).

Table 2: Number of students
(Total number of graduate, undergraduate and single department college students)

Unit: Person

	Actual 2001	Planned 2006 (Planned year of completion)	Actual 2006 (Planned target year)	Actual 2012 (A year after project completion)
Zhengzhou Univ.	32,832	40,037	43,665	65,732
Henan Univ.	20,414	27,955	34,158	60,000
Henan Normal Univ.	12,816	19,000	29,442	31,209
Henan Agricultural Univ.	10,173	13,560	21,339	27,100
Henan Univ. of Science and Technology	11,145	28,000	28,207	36,615
Henan Polytechnic Univ.	9,964	17,000	27,696	52,863
Henan Univ. of Economics and Law	8,784	11,991	15,497	31,784
Henan Univ. of Traditional Chinese Medicine	6,729	10,349	10,324	16,780
Xinyang Normal Univ.	8,316	15,052	13,002	22,516
Zhengzhou Univ. of Light Industry	9,458	12,954	20,353	31,303
Shangqiu Normal Univ.	8,070	12,000	16,675	22,361
Total	138,701	207,898	260,368	389,263

Sources: JICA internal documents; responses to the questionnaire from the executing agency.

The floor area of school buildings also increased beyond the planned levels (Table 3). Most of the increase were funded by the province or the target universities (mainly private borrowing) outside of this project, and the floor area increased through this project accounts for only a small portion of the total increase (i.e. part of the areas of four universities). As a whole, however, the expanded area of school buildings has played a fundamental role in bringing about the desired effects of this project. The buildings developed by this project are fully utilized except for the one at Henan University of Economics and Law, where the construction work is still underway (see “3.4 Efficiency” for details).

Table 3: School building area
(Classrooms, laboratories, libraries, gymnasiums and auditoriums)

Unit: m^2

	Actual 2001 Total area	Planned 2006		Actual 2006 Total area	Actual 2012	
		Total area	Portion under this project		Total area	Portion under this project
Zhengzhou Univ.	832,321	2,342,321	40,000	2,018,714	2,151,235	47,753
Henan Univ.	306,736	706,736	96,000	1,094,867	2,096,563	99,000
Henan Normal Univ.	206,500	467,400	0	608,191	701,840	-
Henan Agricultural Univ.	207,050	339,571	19,860	543,695	860,000	49,000
Henan Univ. of Science and Technology	326,825	863,000	0	1,011,359	1,532,756	-
Henan Polytechnic Univ.	198,617	531,000	0	756,914	1,146,991	-

	Actual 2001 Total area	Planned 2006		Actual 2006 Total area	Actual 2012	
		Total area	Portion under this project		Total area	Portion under this project
Henan Univ. of Economics and Law	246,071	328,141	11,000	922,594	1,615,110	11,000
Henan Univ. of Traditional Chinese Medicine	188,912	317,490	0	290,000	505,078	-
Xinyang Normal Univ.	155,923	443,260	0	414,350	489,317	-
Zhengzhou Univ. of Light Industry	136,518	201,000	0	292,800	488,912	-
Shangqiu Normal Univ.	95,000	145,000	0	136,500	303,166	-
Total	2,900,473	6,684,919	166,860	8,089,984	11,890,968	206,753

Sources: JICA internal documents; responses to the questionnaire from the executing agency.

The monetary value of educational and research equipment[9] increased, and the portion procured by this project mostly achieved the planned value (Table 4). The total value substantially increased as well (mainly due to investments made by the provincial government and the universities themselves). While the equipment procured by this project now constitute only a part of the total value, the provincial Education Bureau and the targeted universities commented that they were particularly important during the project implementation stage when making large-scale investments on their own were difficult, and they continued to play a meaningful role at the time of ex-post evaluation.

Table 4: Total monetary values of educational and research equipment

Unit: thousand yuan

	University total		Portion under this project	
	Actual as of end 2001	Actual as of end 2012	Planned 2006	Actual as of end 2012
Zhengzhou Univ.	47,600	697,290	47,510	48,440
Henan Univ.	81,680	406,690	15,740	21,880
Henan Normal Univ.	53,270	244,810	28,520	25,510
Henan Agricultural Univ.	72,960	259,410	17,990	20,490
Henan Univ. of Science and Technology	66,990	282,080	35,600	38,490
Henan Polytechnic Univ.	65,420	348,300	28,150	35,310
Henan Univ. of Economics and Law	16,240	119,400	21,520	23,390
Henan Univ. of Traditional Chinese Medicine	21,790	162,450	19,010	15,870
Xinyang Normal Univ.	35,120	158,570	18,430	20,230
Zhengzhou Univ. of Light Industry	54,300	259,450	19,040	22,320
Shangqiu Normal Univ.	18,000	114,850	18,420	20,270
Average	48,500	277,570	24,540	26,560

Sources: JICA internal documents; responses to the questionnaire from the executing agency.

[9] At appraisal, this indicator was not designated as an operation and effect indicator for this project. However, in the ex-post evaluation the indicator was considered necessary for confirming how the project responded to the quantitative expansion of teaching and research, and therefore the data was collected including those from before the project.

The equipment developed by this project have generally been well used, while some equipment such as personal computers made in 2006 were replaced with new ones due to obsolescence. All targeted universities answered that the utilization rates of major equipment procured under this project were more than 90%. They named many equipment as being useful, including laboratory analytical instruments, experimental equipment for teaching, computers and networking equipment. On the visits made to each target university for ex-post evaluation, the evaluator made observations of major equipment focusing on the more expensive or highly-used ones, and confirmed that they were being utilized.

(2) Qualitative enhancement of teaching and research

It was found that the average school building area and the monetary value of equipment per student satisfied the national standard at most targeted universities, implying that the quality of teaching/research environment was ensured to a certain degree (Table 5). The increment in the area per student achieved through this project was below the planned value due to the rapid increase in the number of students.

Table 5: School building area (teaching, research and administration) per student and monetary value of educational equipment per student

Units: m^2 or yuan

	School building area per student (m^2) [1]					Value of educational equipment per student (yuan) [2]	
	Actual 2001	Planned 2006		Actual 2012		Actual 2001	Actual 2012
		Area per student	Increment through this project	Area per student	Increment through this project		
Zhengzhou Univ.	23.9	50.3	0.9	29.6	0.7	1,450	10,608
Henan Univ.	14.3	24	3.3	34.0	1.7	3,800	8,000
Henan Normal Univ.	15.6	22.8	-	22.5	-	4,152	7,844
Henan Agricultural Univ.	18.9	22.1	1.3	31.8	1.8	7,296	8,709
Henan Univ. of Science and Technology	28.5	29.7	-	41.9	-	N.A.	7,704
Henan Polytechnic Univ.	19.5	30	-	21.7	-	5,426	6,551
Henan Univ. of Economics and Law	27.7	26.7	0.9	50.8	0.3	1,849	3,757
Henan Univ. of Traditional Chinese Medicine	27.5	30	-	30.1	-	3,238	9,681
Xinyang Normal Univ.	18.7	28.7	-	21.7	-	4,223	7,043
Zhengzhou Univ. of Light Industry	14.4	15.3	-	15.6	-	5,751	8,288
Shangqiu Normal Univ.	11.8	12.1	-	13.6	-	2,244	5,136
Average	20.2	30.1	1.6	28.5	1.1	3,943[3]	7,575

Source: Responses to the questionnaire from the executing agency.

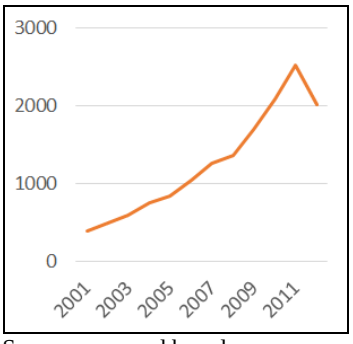
Notes: 1) The national standards of per student school building area of regular undergraduate schools are as follows: total school building area including canteens and dormitories should be "more than $30m^2$", and teaching, research and administration building area should be "more than $20m^2$" in natural science faculties, "more than $15m^2$" in humanity and social science faculties and "more than $30m^2$" in physical education and art faculties (Interim Provisions for Establishment of Regular Undergraduate Schools, No.18 [2006]).

2) The national standard for value of educational equipment per student is "more than 5,000 yuan" for laboratory equipment in faculties of science and technology such as science, engineering, agriculture and medicine, "more than 3,000 yuan" for humanity and social science faculties, and "more than 4,000 yuan" for physical education and art faculties according to the above-mentioned Interim Provision No.18 [2006].

3) Average of the universities for which data was available.

Various indicators to measure the achievements of progress in the areas of teaching and research, such as the number of key disciplines and key laboratories[10], the number of faculties/departments and graduate programs, the number of research projects and social (community) services[11] projects, the number of published research papers, the number of awards, the number of patents granted, etc., showed increasing trends (Table 6). Although such improvements are the outcome of the overall higher education development policies mentioned in "3.1 Relevance", many cases are attributable to the outcome of this project through utilization of the facilities/equipment developed under the project and/or involvement of teachers who received training in Japan in teaching/research activities under this project. Below are some examples.

- Example of key laboratories: the equipment developed by this project was concentrated to construction of key laboratories. Eventually, five key laboratories such as the Key Laboratory of Henan Agricultural Biotechnology & Engineering (provincial key laboratory) and key disciplines were established. (Henan Agricultural University)
- Example of winning research projects: the Key Laboratory of Cotton Biology of the School of Life Science (state key laboratory since 2010, following the procurement of some equipment such as a super speed centrifuge under this project) won a project of the National Basic Research Program of China ("973 Program"). (Henan University)



Source: prepared based on responses to the questionnaire from target universities.

Figure 1: Total number of internationally- published research papers by each of the targeted universities

- Example of social services: the equipment procured by this project such as a gas chromatography-mass spectrometry (GC-MS) system were used in a training course for 40 food inspectors in collaboration with Shangqiu City. The course was first held in 2012, and holding the same training course on a regular basis for local food companies and the quality supervision and inspection department is being considered. (Shangqiu Normal University)

[10] Key disciplines and key laboratories are ones that the state or a local government designates as a base for teaching or research activities and to which resources are preferentially distributed. In this ex-post evaluation, the number of these was used as indicators to show high quality of disciplines and laboratories.

[11] As Social (or community) services, the number of research, testing, etc. commissioned by external organizations (government, companies, etc.) and the number of training courses conducted for those organizations were counted.

・ Example of research papers: a teacher who had been sent by this project to the National Institute for Material Science in Japan for research in the area of physical property published several papers in international journals after returning to China, including those in co-authorship with his advisor in Japan. The papers are highly acclaimed: one of them was selected as an opening article of a journal. (Xinyang Normal University)

Table 6: Trend of major teaching/research indicators (total of the targeted universities)

Indicator	Actual 2001 or 2006 [1)]	Actual 2012
Number of key disciplines (state level)	3	13
Number of key disciplines (provincial/ministerial)	78	660
Number of key laboratories (state level)	0	7
Number of key laboratories (provincial/ministerial)	12	126
Number of undergraduate faculties/departments	311	618
Number of master's degree programs	242	1,070
Number of doctorate degree programs	15	242
Number of research projects (state level)	151 (2006)	639
Number of research projects (provincial/ministerial)	1,070 (2006)	2,182
Number of social services projects [2)]	414 (2006)	954
Number of award-winning researches (state level) [3)]	2 (2006)	10
Number of award-winning researches (provincial/ministerial) [3)]	117 (2006)	240
Number of patented research outcomes [4)]	75 (2006)	921

Sources: JICA internal documents; responses to the questionnaire from the executing agency.
Notes: 1) Where the data of 2001 were either non-available or not comparable with the ex-post data due to difference in counting, the data of 2006 were used. 2) The number of social services projects is a total of the six universities that provided the data. 3) The number of award-winning researches is a total of the ten universities that provided the data. 4) The number of patented research outcomes is a total of the seven universities that provided the data.

3.2.2 Qualitative Effects[12]

(1) Effects on enhancement of teaching and research at each targeted university

Regarding effects of the hardware components, it was confirmed from interviews with the provincial Education Bureau and targeted universities as well as document review that the educational/ experimental facilities and equipment developed under this project have contributed to the improvement of the following aspects to a certain extent.

[12] In this ex-post evaluation, it was difficult to exclude effects of activities that were not under this project from the planned quantitative indicators. Therefore, while taking the trends of the indicators into consideration, qualitative information (collected by document review, questionnaires and interviews) was used to understand how specifically this project is related to such trends. The evaluator conducted individual or group interviews in a semi-structured manner with the provincial Education Bureau (executing agency) and, at each targeted university, with persons in charge of the project implementation as well as ex-participants in teachers' training in Japan. In total, 123 persons from the 11 universities (including 59 ex-participants in teachers' training in Japan) were interviewed. With respect to interviews with universities in Japan that accepted teachers for training from the targeted universities, the evaluator visited one of them and contacted several more universities by telephone or e-mail.

- The national undergraduate education level evaluation by the Ministry of Education[13]: during the implementation period of this project, four of the targeted universities became underwent the national undergraduate education level evaluation. Henan Institute of Finance and Economy, Henan University of Science and Technology and Henan Agricultural University were evaluated as "Excellent", and Shangqiu Normal University was evaluated as "Good". They commented that the equipment procured by this project contributed to such evaluation results through improvement of teaching conditions.

Atomic absorption spectrometer being used for testing of heavy metals in an assessment of industrial hygiene.
(Shangqiu Normal Univ.)

- Upgrading of "college" to "university"[14]: Henan Polytechnic University and Henan University of Economics and Law were upgraded from a "college" to a "university" in 2004 and 2010, respectively. They commented that the facilities and equipment developed by this project contributed to expansion of facilities and equipment that became necessary as they became "universities".


Transmission electron microscope (TEM), which is well managed and used in pathology examinations and professional TEM skills training for other universities. The head of the laboratory (photo) is an ex-participant of teachers' training in Japan.
(Henan Univ. of Traditional Chinese Medicine)

- Improvement of conditions for teaching and experiments: all targeted universities commented that they were able to eliminate shortages of facilities and equipment due to the rapid increase in students and that they became capable of providing more practical education by acquiring additional equipment and increasing the proportion of laboratory classes. For example, before this project, the Center of Numerical Control Processing of the College of Electromechanical Science and Engineering, Zhengzhou University of Light Industry, could perform only a part of the process of laboratory work due to lack of equipment. After the project, it became able to perform the whole process.

[13] An evaluation conducted by the Ministry of Education of China to assure quality of higher education. 198 universities and 87 universities were evaluated in 2007 and 2008, respectively. The evaluation criteria are multifaceted including university management, teaching staff, students, facilities and equipment, academic disciplines/graduate programs, etc. The assessment is made in four levels, "Excellent", "Good", "Qualified", and "Not Qualified".

[14] According to the Higher Education Law, the Provisional Regulations on the Establishment of Regular Higher Education Institutions, and the Interim Provisions for Establishment of Regular Undergraduate Schools, undergraduate schools of regular HEIs can take the name of either "college" (学院/*xueyuang*) or "university" (大学/*daxue*) in Chinese. The requirements for "university", such as minimum size (number of students), minimum number of faculties, number of teaching staff with degree, etc.), are higher than those for "college". (Note for English translation only: in their English names, colleges (学院) use various words including "college", "university" and "institute".)

- Regarding the enhancement of research and social services, all targeted universities answered that the equipment developed by this project enabled them to construct key laboratories, acquire new research projects and provide new social services (see also "3.2.1 Quantitative Effects).

As to effects of the software component, ex-participants in the teachers' training in Japan provided the following comments. In each point, the numbers in ( ) represents the number of universities (out of the eleven universities) where the interviewed teachers said the project was "useful" for the concerned aspect.

- Promotion (9 universities): after returning from Japan, teachers became core staff members (such as head of school, dean, head of research center, professor, qualified doctoral advisor, etc.) of the respective universities.
- Teaching method (9 universities): teachers were able to learn about the state of undergraduate and graduate teaching in Japan. Although it is difficult to directly apply it to undergraduate education in China (because the number of undergraduate students is much higher), they are utilizing a part of what they learned in their teaching after returning from Japan. For example, some started allowing undergraduate students to conduct experiments with graduate students. For graduate students, some teachers introduced to them the seminar style and experiments in smaller groups.
- Operation of laboratory equipment (2 universities): some teachers learned how to operate advanced laboratory equipment. (After returning to their universities, such experience and knowledge was useful when similar equipment was purchased either under this project or using other budget resources).
- Approach and style of research (8 universities): teachers were impressed by the attitude towards research in Japan, such as seriousness, attention to details, and thoroughness in pursuing the answer, and tried to incorporate such attitudes after returning to their respective universities.
- Contents and direction of research (8 universities): some teachers decided on research themes in Japan, and these determined the direction of their research thereafter. For example, teachers of Henan University of Traditional Chinese Medicine put into practice the making of a database of HIV samples that they learned about in the training in Japan. The database they made contributed to the establishment of the HIV bank in emerging epidemic area of Henan Province.

Besides such positive responses, all targeted universities pointed out that the 6-month duration of training, which was applied to the majority of teachers, was too short for participants to deepen their specialization skills. Therefore, some teachers extended their stay or revisited Japan using other financial resources or on their own.

The table below summarizes notable effects, including those mentioned above, of the project on teaching and research at each targeted university.

Table 7: Qualitative effects at each targeted university

Zhengzhou University	The university was participating in the 211 Project[15] and had various financial sources besides this project. Therefore, it is difficult to distinguish the effects of this project from those of other development works. Nevertheless, effects of this project existed although not very distinguishable at schools in natural sciences. As for schools in the arts, one case was found: a teacher of the School of Education learned about civil education in Japan, and used such knowledge in starting an education base for primary and lower secondary students in collaboration with the government of Xinyang City.
Henan University	The university is big and has various financial sources. Therefore, it is difficult to distinguish the effects of this project. Nevertheless, the development of equipment was relatively concentrated at the School of Life Science and the School of Environment and Planning, and there found some cases of improvement such as upgrading of a key laboratory (cotton) from the provincial level (designated by the province) to the state level (designated by the state).
Henan Normal University	The equipment developed by this project contributed to reinforcement of laboratories in areas such as biology and chemistry. At the School of Chemistry and Chemical Engineering, effects on the local economy were observed such as research and development of batteries (of which Xinxiang City where the university is located is one of the two biggest places of production). Several teachers reported that they were able to decide their research themes or open a new course after they returned from their training in Japan. One unique case is that of a professor who learned about cultural properties protection in Japan and became active in the protection of an intangible cultural property of Xinxiang City after his return. A number of teachers visited Japan again using their own money or other opportunities. Also, a double degree program with a university in Japan[16] has started.
Henan Agricultural University	The university concentrated large-scale laboratory equipment (including the ones developed by this project) to the sharing platform[17] and are using them for a wide range of basic research. Some unique cases of use of project equipment were found such as an uninterruptible power supply system installed at the Agronomy Information Center and studio equipment procured for development of multimedia teaching materials. Also, there are equipment that are used for development of new dairy products and vegetable by an enterprise established by the university. Most of the graduates are engaged in agriculture-related jobs in Henan Province. Most of the large-scale chicken farms and hog farms are run by graduates of this university.
Henan University of Science and Technology	A number of good practices were found: ex-participants in teachers' training in Japan and equipment developed at the Material Science and Engineering School contributed to development of a new material (which was commercialized by a collaborating company); a teacher in the area of economic management produced good results after returning from Japan; a teacher was engaged in teaching reform after returning from Japan; a campus information network was constructed and very strictly-managed to assure quality (equipment procured under this project constitute part of the system and ex-participants in teachers' training in Japan are involved in networking design and management of the system).
Henan Polytechnic University	The university put a higher priority to procurement of research equipment over basic educational equipment, and considers it was a good decision as the procured equipment may be utilized for long time. The university is actively engaged in research related to coal (major industry of Jiaozuo City where the university is located) and soil analysis. Large-scale laboratory equipment are shared among schools, and portable analytical equipment are lent to enterprises established by the university. The equipment also contributed to establishment of key laboratories. At the five

[15] A national policy (started in 1996) to support approx. 100 key universities in a focused manner by the 21st century.

[16] A mechanism by which a student can obtain degrees from two universities in parallel.

[17] A system to which laboratories register their equipment for use by other faculties (schools) or outside institutions.

	departments of the School of Electrical Engineering and Automation, teachers' training in Japan and procurement of equipment were related to each other (i.e., equipment procured were used by teachers who returned from training in Japan). Unlike other target universities, teachers did not revisit Japan after the training under this project. According to them, it was difficult due to visa-related issues.
Henan University of Economics and Law	The university still uses the procured computers and multimedia systems made in 2006 with care. The reported effects of this project include smooth implementation of this project following participation in the university management course, modernization of means of teaching, improvement of teaching facilities (though concrete examples of those benefits were not shown), and continuing exchange with advisors of host universities since teachers' training in Japan.
Henan University of Traditional Chinese Medicine	A number of good practices were found including effects of teachers' training in Japan in HIV/AIDS, contribution of equipment procured to the establishment of a Level 3 traditional Chinese medicine testing laboratory[18], and effective utilization of the transmission electron microscope (e.g. determination of causes of several diseases and testing services to other institutions such as Zhengzhou University and research institutions in Zhengzhou City). These cases are also good practices of good operation and maintenance of equipment as a result of thorough study of each of them before procurement.
Xinyang Normal University	The project significantly contributed to education in rural areas through development of graduates who would become teachers in Henan Province, training for rural teachers, etc. It was reported that ex-participants in teachers' training in Japan applied the Japanese teaching style that puts importance on experiment (practice) and encourages students' initiative, which led to high reputation of graduates at graduate schools of other universities they attended. Both equipment and training in Japan were utilized for establishment of major disciplines. There are equipment that are used not only for teachers' development but also for enhancement of research activities that would benefit the development of the city. The project also procured equipment such as basketball goals of international standard and electric score board at the gymnastic hall as well as pianos that are unique to normal universities.
Zhengzhou University of Light Industry	Various effects were found such as the establishment of provincial-level key laboratories using equipment procured by this project as a basis, and exchanges with universities in Japan at individual or faculty (school) levels as well as research outcomes that started from teachers' training in Japan. Some teachers extended their stay in Japan from 6 months under this project to 1 year using their own money, and enriched their research outcomes and exchanges with the host universities. Teachers who stayed in Japan for a shorter period also achieved certain outcomes as their research themes matched those at the host universities. This project enhanced the university's recognition of effectiveness of teachers' overseas experience: the university is planning to start a program to send 15 teachers every year for 1-2 year training abroad.
Shangqiu Normal University	The effects of this project to the university are characterized by various cases of social services to the local area, including industrial hygiene analysis at coal companies (coal is a major industry of Shangqiu City), breed improvement of strawberries, dispatch of teachers to rural areas, etc. After returning from training in Japan, some teachers visited Japan again on their own and some others are planning to do so. Also, exchanges are continuing such as inviting a professor from the host universities in Japan to Shangqiu Normal University for lectures.

Sources: Prepared based on responses to the questionnaire from targeted universities, interviews with them, information from their websites, etc.

Lecture using equipment procured by this project.

(Zhengzhou University of Light Industry)

Scanning electron microscope (SEM) being used by a teacher and her student for analysis of coal.

(Henan Polytechnic University)

Photographs of parts of batteries taken using SEM. The batteries were developed in collaboration with a company in Xinxiang City.
(Henan Normal University)

[18] The bio-safety level ranges from 1 to 4 (highest) according to the degree of danger of pathogens that the laboratory can handle.

3.3 Impact

3.3.1 Intended Impacts

(1) Enhancement of teaching and research at the provincial level

Table 8 shows selected higher education indicators at the provincial level. Improvement is seen in the quantitative indicators such as higher education enrollment rate that were planned at appraisal. As the targeted universities of this project are all top ranked among regular HEIs of the province in terms of size and other criteria[19], it can be said that they have lead such improvement.

Table 8: Higher education indicators of Henan Province

	Actual 2001	Planned 2006	Actual 2006	Actual 2010	Actual 2012
Number of regular HEIs (of which universities with undergraduate programs)	91 (39)	90	84	107	120 (47)
Number of students enrolled in regular HEIs	570,000	1,300,000	970,000	1,460,000	1,590,000
Enrollment rate in HEIs	12%	16%	18%	24%	27%
School building area per student (average of targeted universities) (m^2/person)	34.1 m^2	30.0 m^2	31.0 m^2	28.9 m^2	31.9 m^2

Sources: Prepared based on JICA internal documents, responses to the questionnaire from the executing agency, provincial statistics, etc.

(2) Contribution to regional vitalization, market economy reform support, and environmental conservation

Regarding the three development issues intended at appraisal, namely, (i) regional vitalization, (ii) market economy reform support and (iii) environmental conservation, sufficient quantitative data to show the overall trend could not be collected for ex-post evaluation. Also, as large-scale universities tend to simultaneously implement a number of development projects, which made it difficult to see the impact of this project. Nevertheless, at least certain cases of contribution of this project were observed in all targeted universities, including the ones that the facilities and equipment were used for research that would benefit the development and environment of the province and the concerned cities, and that teachers who were trained in Japan were playing important roles in the educational aspect (i.e. through development of good graduates) and the research aspect (through university-industry collaboration and social services). Many cases are reported particularly in the area of environment.

[19] For example, the total number of students of the eleven targeted universities accounted for 24% of the total number students of all of the 120 regular HEIs in the province, and all targeted universities are included in the 15 universities with the largest numbers of students in the province (data are all as of 2012). Also, according to "China Colleges and Universities Rankings 2012" of the Chinese Universities Alumni Association, all targeted universities were ranked between the 1st to the 18th places in Henan Province (Zhengzhou University was ranked first).

(i) Regional vitalization

First, regarding how the project provided human resources to the province's key industry (petrochemical industry, mechanical industry, traditional Chinese medicine, etc.), the targeted universities did not have precise data on employment status of graduates. Therefore, the number of graduates who majored in those fields were evaluated instead. From the available data the number of such graduates (ranging between 100 and 3,000 persons depending on university) showed an increasing trend. In this relation, targeted universities also commented that a certain portion of the graduates are employed in the concerned industry, and this project contributes to regional vitalization indirectly through improvement of graduates' practical skills. For example, at the School of Chemistry and Chemical Engineering of Zhengzhou University, equipment developed and a teacher trained in Japan under this project improved the quality of teaching and research (e.g., a research project won the third prize of the China Petroleum and Chemical Industry Federation), which impacted employment in petrochemical industry and chemical engineering machine industry. Also, there were cases found where the targeted universities located outside the provincial capital contributed to promotion of local industries such as coal industry in Jiaozuo City (Henan Polytechnic University) and battery industry in Xinxiang City (Henan Normal University) through university-industry collaboration and employment of graduates.

Utilization of the outputs of this project in vocational education and adult education was observed at two target universities. For example, there was a case where the equipment developed by this project was used for education of secondary school teachers and skills training for employees of state-owned enterprises (Henan University).

As for dispatch of teachers and doctors to rural areas, some universities said the project indirectly contributed to it in terms of enhancing practical skills of the teachers and doctors who are dispatched under the provincial policy, the graduates who are employed in rural areas and the students who are sent to rural areas for a term. For example, Xinyang Normal University reported that graduates were commended by the provincial Education Bureau for their outstanding achievement in education in rural areas. The university also said that the facilities and equipment developed by this project were useful in the "two-way training", in which students before graduation are sent to rural areas during the period when rural teachers are invited to the university for training.

(ii) Market economy reform support

The number of graduates in the related fields (i.e. economics, law, accounting, finance, etc.) are generally increasing (ranging between 100 and 8,000 persons depending on university). About half of the targeted universities acknowledged the indirect contribution of this project, mainly instruction by teachers who were trained in Japan, to provision of human resources with higher practical skills. Also, there were cases of contribution of some facilities/equipment and

teachers through social services and university-industry collaboration. On the other hand, at one of the targeted universities, this project did not cover the faculties and disciplines related to this issue (Zhengzhou University of Light Industry), and another university commented that while there may have been contribution of teachers trained in Japan, it was difficult to name concrete cases, and that impacts of training in Japan was limited as the duration of training (6 months, etc.) was short (Henan University of Economics and Law).

(iii) Environmental conservation

The number of graduates in the environment-related fields is increasing (ranging between 100 and 3,000 persons depending on university). Most of the targeted universities acknowledged indirect contribution of this project to environmental conservation through providing graduates with higher practical skills. At the same time, those universities all reported concrete cases where research outcomes, university-industry collaboration and social services using the procured equipment and the ideas or methods that teachers learned in Japan contributed to environmental measures. For example, at Henan Agricultural University, an ex-participant in teachers' training in Japan provides technical support to all projects of the Henan Province Forestry Bureau using equipment procured by this project (various analytical instruments) and the viewpoint of research that he learned in Japan. He also said that he opened two training courses related to ecological environmental issues.

3.3.2 Other Impacts

(1) Impacts on the natural environment

No negative impacts were observed. By the time of the appraisal, all targeted universities had completed the necessary domestic procedures of environmental clearance with the environmental impact assessments (EIA) approved by the environmental protection department of the province or the cities where the universities are located. Some noises, vibrations and dusts due to the building construction and foul water due to the use of the constructed facilities had been expected but to a small scale. During the project implementation period as well as after project completion, each school said that it has been taking necessary measures of exhaustion, water discharge and noise control and that it implemented environmental monitoring as planned.

(2) Land acquisition and resettlement

As planned in the appraisal, there was no land acquisition and resettlement associated with this project.

(3) Strengthening of exchanges and cooperation with universities in Japan

Impacts of the project on strengthening of exchanges with universities in Japan were observed. In some cases new relationships were built with universities in Japan, and in other

cases the existing relationships were strengthened after the project. However, there were not many cases of reaching official university-level cooperation, partly because many of the Japanese universities had already concluded agreements with other universities in China. Therefore, most of the exchanges seemed to be at the teacher (individual) or faculty levels, including invitation of teachers from Japan for lectures, sending students to Japan for study and joint research.

The outcomes of individual cases of exchange are described in Table 7. Overall, almost all of the interviewed ex-participants in the teachers' training under this project said that they had been strongly impressed by the elaborateness of teaching and research activities at universities in Japan and seriousness of the Japanese people, and had come to feel more familiar with Japan. Generally, western countries tend to be more preferred as the place to visit, but many teachers who participated in this project said that they talked about their research and life in Japan to their colleagues and students, who then gained a better understanding of Japan. For example, according to Henan University of Science and Technology, a specialized subject titled "Japanese Culture" was newly opened, and teachers trained in Japan under this project took turns providing lectures.

Further, an impact on international exchanges beyond those with Japan was observed: in recognition of the good human resource development outcomes of the teachers' training in Japan, Zhengzhou University of Light Industry is planning to start a program to send more than 15 teachers abroad for training every year. According to the university, the foundation of exchanges with foreign countries has been established, based on which visiting research and degree programs may be developed.

This project has largely achieved its objectives, therefore its effectiveness and impact is evaluated to be high.

Data server room in the library. Security and hygiene are strictly controlled. An ex-participant in teachers' training in Japan undertook the optimization design. (Henan University of Science and Technology)

3.4 Efficiency (Rating: ②)

3.4.1 Project Outputs

The actual production of the outputs is summarized in "Comparison of the Original and Actual Scope of the Project" on the final page of this report (the floor area of the buildings constructed for each university is in Table 3). The hardware outputs were developed mostly as planned with some differences in location of the buildings, construction materials to be procured under this project, and content and location of education/research equipment to be procured. Henan University of Economics and Law changed the location of a library to be constructed from the old campus to the new campus. Following this change, the

construction work was delayed and the building had not been completed at the time of ex-post evaluation. Nevertheless, the portion under this project - the procurement of steel for the foundation of the building – had been completed, and so was the construction of the foundation. Besides, Zhengzhou University, Henan University and Henan Polytechnic University cancelled some equipment as production of those equipment stopped while the project was delayed.

As for the software outputs, the actual number of participants in the teachers' training in Japan significantly increased reflecting the high demand. Invitation of experts from Japan was cancelled as sending Chinese teachers to Japan was given higher priority.

Multimedia system. Though already old (made in 2006), it is still used after upgrading.
(Henan University of Economics and Law)

Basketball goal of international standard and electric scoreboard.

(Xinyang Normal University)

High performance liquid chromatograph (HPLC). As it was useful, the university purchased another one on their own.
(Henan Agricultural University)

3.4.2 Project Inputs

3.4.2.1 Project Cost

As shown in the table below, the total project cost was 8,489 million yen (of which the Japanese ODA loan was 4,556 million yen), which was within the plan (ratio against the plan: 99%).

Table 9: Planned and actual project costs

Unit: million yen

	Plan (appraisal)			Actual		
	Foreign currency	**Local currency**	**Total**	**Foreign currency**	**Local currency**	**Total**
1. Building construction	903	2,791	3,694	885	2,990	3,875
2. Equipment	3,263	786	4,049	3,364	893	4,258
3. Training	217	65	282	300	48	349
4. Price contingency	92	11	103	0	0	0
5. Physical contingency	224	183	407	0	0	0
Total	4,699	3,836	8,535	4,550	3,933	8,483

Sources: JICA internal documents, responses to the questionnaire from the executing agency.
Notes: As the actual amount in the table does not include the disbursement charges, the total amount is different from the amount mentioned in the main text. Also, due to rounding down of the fractions smaller than 1 million yen, the breakdown and total amounts may not match. The exchange rates applied were: (planned) 1 yuan=15 yen; (actual) 1 yuan=13.8 yen.

3.4.2.2 Project Period

As shown in Table 10, the actual project period was more than 128 months, which was significantly longer than the planned 36 months (ratio against the plan: beyond 356%) due to the following reasons:

- Building construction: the process was delayed due to the adjustments of locations of new campuses (Henan Agricultural University, Henan University of Economics and Law).
- Equipment: the start of the procurement process was delayed for 24 months due to the outbreak of severe acute respiratory syndrome (SARS); in that period the models and specifications of the equipment that had been planned in 2003 changed, and thus reconsideration of them became necessary; a rise in the yuan exchange rate versus the Japanese yen in 2007 was beyond the exchange rate risk bearing capacity of the suppliers; the (Inland) Higher Education Projects were implemented in 22 provinces almost simultaneously, which caused concentration of procurement into limited routes; due to the prolonged procurement process for these reasons, it took time for re-contract on the equipment whose production stopped and for the customs exemption procedures.
- Training: the process was significantly delayed following the delayed start due to SARS (6 months) and the increase in the number of teachers to be sent to Japan.

Table 10: Planned and actual project periods (as of October 2013)

	Plan (appraisal)	**Actual**
Signing on Loan Agreement	March 2003	March 2003
Building construction	December 2004	Not completed yet
Procurement of equipment	December 2005	December 2010
Training	March 2006	July 2011
Project completion (lengths of months)	March 2006 (36 months)	Not completed yet (beyond 128 months)

Sources: JICA internal documents, responses to the questionnaire from the executing agency.

3.4.3 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 was not possible.

Although the project cost was within the plan, the project period significantly exceeded the planned period, and therefore efficiency of the project is evaluated to be fair.

3.5 Sustainability (Rating: ③)

3.5.1 Institutional Aspects of Operation and Maintenance

As planned during the appraisal, the facilities and equipment developed under this project are operated and maintained by each targeted university, and the Education Bureau of Henan

Province, the executing agency, oversees them. All targeted universities added the developed facilities and the equipment to the universities' fixed assets, and established the operation and maintenance system with clearly defined responsibilities and procedures through establishing regulations such as the procedures for maintenance of large equipment and fund management, work regulations on experiment teaching, the procedures for fixed asset management, etc. The division of responsibilities among related organizations is clear, and there are no issues recognized with respect to the number of staff in charge of operation and maintenance.

3.5.2 Technical Aspects of Operation and Maintenance

No problem was observed in the technical aspects as all targeted universities regularly carry out maintenance and inspection of the facilities and equipment, and outsource repair works to contractors such as suppliers when necessary. To secure the skills necessary to operate and maintain large or sensitive laboratory equipment, the universities appoint full-time technical staff for each instrument or laboratory to manage the equipment in an integrated manner. At all targeted universities, the manuals and precautions are posted near individual instruments for easy reference. Also, it was reported that teachers in charge of sensitive equipment receive technical training regularly from the manufacturers.

3.5.3 Financial Aspects of Operation and Maintenance

The targeted universities are all overseen by the provincial government. Their budgets consist of subsidies from the state or province and own income such as tuitions and fees. Although the financial data were only partially available, the budgets of the province and individual universities are generally stable or in an increasing trend (Tables 11 and 12). Based on the interviews, it can be said that the necessary budget for operation and maintenance is ensured in the university budget[20]. None of the main facilities and equipment developed under this project were found unused due to lack of budget for operations and repairs.

Table 11: Financial expenditure of Henan Province

Unit: million yuan

	2010	2011	2012
Total expenditure	341,614	424,882	500,640
of which education sector	60,937	85,714	110,651

Source: Prepared based on statistics from provincial Education Bureau.

Table 12: Operation and maintenance expenses of targeted universities

Unit: thousand yuan

	2010	2011	2012
Henan Normal Univ.	1,000	1,200	1,500
Henan Agricultural Univ.	650	650	850
Henan Univ. of Science and Technology	198	214	226
Henan Polytechnic Univ.	7,090	6,580	6,050
Henan Univ. of Traditional Chinese Medicine	200	200	200
Xinyang Normal Univ.	1,060	1,060	1,060
Shangqiu Normal Univ.	766	894	1,222

Source: responses to the questionnaire from target universities.

[20] Although the data were not available, all universities said that they use income from testing services and other services using equipment for maintenance of the equipment.

3.5.4 Current Status of Operation and Maintenance

In all targeted universities, the equipment developed by this project are registered in the maintenance and management database. Based on observation and review of usage or inspection records, it was confirmed that the equipment were mostly in good condition. A user of equipment must record the usage as well as the conditions of the equipment every time they use it. In all universities, breakdowns and other troubles are handled either by repairing by themselves or by outsourcing (sending the equipment to manufacturers or having repair persons visit the laboratory). It was also reported that there were no major problems in purchasing and keeping stock of consumables. All universities said that there is no problem in purchase and stock of spare parts that are produced.

Single-crystal X-ray diffraction spectrometer. Operating for almost 24 hours a day. Kept in good conditions with maintenance by a teacher and a graduate student. (Henan University)

No major problems have been observed in the institutional, technical and financial aspects of the operation and maintenance system. Therefore sustainability of the project effect is high.

4. Conclusion, Lessons Learned and Recommendations

4.1 Conclusion

This project aimed to improve teaching and research at eleven major universities in Henan Province through the development of their facilities and equipment as well as providing training for teachers. Relevance of the project was evaluated to be high, as it was in line with (i) the higher education policies of China and Henan Province, (ii) development needs for quantitative and qualitative enhancement of the universities, and (iii) Japan's assistance policies. Effectiveness/impact was also high, based on the observations that the project satisfied such needs, improved education activities by enabling more experiments, and improved research activities through outcomes achieved from advanced equipment and training, and thereby contributed to the promotion of the key industries as well as environmental conservation. Efficiency of the project was evaluated to be fair on the whole: although the project cost was within the plan, the project period significantly exceeded the planned period due to factors such as delays in the building construction following changes in location. Sustainability was evaluated to be high, with no problem observed in institutional, technical and financial aspects, and due to the good status of operation and maintenance of the facilities and equipment developed by the project.

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) The targeted universities are recommended to continue the proper use of the facilities and equipment developed under this project in teaching and research, as well as to extend the knowledge that has been gained from exchanges with Japan.

(2) Construction of the unfinished building should be completed as soon as possible.

4.2.2 Recommendations to JICA

The higher education human resources who were developed by this project and who have gained a good understanding of Japan (i.e. teachers of the targeted universities) should be regarded as resource persons for future cooperation projects with China. Therefore, information on those human resources should be maintained. Utilization of the (Inland) Higher Education Projects web site, which is currently operated for the provinces where the Projects are still being implemented, could be considered. Possible ways to utilize the website for the provinces where the (Inland) Higher Education Projects have been completed could include updating of the information on, and encouraging posting from, those "completed" provinces.

4.3 Lessons Learned

(1) Planning of teachers' training that is effective

In order to send as many teachers as possible to Japan, the most common duration of the teachers' training under this project was around six months, which was, however, too short to deepen the participants' research work. Therefore, a vision of how to make best use of the training should be elaborated from the project planning stage. Possible ways may include: reducing the number of teachers to be sent to Japan, but allowing them to stay longer such as for more than one year; setting the training or research themes with which the outcome is expected to be obtained in the short-term (i.e. during the six-month stay in Japan); removing the language barrier by sending teachers to the universities where there are Chinese advisors; selecting the teachers who have a will to pursue their research by extending their stay or visiting Japan again using other funds or even their own money; preparing a system to develop the contacts with Japanese advisors/universities that teachers could bring back from Japan into organization-level exchanges; preparing a JICA's support to construct a system of re-visiting by ex-trainees to Japan and visits by Japanese advisors to China (e.g. approach the host universities in Japan and provide information and opportunities, etc.). This project eventually realized some of those ways, but the outcomes could be further maximized if future projects plan teachers' training with a clearer strategic intent from the planning stage.

(2) Identifying effects of this project among many other ongoing development projects

Large scale universities often implement many development projects simultaneously. From

an evaluation perspective, it is hard to identify the outcomes of a certain cooperation project even if there is a high need for that project. When setting the expected outcomes of the project at appraisal, consideration should be given on how to assess the effects of the project, for example, whether looking at the aggregated (combined) effects of all projects or narrowing down the expected outcome (e.g. developing laboratories of a certain faculty) based on needs of the country and the type of project, and concentrating the inputs for the specific outcome[21].

[21] This ex-post evaluation eventually combined both ways of looking at project outcomes. However, as the appraisal did not seem to have paid attention to how to assess the effects of this project separately from other projects, the plan-actual comparison was possible only to a limited extent.

Comparison of the Original and Actual Scope of the Project

Item	Original	Actual
1. Project Outputs	Target: 11 universities in Henan Province	Target: same as planned
(a) Hardware i) Building construction	8 buildings such as teaching building for 4 universities; total floor area of 167,000m^2	Completed: 6 buildings such as teaching building for 3 universities; total floor area of 195,753m^2
ii) Procurement of educational equipment	Physics, chemistry, biology, environmental engineering, electrical engineering, physical chemistry, chemical engineering, traditional Chinese medicine, geology, education engineering, multimedia, campus net, etc.	Areas of education: same as planned Total 1,050 items 9,539 pieces
(b) Software Teachers' training in Japan or acceptance of experts from Japan	Total 232 persons (including 16 experts from Japan)	Total 318 persons sent to 82 Japanese universities or institutions (experts from Japan: none)
2. Project Period	March 2003 – March 2006 (36 months)	March 2003 - not completed as of October 2013 (more than 128 months)
3. Project Cost Amount paid in Foreign currency	4,699 million yen	4,556 million yen
Amount paid in Local currency	3,836 million yen (258 million yuan)	3,933 million yen (285 million yuan)
Total	8,535 million yen	8,489 million yen
Japanese ODA loan portion	4,699 million yen	4,556 million yen
Exchange rate	1 yuan = 15 yen (As of September 2002)	1 yuan=13.8yen (average during 2004-2011)

People's Republic of China

Ex-Post Evaluation of Japanese ODA Loan

"Inland Higher Education Project (Regional Vitalization, Market Economy Reform Support, and Environmental Conservation (Qinghai Province))"

External Evaluator: Naomi Murayama, OPMAC Corporation

0. Summary

The objective of this project (hereinafter referred to as "the Project") was to improve higher education in Qinghai Province quantitatively and qualitatively by supporting the construction of buildings, the procurement of equipment and the training of teachers in the target universities. This objective was consistent with the China's development plan and development needs as well as with Japan's ODA policy at the time of both the appraisal in 2004 and the ex-post evaluation; therefore its relevance is high. The effectiveness and impact of the Project was high because quantitative indicators (building areas, amount of educational equipment) and qualitative indicators (number of key faculties and laboratories, number of research papers, etc.) have improved. Moreover, there are many cases of good practice in the utilization of buildings, equipment and training provided under the Project. The outputs were essentially completed in line with the initial plans, and the project cost was within the plan. The project period, however, exceeded the plan; therefore the efficiency of the project is fair. No major problems have been observed in all institutional , technical and financial aspects of the operation and maintenance system and its current status is very good; therefore the 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

Teaching Building of Preclinical Medicine at the Medical College, Qinghai University

1.1 Background

As far as the economic situation of Qinghai Province at the time of appraisal is concerned, the GDP per capita (RMB[1] 6,426 in 2002) was below the national average (RMB 7,966 in 2002). "The 10th Qinghai Province Five-Year Plan (2001 - 2005)" had the target of an annual average GDP growth rate of about 9.0% and of a GDP per capita of RMB 8,921 in 2005. In the fields of economic growth and industrial structural adjustment, the processing industry of natural gas and petroleum and drug development were specified as key industries. The Qinghai Provincial government recognized the necessity of expanding higher education for human resource development centering on these sectors in order to attain its objective. It announced a policy to raise the higher education enrollment rate from 11.4% in 2001 to 15% in 2005 and the number of higher education students from around 49,000 (out of this total, 23,000 were ordinary higher education students) in 2001 to about 112,000 (with approximately 38,000 ordinary higher education students) by 2005.

1.2 Project Outline

The objective of the Project was to upgrade higher education in both quality and quantity for four important institutes[2] in Qinghai Province by supporting the construction of school buildings, the procurement of educational equipment and the training of teachers in Japan, thereby contributing to regional vitalization, market economy reform and environmental conservation.

Loan Approved Amount/ Disbursed Amount	2,812 million yen / 2,671 million yen	
Exchange of Notes Date/ Loan Agreement Signing Date	March, 2004 / March, 2004	
Terms and Conditions	Interest rate:	1.5% (0.75% for training component)
	Repayment period:	30 years (40 years for training component)
	(Grace period)	(10 years)
	Conditions for procurement:	General untied
Borrower/ Executing Agency	The Government of the People's Republic of China / Qinghai Province People's Government	
Final Disbursement Date	August, 2011	

[1] Chinese Renminbi.

[2] The target universities at the time of appraisal were 1)Qinghai University, 2) Qinghai Normal University, 3) Medical College of Qinghai University and 4) Qinghai University for Nationalities. However, the target universities at the time of ex-post evaluation had dropped to three due to establishment of new "Qinghai University" as a result of merger between Qinghai University and the Medical College of Qinghai University in 2004.

Feasibility Studies, etc.	1. F/S: "Feasibility Study Report" (Qinghai Engineering Consulting Center, June 2003) 2. JICA report: 1) "FY 2001 Special Assistance for Project Implementation(SAPI) for the Higher Education Project in China" (August 2003) 2) "Special Assistance for Project Implementation (SAPI) for a Higher Education Project in the People's Republic of China" (March 2004) 3) "SAPI for a Higher Education Project in China" (May 2005) 4) "The Supervision Survey Report on JICA Loaned Higher Education Project" (2010)

2. Outline of the Evaluation Study

2.1 External Evaluator

Naomi Murayama, OPMAC Corporation

2.2 Duration of Evaluation Study

Duration of the Study: August, 2013 – November, 2014

Duration of the Field study: December 2, 2013 – December 27, 2013,
March 9, 2014 – March 17,2014

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

3.1 Relevance (Rating:③[4])

3.1.1 Relevance to the Development Plan of China

China was admitted to the World Trade Organization (hereinafter referred to as "WTO") in December 2001 and has been aiming at high rates of economic growth, openness and reform through industrial structural adjustment. Disparities between coastal and inland areas, and between urban and rural areas, have been issues in China. To address increasing environmental issues, not only the government initiatives but also more comprehensive approaches were needed, including human resource development and research on environmental conservation by higher educational institutions.

It was expected that the Project would contribute largely to regional vitalization, market economy reform and environmental conservation by human resource development through supporting tertiary education in one of China's inland areas. The Project objectives complied with "the 10th Five-Year Plan for National Economic and Social Development, "the 10th Five-Year Plan for Education", "China Western Development", "the 10th Qinghai Province Five-Year Plan" and "the 10th Qinghai Province Five-Year Plan for Education" at the time of

[3] A: Highly satisfactory, B: Satisfactory, C: Partially satisfactory, D: Unsatisfactory

[4] ③: High, ②: Fair, ①: Low

appraisal.

At the time of the ex-post evaluation, the "National Mid- and Long-Term Reform and Development Plan for the Education Sector (2010-2020)" had been formulated in addition to "the 12th Five-Year Plan for National Economic and Social Development", "the 12th Five-Year Plan for Education", "China Western Development", "the 12th Qinghai Province Five-Year Plan" and "the 12th Qinghai Province Five-Year Plan for Education". In line with these plans, China has been promoting human resource development and regional disparity rectification for further economic growth, together with further openness and reform.

3.1.2 Relevance to the Development Needs of China

At the time of the appraisal, the quantitative demand for higher education was growing, with backing from an increase in the number of secondary graduates and the government policies for the increase in the number of higher education students. However, insufficient capacity of facilities and teaching staff at universities was an issue. In order to address the issue, the enhancement of higher education from the aspects of infrastructure, human resources and finance was needed. The Project supported the enhancement of higher education; therefore it was consistent with the development needs of China.

The increase in tertiary enrollments in Qinghai Province was relatively moderate in comparison with the increase in post-secondary students (Table 1). As of 2012, the numbers of post-secondary students and tertiary enrollments exceeded the targets set at the time of appraisal. Although the number of ordinary tertiary enrollments had not achieved the target as of 2012, it had increased to 16,100 from 11,100 at the time of appraisal. According to the Education Department of Qinghai Province, the number of ordinary tertiary enrollments is controlled in order to avoid deterioration in the quality of education. In addition, universities in Tianjin have started accepting from 1,000 to 1,500 students from Qinghai Province annually since 2009. The slow rate of increase in ordinary tertiary enrollments in Qinghai Province can therefore also be attributed to an increasing number of students who go on to universities outside the province.

Table 1: Number of Post-secondary Students and Tertiary Enrollments in Qinghai Province

Unit: thousand

	2007 (Target)	2007 (Actual)	2012 (Actual)
Post-secondary students	31.5	31.8	35.8
Tertiary enrollments	20.6	17.2	21.8
Ordinary tertiary enrollments	19.6	16.6	16.1

Source: Qinghai Province People's government

Note: Higher education institutions (tertiary) include vocational technical schools, short-term higher education, four-year universities, and graduate schools. Ordinary tertiary institutes include only four-year universities and graduate schools. In this chart, these indicate institutions excluding graduate schools.

The target universities were selected in line with provincial development goals such as the provision of human resources for key industries, the fostering of teachers and the fostering of high-ranking minorities. The universities meet the needs for human resource development in these fields.

During project implementation, higher education reforms such as the enhancement of facilities and improvements in teaching and the quality of administration were rapidly taking place. Therefore, the timing of financial support was appropriate. Moreover, higher education reform is still continuing. Thus, the project objectives are consistent with the development needs of universities.

3.1.3 Relevance to Japan's ODA Policy

Japan's ODA Charter at the time of appraisal placed importance on assistance in the Asian region and assistance in human resource development; therefore the project objectives were consistent with Japan's ODA policy.

Furthermore, the Country Assistance Program for China, the Medium-Term Strategy for Overseas Economic Cooperation Operations and the Country Assistance Strategy for China at the time of appraisal made human resource development a priority from the viewpoint of support for openness and reform (market rules), environmental conservation, and regional development (including progress in Japan-China exchanges). The project objectives were therefore also consistent with Japan's aid policies.

This project has been highly relevant to the country's development plan and development needs, as well as to Japan's ODA policy. Therefore its relevance is high.

3.2 Effectiveness[5] (Rating: ③)

3.2.1 Quantitative Effects (Operation and Effect Indicators)

In this ex-post evaluation study, the evaluator analyzed the quantitative effects using the indicators directly related to the three project components, i.e. building construction, the provision of educational equipment and training. Specifically, contributions to increases in the number of students were evaluated by analyzing the areas of school buildings (floorage), the monetary value per student of educational equipment and the utilization rate of school buildings and educational equipment for quantitative improvement. For qualitative improvements, the educational environment was analyzed by floorage per student and the monetary value per student of educational equipment. The contribution made by the project to aspects of education and research was then evaluated based on the number of key faculties, key laboratories, research papers, research projects, the number of patents for inventions and so forth.

[5] The sub-rating for Effectiveness is to be dealt with in consideration of Impact.

3.2.1.1 Improvements in Quantity

(1) Changes in the number of students

In China, the number of higher education institutes and university students has sharply increased since the release of the "Action Plan for Educational Vitalization Facing the 21st Century" in 1998, which aimed at an increase in the university enrollment rate from 9.8% in 1998 to 15.0% in 2010. In the meantime, the number of higher education institutes in Qinghai Province fluctuated. The number was ten in 2002, dropping to eight in 2007 due to the merger and abolition of institutes. The number had increased again to eleven by 2012. The number of students in Qinghai Province, as mentioned above, increased only slightly from 62.3 thousand in 2002 to 64.1 thousand in 2012 because of the limiting of recruitment in order to maintain the quality of education.

On the other hand, the growth rate of students at target universities is higher than 2.9% of the province total. According to answers to a questionnaire from each of the target universities, the total number of students at the target universities increased by 9,770 in the last decade (a 35.2% increase) from 27,768 in 2002 to 37,538 in 2012 (Table 2).

Table 2: Increase in students at the target universities

Unit: person

	Baseline (2002)	**Actual (2007)**	**Actual (2012)**	**Increase compared to baseline**	**Growth rate (%) (2002－2012)**
Qinghai University	12,187	11,669	14,598	2,411	19.8
Qinghai Normal University	8,891	12,533	12,721	3,830	43.1
Qinghai University for Nationalities	6,690	9,312	10,219	3,529	52.8
Total	27,768	33,514	37,538	9,770	35.2

Source: Responses to the questionnaire
Note: The baseline number of students at Qinghai University includes the Medical College of Qinghai University.

(2) Changes in school building areas

To meet the increase in university students mentioned above (1), each target university constructed teaching and laboratory buildings, libraries and so on. At Qinghai Normal University and Qinghai University for Nationalities which had small floorages at the time of appraisal, the building areas drastically increased (Table 3). Qinghai University merged with the Medical College of Qinghai University in November 2004. However, the increase of floorage went no further than 23.2%, which is small in comparison with the drastic increase at the other target universities. This is for the following reasons: 1) an old lecture hall that existed at the time of appraisal was demolished and 2) residences for teachers were included in the school building areas before 2004 but these were later excluded from the calculation of floorages at universities based on national regulations.

Although the Project buildings do not necessarily account for a large share of the building

areas of each university, according to answers to questionnaires from each university, all the universities felt that the Project had contributed to a mitigation of the shortage of the school buildings as it had been implemented at a time which coincided with campus expansion or the rebuilding of school buildings. Moreover, these buildings play a significant role in education and research. Therefore, it can be said that construction of school buildings under the Project has contributed to some extent.

Table 3: Changes in school building areas at the target universities

Unit: m^2

	Baseline (2002)	Actual (2012)	Growth rate (%) (2002－2012)	Project area	Project share (%)
Qinghai University (Medical College of Qinghai University)	319,344 (34,806)	436,460	23.2	39,508	9.1
Qinghai Normal University	82,211	246,622	200.0	18,263	7.4
Qinghai University for Nationalities	55,485	427,207	670.0	9,113	2.1

Source: JICA appraisal documents for baseline data, responses to the questionnaire for others

(3) Changes in the monetary value of educational equipment

In Qinghai Province, the monetary value of educational equipment per student increased drastically. The Undergraduate University Establishment Standards of China of the Ministry of Education of the People's Republic of China has the following requirements: that the monetary value of educational equipment per student for science faculties is not less than RMB 5,000; for literature and social faculties, not less than RMB 3,000; for gymnastic and art faculties, not less than RMB 4,000. None of the target universities met this requirement before Project implementation. After Project completion, however, all the target universities met this requirement (Table 4).

Table 4: Monetary value of educational equipment

Unit: RMB

	Baseline (2002)	Actual (2007)	Actual (2012)
Qinghai University	3,067	4,493	9,123
Qinghai Normal University	1,162	10,993	9,488
Qinghai University for Nationalities	762	6,457	7,687

Source: Responses to the questionnaire
Note: The baseline number of students at Qinghai University includes the Medical College of Qinghai University.

The total amount of educational equipment at each target university increased more than ten times (Table 5). In particular, the amount increased from twofold (at Qinghai Normal University) to twelvefold (at Qinghai University for Nationalities) solely through equipment procured under the Project such as computers and spectrometers. The total amount of the educational equipment procured by the project was JPY 1,358 million and the total number of students at the target universities in 2012 was 37,538. The benefit as of 2012 for the equipment

procured by the project per student was about JPY 36,187 (RMB 2,784, if RMB 1 = JPY 13[6]) as shown by a simple calculation[7] and this accounts for approximately 30% of the monetary value of educational equipment per student. In light of the above, this project can be said to have made a considerable contribution to increases in the monetary value of educational equipment at the target universities.

Table 5: Total amount of educational equipment

Unit: RMB thousand

	Baseline (2002)	Actual (2012)	Growth rate (%) (2002－2012)	Project equipment	Project share (%)
Qinghai University	19,950	149,090	647	52,580	35.3
Qinghai Normal University	10,330	120,700	1,069	23,230	19.2
Qinghai University for Nationalities	2,310	88,890	3,756	28,680	32.3

Source: Responses to the questionnaire
Note: The baseline number of students at Qinghai University includes the Medical College of Qinghai University.

Table 6: Higher Education Budget in Qinghai Province

Unit: RMB thousand

FY 2001	FY 2008	FY 2012
163,980	270,540	948,060

Source: Responses to the questionnaire

Moreover, the Project played a role in the designation of Qinghai University as one of the Project 211 [8] universities, in the accreditation of Qinghai University and Qinghai Normal University for awarding doctorate degrees , in the granting of the honorable title “Excellent University” or “Good University” in the “Undergraduate University Teaching Level Evaluation” conducted by the Ministry of Education of China[9], and in the upgrading from Qinghai “College” for Nationalities to Qinghai “University” for Nationalities in 2009. School facilities were drastically improved by the Project although these had been very limited before project implementation. As a result, the target universities received good ratings, as mentioned above. This led to increases in the budget granted from the government to the target universities (Table 6). Thus, the education and research environments were improved in a virtuous cycle created by the Project.

[6] Annual average exchange rate in 2012: http://www.murc-kawasesouba.jp/fx/yearend/index.php?id=2012

[7] As it was difficult to collect detailed data, the evaluator simply divided the total amount of educational equipment procured under the project by the number of students as of 2012. However, if the amount at the time of procurement completion at each university is divided by the number of students at that time, the benefit per student would be more than the evaluator’s calculation.

[8] Project 211 is a national project, named from an abbreviation of “the 21st century and approximately 100 universities respectively”. A designation as a Project 211 university by the Ministry of Education of the People’s Republic of China means that the university is top level in education, research and management. (Source: Japan Science and Technology Agency China Research Center, 2011, “2010 Current Situation and Trend of Higher Education in China”)

[9] The evaluation system for higher education introduced by the Ministry of Education of China. Once every five years, school operations and the quality of education are evaluated. The first phase of evaluation was conducted from 2003 to 2008. The results are evaluated on a four-point scale.

(4) Utilization rate of school buildings and educational equipment

As mentioned above, the school building areas and the monetary value of educational equipment increased as each target school quantitatively responded to the increase in students. However, effectiveness cannot be discussed if buildings and equipment are not actually utilized.

Table 7 shows the utilization rate of major school buildings. In each university, the utilization rate is more than 90% and thus it can be said that the buildings are sufficiently utilized.

Table 8 shows the utilization rate of major equipment at the target universities. This is also a very high ratio, at more than 90% at all the universities. Since Qinghai University is a research oriented university, the utilization rate of large and sophisticated research apparatus is high. An analysis and testing center was established using equipment procured under the Project. Research results were produced that received the First Prize of Technological Advancement at Qinghai Provincial Level[10] by use of the equipment. At Qinghai Normal University and Qinghai University for Nationalities, multimedia facilities are highly utilized as one of the means of sophisticated education (these include language laboratories, lecture rooms with projectors, computer rooms etc.).

Table 7: Utilization rate of major school buildings

Unit:%

	2007	2012
Qinghai University	100	100
Qinghai Normal University	100	100
Qinghai University for Nationalities	92	95

Source: Responses to the questionnaire

Table 8: Utilization rate of major equipment

Unit:%

	2012 (a)	2012 (b)
Qinghai University	100	100
Qinghai Normal University	100	100
Qinghai University for Nationalities	90	95

Source: Responses to the questionnaire
Note: Equipment in use (a) at price base , and (b) at operation rate

As far as quantitative improvement is concerned, as seen above, the number of students increased more than the provincial average. Nevertheless, the monetary value of educational equipment per student at all the target universities improved. School building areas largely increased, except at Qinghai University. The utilization rates of major school buildings and major equipment were also very high. In light of the above, it can be said that the construction of buildings and the procurement of equipment under the Project contributed largely to quantitative improvement.

[10] A prize at provincial level based on the "Qinghai Province regulations for the encouragement of science and technology" (Qinghai Province People's Government ordinance No. 74) and the "administrative instructions for Qinghai Province regulations for the encouragement of science and technology". The first prize is the highest level prize for the encouragement of science and technology in Qinghai Province.

3.2.1.2 Improvements in Quality

(1) Floorage and monetary value of educational equipment per student

The Undergraduate University Establishment Standards of China required that the 2006 national standard of floorage per student was more than 30 m^2 [11]. Although Qinghai University already had a large floorage, Qinghai Normal University and Qinghai University for Nationalities had floorages which were below the national requirements. However, they had exceeded the national requirements for teaching and administrative buildings by 2012 and the educational environment was widely improved. Having said this, the increase of floorage per student through the Project was limited (Table 9).

Table 9: Floorage per student

Unit: m^2

	Baseline (2002)	Actual (2012)	
		Floorage per student	Increase of the floorage per student through the Project
Qinghai University (Medical College of Qinghai University)	33.3 (13.3)	29.9	2.7
Qinghai Normal University	9.2	19.4	1.4
Qinghai University for Nationalities	8.2	38.9	0.9

Source: Responses to the questionnaire

On the other hand, the Project had a positive effect in increasing in the monetary value of equipment per student as seen, in Table 4. In light of the above, the educational environment is can be said to be moving toward improvement.

(2) Changes in the number of key faculties and key laboratories

In China, since "Some opinion concerning the development of higher education institutions and key faculties" was proclaimed by the State Education Commission in 1993, the state or provincial governments have designated faculties and laboratories which closely relate to national development strategies and public welfare. These are labeled key faculties and key laboratories and supporting funds are intensively provided by the government in order to raise education and research to an international level (Table 10, Table 11)[12].

[11] For education and administration buildings at ordinary universities, the floorage per student for departments of science, engineering, agriculture and medicine is more than 20m^2, the floorage per student for departments of humanities, social sciences, and management is more than 15m^2, and the floorage per student for departments of physical education and arts is more than 30m^2.

[12] National key faculties are designated by the State government. Provincial or ministerial key faculties are designated by provincial governments, while ministerial key faculties are designated by provincial governments or ministries such as the Ministry of Education.

Table 10: Number of key faculties

	Baseline	Target	Actual	
	2002	2007	2007	2012
Qinghai University (Medical College of Qinghai University)	NL: 0 PML: 8 (NL: 0 PML: 2)	NL: 2 PML: 15 (NL: 2 PML: 6)	NL: 0 PML: 17	NL: 2 PML: 19
Qinghai Normal University	NL: 0 PML: 4	NL: 0 PML: 11	NL: 0 PML: 7	NL: 0 PML: 12
Qinghai University for Nationalities	NL: 0 PML: 3	NL: 1 PML: 7	NL: 1 PML: 7	NL: 1 PML: 8

Source: Responses to the questionnaire
Note: NL (National Level): National key faculty, PML (Provincial or Ministerial Level): Provincial or ministerial key faculty

The target universities had not achieved the target as of 2007 but all had achieved it as of 2012. In particular, a teacher who had participated in training played a leading role in the accreditation of the key faculty of internal medicine (high altitude medicine) at Qinghai University.

Table 11: Number of key laboratories

	Baseline	Target	Actual	
	2002	2007	2007	2012
Qinghai University (Medical College of Qinghai University)	NL: 0 PML: 2 (NL: 0 PML: 2)	NL: 7 PML: 8 (NL: 0 PML: 2)	NL: 0 PML: 12	NL: 2 PML: 44
Qinghai Normal University	NL: 0 PML: 3	NL: 1 PML: 7	NL: 0 PML: 6	NL: 2 PML: 14
Qinghai University for Nationalities	NL: 0 PML: 0	NL: 0 PML: 0	NL: 0 PML: 1	NL: 0 PML: 8

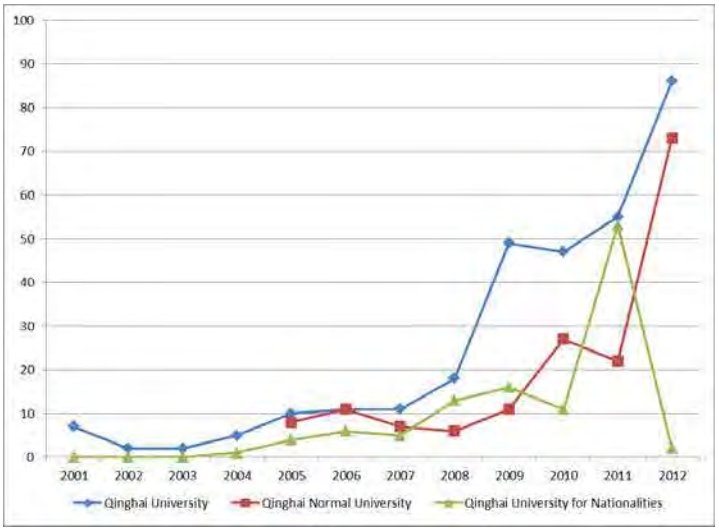
Source: Responses to the questionnaire
Note: NL (National Level): National key laboratories, PML (Provincial or Ministerial Level): Provincial or ministerial key laboratories

The number of provincial or ministerial key laboratories largely increased in each target university although these universities were not able to achieve their targets in terms of the number of national key laboratories. The recent drastic increase in number can be attributed to the government's support for the establishment of key laboratories and research funding in the Midwestern China, based on government policy. In the accreditation of key faculties and key laboratories, the development of facilities including libraries etc. is one of the qualification criteria. Therefore, the development of school buildings and facilities under the Project has contributed to these accreditations to some extent.

At Qinghai University, a teacher who participated in training in Japan played a leading role in establishing the "National Level Experiment and Education Pilot Center: Experiment and Education Pilot Center for Tibetan Medicine". Apparatus procured under the Project has played an important role in establishing the "Ministry of Education Key Laboratory for Environment and Resources in the Tibetan Plateau" at Qinghai Normal University and the "Qinghai Province Key Laboratory for Applied Physics", the "Key Laboratory on the Tibetan Plateau for Botanical Resources Research" and the "Key Laboratory for Drug Analysis" at Qinghai University for Nationalities.

(3) Number of research papers, research projects, prizes awarded etc.

The number of research papers published in international scholarly journals such as Science Citation Indicators (SCI) has been increasing at all the target universities (Figure 1). Although the number was less than ten at the target universities before the project implementation, a drastic increase in articles since 2009 has been an outstanding feature. More high-quality research papers have been written thanks to facilities being expanded by the Project and larger research budgets being allocated than before Project implementation. As mentioned before, the Project has had a relatively large effect on the expansion of facilities and it is clear therefore that the Project has contributed to the increase in research papers to some extent.



Source: Responses to the questionnaire
Note: SCI (Science Citation Indicators), EI (Engineering Index), ISTP (Index to Scientific & Technical Proceedings)

Figure 1: Number of articles in SCI, EI, and ISTP

Examples of notable research papers using equipment procured under the Project are as follows: “Cluster Location Control and Adaptive Routing” (Computer engineering) and “Physiographic Condition and Impact on the Environment of Primitive Ecological System Tourism Resources in Qinghai Lakeside” at Qinghai Normal University.

The number of research projects has drastically increased in the last decade at all the target universities (Table 12). The Ministry of Science and Technology of China, International Science Technological Cooperation Project “Research on the creation technology of fertilized eggs from excellent cattle by in vitro fertilization” (Qinghai University: from 2008 to 2010) was one of these research projects and equipment procured by the Project was utilized.

Table 12: Number of research projects

	Baseline (2002)	**Actual (2007)**	**Actual (2012)**
Qinghai University	NL: 4 PML: 27	NL: 20 PML: 53	NL: 37 PML: 124
Qinghai Normal University	NL: 2 PML: 5	NL: 9 PML: 18	NL: 31 PML: 43
Qinghai University for Nationalities	NL: 0 PML: 4	NL: 13 PML: 21	NL: 14 PML: 35

Source: Responses to the questionnaire
Note 1: The baseline number of students at Qinghai University includes the Medical College of Qinghai University.
Note 2: NL (National Level): National research project, PML (Provincial or Ministerial Level): Provincial or ministerial research project

The number of social services, one of the so-called "university's three missions" (education, research and social service), has also been on the increase (Table 13). For example, "Research on the desertification process of land around the lake" has played a role in anti-desertification measures around Qinghai Lake utilizing equipment procured under the Project at Qinghai Normal University.

Table 13: Number of social services

	Baseline (2002)	Actual (2007)	Actual (2012)
Qinghai University	19	48	70
Qinghai Normal University	0	3	9
Qinghai University for Nationalities	2	7	11

Source: Responses to the questionnaire
Note 1: The definition of social services is in accordance with the Higher Education Law in China (passed by the 4th meeting of the 9th Standing Committee of the National People's Congress, on August 29, 1998).
Note 2: The baseline number of students at Qinghai University includes the Medical College of Qinghai University.

As for the number of prizes awarded, each target university has received awards for Technological Advancement at Qinghai Provincial Level and other awards. In each case, research utilized equipment procured under the Project (Table 14). Examples include "Research on Tibetan Genetics Mechanisms Adapted to High Altitude" (the first prize in 2011) at Qinghai University, "Research on segmentation labeling rule for Tibetan corpus and its supplemental tool" at Qinghai Normal University (the third prize in 2009) and "New Chemical Compounds from Caragana Jubata (pall) Poir" at Qinghai University for Nationalities (Qinghai Province Natural Science Excellent Research Paper in 2011).

Table 14: Number of prizes awarded

	Actual (2007)	Actual (2012)
Qinghai University	NL: 0 PML: 10	NL: 3 PML: 19
Qinghai Normal University	NL: 0 PML: 5	NL: 0 PML: 13
Qinghai University for Nationalities	NL: 5 PML: 15	NL: 0 PML: 20

Source: Responses to the questionnaire
Note 2: NL: National Level, PML: Provincial or Ministerial Level

Table 15: Number of undergraduate faculties and graduate courses

	Undergraduate			Master's course			Doctoral course		
	Baseline	Actual		Baseline	Actual		Baseline	Actual	
	2002	2007	2012	2002	2007	2012	2002	2007	2012
Qinghai University	46	55	67	6	27	56	0	2	5
Qinghai Normal University	35	43	58	7	23	65	0	0	0
Qinghai University for Nationalities	18	24	54	5	8	78	0	0	0

Source: Responses to the questionnaire
Note: The baseline number of students at Qinghai University includes the Medical College of Qinghai University.

Faculties at undergraduate schools and courses at graduate schools have also shown an upward trend (Table 15). At undergraduate level, numbers have moderately increased due to

limited recruitment in order to maintain or improve the quality of education. However, courses at graduate schools drastically increased at all the target universities as they have been aiming for higher education which is research-oriented. As of 2012, only Qinghai University had doctoral courses but in 2013 Qinghai Normal University was also accredited as an institute able to award doctorate degrees in Tibetan, history, geography and biology. Qinghai Normal University is starting to recruit ten students from 2014.

In light of the above, as far as qualitative improvement is concerned, the educational environment is gradually improving and floorage and the monetary value of equipment per student show an upward trend. As for the development of school buildings and equipment such as electron scanning microscopes, there has been a substantial improvement, especially in educational equipment. Meanwhile, the project has contributed to the improvement of floorage to some extent. The project has had a profound effect on the increase in the designation of key faculties and laboratories. The project also contributed to the increase in the number of research papers, prizes awarded etc. as many of these used equipment procured under the Project. Therefore, the Project has played a significant role in improving the quality of education and research.

3.2.2 Quantitative Effect

Qualitative effects of the project are (1) the enhancement of the reputations of schools through an upgrade in the educational environment (effects of building construction and equipment procurement) and (2) improvements in the education system with institutional change (the effects of training).

(1) Effects of building construction and equipment procurement

Effects of building construction and equipment procurement include 1) good results on the “Undergraduate University Teaching Level Evaluation”, 2) upgrades from college to university, 3) accreditation for institutes awarding doctorate degrees, and 4) designations as universities of “Project 211” through upgrading of the educational environment. In the “Undergraduate University Teaching Level Evaluation” conducted by the Ministry of Education of the People's Republic of China, each target university received good results due to improvements in floorage per student and in the rate that experiments are conducted through enhancements of equipment. Qinghai “College” for Nationalities was upgraded to Qinghai “University” for Nationalities as through the implementation of the Project the institute was able to meet the requirements for the quantity of experimental apparatus established by the Ministry of Education of China. Furthermore, new faculties at Qinghai University for Nationalities were accredited and the institute was accredited for the awarding of master degrees. Qinghai University and Qinghai Normal University were accredited as institutes awarding doctorate degrees. The Project indirectly contributed to the designation of Qinghai University as one of the universities of

"Project 211" by the development of facilities under the Project.

(2) Effects of training

Many teachers who participated in mid- and long-term training have been using Japanese methods of research and education since returning to their universities. For instance, when he was studying in Japan, a teacher of human anatomy at Qinghai University was very impressed with the courteous treatment of donors' bodies at Japan's College of Medicine (donors' bodies are buried one by one in Japan, while this is generally not the case in China). Having returned to his university, the teacher submitted a proposal for the treatment of donors' bodies, preparing rules and adopting the Japanese way of treating donors' bodies.

3.3 Impact

3.3.1 Intended Impacts

(1) Impact on higher education at provincial level

Quantitative indicators, such as the number of higher education institutions and the number of students at higher education institutions as a whole in Qinghai Province, decreased in 2007, returning almost to the same level as the baseline in 2012 (Table 16). The number of higher education institutions temporarily decreased because of mergers. As for the number of students, according to the Education Department of Qinghai Province, recruitment is controlled to prevent deterioration in the quality of higher education. Although floorage per student and the monetary value of educational equipment per student in 2012 largely increased from the baseline, it decreased compared with the actual data in 2007. While new school buildings were constructed, old ones were demolished. Therefore, according to the Education Department, data fluctuated widely depending on when it was gathered.

In light of the above, the effects of the Project might not have had a great impact on the whole province.

Table 16: Impact on higher education at provincial level

Purpose	Indicators	Baseline (2002)	Target (2007)	Actual (2007)	Actual (2012)
Quantitative improvement	Number of higher education institutions	10	11	8	11
	Number of students at higher education institutions (thousands)	62	140	51	64
	Higher education enrollment ratio (%) (=Appropriate age enrollment/ Appropriate age population)	13.0	18.0	22.4	31.6
Qualitative improvement	Floorage per student (m^2/student) (=floorage/number of students)	17.6	30.0	34.3	25.1
	Monetary value of educational equipment per student (RMB)	1,663.5	—	7,314.2	7,104.2

Source: Responses to the questionnaire

(2) Impact on regional vitalization

At the time of appraisal, an impact on regional vitalization was expected through the dispatch of school teachers and doctors to rural areas, the provision of human resources to key industries, and the development of human resources through vocational training and adult education. As far as the dispatch of human resources is concerned, a system for dispatch to rural areas already existed so there had been some examples of the dispatch of teachers and doctors to rural areas. In the case of Qinghai Province, following an earthquake in Yushu[13] the target universities supported reconstruction, and conducted vocational training in areas of poverty, including Yushu, through which medical human resources were developed at the target universities. School buildings and equipment supported by the Project were utilized for these human resource development activities.

As for providing human resources to key industries, statistical data only exists at a few institutes. However, in response to questionnaires from the target universities, many universities said that the employment rate in key industries had been raised, by enhancing students' practical abilities through the use of the equipment procured under the Project. For example, much of the apparatus at the College of Science and Engineering, Qinghai University was procured under the Project and graduates from the college account for approximately 60% of the engineers in science and engineering research institutes and the enterprises of key industries throughout the whole province. The major facilities in the College of Chemistry and Biology, Qinghai University for Nationalities, also were procured under the Project and many graduates now work for potassium fertilizer plants and pharmaceutical companies.

As for vocational training and adult education, there are some connections to the Project. For example, teachers who participated in training in Japan are now in charge of courses and the equipment procured or school buildings and libraries constructed under the Project are being utilized. However, the evaluator could not confirm whether human resources fostered through the Project had had an impact on regional vitalization.

(3) Impact on the strengthening of market rule

The number of graduates from faculties of accounting, law and financial management increased (Table 17). At Qinghai University, the Project directly contributed to the development of human resources in this field as the school building for the College of Economic Management was constructed under the Project. Furthermore, the College

Table 17: Number of graduates from faculties of accounting, law and finance

	Baseline	Actual	
	2002	2007	2012
Qinghai University	39	779	603
Qinghai Normal University	n.a.	90	121
Qinghai University for Nationalities	127	160	193

Source: Responses to the questionnaire

[13] Tibetan Autonomous area in southern part of Qinghai Province. It is one of the poverty areas in the province.

of Finance and Economics has conducted thirteen projects in the Western area of the National Social Science Foundation[14] since 2010. At Qinghai Normal University, the Secretariat Division of the Qinghai Province Legal Advertisement Education Leading Group held the course on the "Improvement of leaders' problem-solving abilities by the rule of law" in October 2013. A professor from the College of Politics and Law, Qinghai Normal University took this course and gave lectures to more than 200 officials and leaders of each department of provincial commissions, provincial institutions, people's groups, the Qinghai Province State-owned Assets Supervision and Administration Commission, provincial offices of central government[15] as well as to department leaders of Xining. The trainees play an important role in the economy and society of Qinghai Province.

(4) Impact on environmental conservation

There is no obvious evidence of a direct contribution by graduates on environmental conservation and public health. However, each target university has conducted some activities, as shown in Table 18. The connection with the Project is the utilization of equipment procured under the Project in all cases.

Table 18: The contributions of the target universities to environmental conservation and public health

University	Good practices
Qinghai University	Qinghai University provides expertise to enterprises and projects conducted by the Xining Department of Environmental Protection, the Penyao sewage plant and the Jieshen group. Some equipment procured under the Project such as microcomputers metal phase diagram measurement systems are utilized for technical assistances.
Qinghai Normal University	In the "Pilot project on remotely-real-time monitors and intelligent skills in decision-making through internet for ecosystem protection in Samjiangyuan" by the Department of Science and Technology of Qinghai Province (2012), equipment procured by the Project was utilized for ecosystem protection in Samjiangyuan, which is in the middle of the Qinghai-Tibet Plateau (a site where the headstreams of three big rivers, the Yangtze River, the Yellow River and River Mekong converge in the southern area of Qinghai Province).
Qinghai University for Nationalities	Qinghai University for Nationalities focused on the promotion of energy saving and carbon dioxide emission reduction activities in several manufacturing industries, and provided advice on effluent, solid waste and effluent gas from manufacturers. In particular, apparatus procured under the Project such as preparative liquid chromatography and ultra-violet and visible spectrophotometric were utilized. Furthermore, the university, together with a company, developed recycling technology to extract pigment from the peel of hippophae rhamnoides which are dumped after the production of fruit juice thus contributing to waste reduction.

Source: Responses to the questionnaire

[14] The National Social Science Foundation was established in 1991 to provide subsidies for social science research projects. It has an open application system and tends to concentrate on the adoption of proposals from universities in Beijing and coastal areas. Therefore, "Western project" targets universities in the Western area of China in order to create a balance between coastal areas and inland areas.

[15] Branch office or liaison office in Qinghai Province of central government agencies and foundation etc..

3.3.2 Other Impacts

(1) Impacts on the natural environment

The Environmental Impact Assessment (hereinafter referred to as “EIA”) was conducted prior to project implementation in accordance with Chinese regulations. “Three-Stage Simultaneous” implementation was envisioned (i.e. the regulation that environmental protection facilities should be designed, constructed and put into production simultaneously with the main construction structures). Based on this regulation, noise-abatement measures, and measures for appropriate sewage treatment and waste disposal were conducted by each university during the implementation period. Environmental facilities such as a waste water treatment plant were constructed before project completion, as necessary, and these environmental facilities were operated at the same time as the buildings and equipment were put into use. All the target universities took the necessary environmental protection measures, including environmental monitoring, at each stage, namely the design, construction and operation stages. In this way, “Three-Stage Simultaneous” was smoothly implemented.

At the time of the ex-post evaluation, no negative impact on the environment was observed, according to responses by the universities to the questionnaire, to interviews with the those in charge, and by visual confirmation at the sites by the evaluator.

(2) Land Acquisition and Resettlement

The project was carried out on existing university properties, and thus there was no land acquisition or relocation of residents.

(3) Mutual understanding between Japan and China

It can be said that participants in the training in Japan were able to gain a deep understanding of Japan. They renewed their perception of Japan through not only research and education but also through small events in daily life. As for research and education, many lecturers were impressed with Japanese educational methods, philosophy, and attitudes toward research and put them into practice. At the level of daily-life, many trainees renewed their perception of the Japanese as they were really touched by Japanese kind-heartedness as they communicated through participation in Japanese language classes operated by community volunteers. They were also touched when they were supported by their academic supervisors in their acquisition of status of residence and by the daily care that their supervisors provided.

Exchange between each target university and Japanese universities is shown in Table 19.

Table 19: Exchange between each target university and Japanese universities

University	Good practices
Qinghai University	Qinghai University and the University of Miyazaki concluded an agreement for cooperation agreement in 2009 and accomplished results in human resource development, the mutual visiting of staff and collaborative research. Two students from Qinghai University have been enrolled at doctoral courses at the University of Miyazaki. One student graduated from the master course at the University of Miyazaki. In total, five researchers have studied at the University of Miyazaki. Four researchers from Qinghai University Hospital were trained at the University of Miyazaki Hospital. Some professors and researchers from the University of Miyazaki conducted collaborative research at Qinghai University. A researcher from Qinghai University and a professor from the University of Miyazaki conducted a collaborative project of the Ministry of Science and Technology of China and the Ministry of Science and Technology of Japan on "Epidemiological research and the establishment of preventive measures against amphixenosis, dermatobiasis, in Qinghai Province". This was a chance to enhance cooperation with other universities in Japan. These activities strengthen further friendship between Qinghai University and the University of Miyazaki as well as between Qinghai University and other universities in Japan. The base for further cooperation of research activities has thus been established.
Qinghai Normal University	Qinghai Normal University established a relationship with Ritsumeikan University, Suzuka Junior College and Musashi-Urawa Japanese Language Institute through the Project. The teachers who participated in training in Japan were able to get an opportunity to broaden their views by learning about Japanese society and the situation of higher education. After they returned, three teachers out of seven participants went on to doctoral courses and one works as a graduate educator. They published papers more than once annually and frequently participate in academic conferences. Generally, each participant has accomplished good results in each respective research area.
Qinghai University for Nationalities	Through visiting or academic exchanges with Ritsumeikan University, Tokyo University of Foreign Studies, Kobe University and Chukyo University, Qinghai University for Nationalities has gained mutual understanding with these institutions as well as establishing collaborative relationships. It has played a positive role in promoting exchange with universities in Japan. The Qinghai University for Nationalities International Exchange Center sends exchange students and there are mutual visits with universities in Japan on an irregular basis.

Source: Responses to the questionnaire

This project has largely achieved its objectives. Therefore its effectiveness and impact is high.

3.4 Efficiency (Rating:②)

3.4.1 Project Outputs

The Project included the construction of school buildings, the enhancement of educational and research equipment, and the training of higher education personnel. The outputs of each component are as follows:

Table 20: Comparison of Outputs (planned and actual)

Items	Planned	Actual (achievement rate)
Buildings	4 universities total: 55,748 m^2	3 universities total: 66,904 m^2 (120.0%)
Equipment	4 universities	3 universities: mostly as planned
Training	4 universities total: 58 staff	3 universities total: 82 staff (141.4%)

Source: JICA appraisal documents for the planned, Responses to the questionnaire for the actual data

There was no drastic re-examination of the plan for building construction although floorage was expanded according to the needs of each university. An exception was that the plan for the Comprehensive Building of the Library of the Medical College of Qinghai University was changed into the Teaching Building of Preclinical Medicine of the Medical College at Qinghai University (see photo on the first page) due to a merger of Qinghai University with the Medical College of Qinghai University in 2004. Qinghai University already had libraries so there was no problem with the change of plan. On the other hand, Qinghai University did not have school buildings for a medical college and needed to construct them. Therefore, this change of plan was reasonable.

As for educational equipment, there is no big difference between the plan and the actual, although the model was changed for some of the digital equipment due to production ending during the process of procurement.

As regards the training component, staff had some problems with displacement such as the language barrier and in personnel transfer. The number of participants in mid- and long-term training (three to twelve months) decreased in comparison with the plan. On the other hand, two groups of administrative staff were dispatched to Ritsumeikan University and Kobe University, respectively, with the concurrence of JICA, in order to enhance the exchange between universities in Japan universities and the target universities in China. The training period was two to three weeks and the main content was Japan's higher education policy, the reform of university education, university operation, fund management, asset management, student management and so on. The participants had a good opportunity for interdisciplinary exchange through participating in training in these areas.

3.4.2 Project Inputs

3.4.2.1 Project Cost

Actual project costs amounted to 3,457 million yen (of this, the actual loan disbursement amounted to 2,669 million yen[16]) against the estimated costs of 3,573 million yen (of this, the planned loan amounted to 2,812 million yen). The actual costs were lower than planned (97%). While the appreciation of the yen against Chinese yuan was about two yen during project implementation, there was an average inflation rate of 3 % in China. Therefore, the Project was conducted mostly as planned in an efficient way.

3.4.2.2 Project Period

The project period planned at the time of appraisal was 61 months, or from March 2004 to March 2009. The actual project period was 90 months, or from March 2004 to August 2011,

[16] According to data provided from the executing agency, this was JPY 2,669 million. As the executing agency received the fund in Chinese yuan through the Central government, the difference between this and the data provided by JICA depends on what the exchange rate was when the executing agency closes an account.

which was longer than planned : equivalent to 148 % of the original plan. The reasons for the delays are as follows: 1) it took time to get domestic approvals from the National Development and Reform Commission etc. with regards to changes in planning from the Comprehensive Building of the Library of the Medical College of Qinghai University to the Teaching Building of Preclinical Medicine of the Medical College at Qinghai University due to the merger, 2) bidding was delayed as the procurement of various types of equipment started at the same time causing shortages of working capital on the part of suppliers and leading to delays in the arrival of shipments, and 3) regarding the training component, candidate trainees had to find and make contact with academic supervisors in Japan directly by themselves and sometimes had a trouble with language making it difficult to make smooth contact with universities in Japan. Although the Project was not completed within the defined project period[17], it is particularly worth noting that Qinghai Province completed the project by the planned final disbursement date without an extension of disbursement expiry date. Since Qinghai Province had not had any experience of loan projects with external institutions such as JICA, the executing agency used their own funds to visit other provinces whose governments had already conducted JICA projects where they made inspections of implementation methods including the necessary regulations and the composition of a project implementation team. They also conducted study meetings on procedures for Japanese ODA Loan projects. They contrived ways, though with some difficulties, to implement the Project smoothly and effectively (Box). As a result, although the Project was not completed as scheduled, their efforts were highly appreciated.

Box: For smooth and effective implementation of the Project

The Project Management Office of the Education Department of Qinghai Province organized a project implementation team composed of selected human resources from the Education Department and the target universities at the time of project planning. As far as the Education Department of Qinghai Province was concerned, the Project was its first foreign and official loan. Therefore, the project management was conducted with some difficulties. It was fortunate that the Project belonged to the third batch among Higher Education Projects being implemented in China and that similar projects were being implemented in other provinces. In order to draw on the experience of other provinces such as in the methods of making regulations for the implementation of the Project, making documents for JICA, selecting and packaging equipment, visits were made to Gansu Province and Jilin Province where projects had already been implemented. Also, there was participation in seminars and workshops held by JICA and in study meetings within the project implementation team. In Gansu Province, two people in charge of the Project in the Education Department dealt with the Project from the beginning to the end which eliminated project delay caused by personnel transfers. So, in Qinghai Province, the core members selected from the target universities stayed active on a consistent basis aiming at smooth implementation. They established rules for the Project in Qinghai Province using examples from Jilin Province. Moreover, they provided pre-departure training in Japanese to trainees in order that the teachers and administrative staff from the target universities could undergo training effectively in Japan.

[17] The completion of the project was defined as completion of three components at the time of appraisal: teaching and /or research buildings, educational and/ or research equipment, and personnel training. The definitions of each component as follows: 1) completion of building construction, 2) completion of equipment installation and 3) return of Chinese trainees or Japanese experts.

3.4.3 Results of Calculations of Internal Rates of Return

Due to the nature of the Project, a quantitative analysis of the internal rate of return was not possible.

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

3.5 Sustainability (Rating: ③)

3.5.1 Institutional Aspects of Operation and Maintenance

Each target university has a department of building management and a department of facility management. The former department conducts the management of construction and various inspections of the construction. The latter department prepares and implements related rules and systems for the management of equipment and facilities and the establishment of laboratories. In addition, they consider the allocation of equipment and evaluate the effect of utilizing equipment. They are in charge of allocation, breakages, review of the repair and abolishment of facilities and applications for permits from laboratories. These asset managements are supervised periodically by the provincial government (the education department). The department of education conducts annual inspections of the management of each university and the supervision of the audit office.

Basically, the hard assets, such as buildings constructed and equipment procured under the project, are managed as planned. Daily operation and maintenance systems have been well established at each target university and there are no problems.

3.5.2 Technical Aspects of Operation and Maintenance

All the target universities have set up regulations and conduct maintenance and inspection periodically at each laboratory or maintenance center. If necessary, they ask suppliers or manufacturers to perform maintenance for them. There is no particular problem with the technical aspects.

3.5.3 Financial Aspects of Operation and Maintenance

The budget for operation and maintenance at each university is allocated annually from the provincial financial budget. If there is a shortage in the budget for operation and maintenance, the shortage is made up using the revenue of the universities.

There is no evidence that the equipment lies neglected without maintenance and therefore, it is thought that the necessary resources for operation and maintenance are being provided.

Table 21: Operation and maintenance costs at each target university (annual)

Unit: RMB ten thousand

	2010	2011	2012
Qinghai University	IC : 30,612 EX : 27,932 (O/M: 1,020)	IC : 34,763 EX : 39,104 (O/M: 1,060)	IC : 40,863 EX : 39,460 (O/M: 1,210)
Qinghai Normal University	IC : 18,345 EX : 17,504 (O/M: 54)	IC : 23,562 EX : 24,180 (O/M: 124)	IC : 42,134 EX : 41,427 (O/M: 602)
Qinghai University for Nationalities	IC : 22,526 EX : 24,282 (O/M: 367)	IC : 39,007 EX : 37,468 (O/M: 224)	IC : 25,417 EX : 21,7958 (O/M: 354)

Source: Responses to the questionnaire
Note1: IC= income
Note2: EX= expenditure
Note3: O/M＝Operation and Maintenance cost

3.5.4 Current Status of Operation and Maintenance

At all the target universities, the buildings and equipment are well maintained. All the universities have inventory books and maintenance logs for the major equipment.

End-of-life equipment, such as PCs, has already been replaced by their own fund. However, valuable equipment is well maintained and the utilization ratio (100% in all the target universities) is high (actual (a) in Table 8). In order to raise the utilization ratio, the education department has established a platform for sharing equipment and this is open to other universities.

No major problems have been observed in the institutional, technical and financial aspects of the operation and maintenance system. Therefore sustainability of the project effect is high.

4. Conclusion, Lessons Learned and Recommendations

4.1 Conclusion

The Project objective was to improve higher education in Qinghai Province quantitatively and qualitatively by supporting the construction of buildings, the procurement of equipment and the training of teaches in the target universities. This objective was consistent with China's development plan and development needs as well as with Japan's ODA policy at the time of both appraisal in 2004 and ex-post evaluation; therefore the relevance of the Project is high. The effectiveness and impact of the Project was high because both the quantitative indicators (building areas, amount of educational equipment) and qualitative indicators (number of key faculties and laboratories, number of research papers, etc.) have improved. Moreover, there are many examples of good practice in the utilization of the buildings, equipment and training provided under the Project. The outputs were essentially completed in line with the initial plans, and the project cost was within the plan. The project period, however, exceeded the plan;

therefore the efficiency of the project is fair. No major problems have been observed in all institutional , technical and financial aspects of the operation and maintenance system and its current status is very good; therefore the sustainability of the project effects is high.

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

4.2 Recommendations

None.

4.3 Lessons Learned

[Capacity building of the executing agency]

In the case where it is the first experience of a Japanese ODA Loan project for an executing agency without project management consultants, it is desirable that a support system, such as On-the-Job training, is designed at the planning stage of the Project. In case of the Project, the executing agency made efforts to implement the Project smoothly and effectively by themselves. However, as they did not have sufficient experience or knowledge of a Japanese ODA Loan, in the end, they were unable to conduct things as scheduled. If some kind of support at the commencement stage of the Project had been built into the project component, it would have been possible to implement the Project more smoothly and effectively.

[Consideration at the time of bidding]

At the procurement stage of the Project, the shortage of working capital on the part of suppliers led to delays in the arrival of shipments. In order not to affect implementation of the Project, it is necessary to take measures such as confirming the financial ability of bidders during the tender process.

End

Comparison of the Original and Actual Scope of the Project

Item	Original	Actual
1.Project Outputs	4 target universities	3 target universities (due to merger)
1) school buildings	5 buildings such as libraries 55,748 m^2	5 buildings such as libraries 66,904 m^2
2) equipment	function generator, solubility measuring equipment, computer basic experimental facility, multimedia class equipment etc.	Mostly as planned
3) training	58 staff from 4 target universities	82 staff from 3 target universities
2.Project Period	March 2004 – March 2009 (61 months)	March 2004 – August 2011 (90 months)
3.Project Cost		
Amount paid in foreign currency	2,812 million yen	2,669 million yen
Amount paid in local currency	761 million yen (53.2 million RMB)	788 million yen (65.4 million RMB)
Total	3,573 million yen	3,457 million yen
Japanese ODA loan portion	2,812 million yen	2,669 million yen
Exchange rate	1 RMB= 14.3 yen (As of July 2003)	1 RMB = 12.0 yen (As of August 2011)

People's Republic of China

Ex-Post Evaluation of Japanese ODA Loan

"Inland Higher Education Project (Regional Vitalization, Market Economy Reform Support, and Environmental Conservation)" (Ningxia Hui Autonomous Region)

External Evaluator: Naomi Murayama, OPMAC Corporation

0. Summary

The objective of this project (hereinafter referred to as "the Project") was to improve higher education in the Ningxia Hui Autonomous Region (hereinafter referred to as "NHAR") quantitatively and qualitatively by supporting the construction of buildings, the procurement of equipment and the training of teachers in the target universities. This objective was consistent with China's development plan and development needs as well as with Japan's ODA policy at the time of both the appraisal in 2004 and the ex-post evaluation; therefore its relevance is high. The effectiveness and impact of the Project was high because quantitative indicators (building areas, amount of educational equipment) and qualitative indicators (number of key faculties and laboratories, number of research papers, etc.) have improved. Moreover, there are many cases of good practice in the utilization of buildings, equipment and training provided under the Project. Although the outputs were essentially completed in line with the initial plans, some equipment was additionally procured. While the project cost was within the plan, the project period exceeded the plan. Considering that the additional equipment, which was important for Project effectiveness, was procured in the final stage of the Project implementation, this was an unavoidable delay; therefore the efficiency of the project is high. No major problems have been observed in any of the institutional, technical or financial aspects of the operation and maintenance system and its current status is very good; therefore the 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

Laboratory building, Ningxia Medical Univ.

1.1 Background

As far as the economic situation of NHAR at the time of appraisal is concerned, the GDP per capita (RMB[1] 5,775 in 2002) was below the national average (RMB 7,966 in 2002). "The 10th NHAR Five-Year Plan (2001-2005)" had the target of an annual average GDP growth rate of more than 9.0% and of a GDP per capita of RMB 7,167 by 2005. In the fields of economic growth and industrial structural adjustment, the high-technology industry was specified as a key industry. The NHAR government recognized the necessity of expanding higher education for human resource development centering on this sector in order to attain its objective. It announced a policy to raise the higher education enrollment rate from 12.9% in 2002 to 13.5% in 2005 and the number of higher education students from around 34,000 (out of this total, 23,000 were ordinary higher education students) in 2001 to about 67,000 (with approximately 36,000 ordinary higher education students) by 2005.

1.2 Project Outline

The objective of the Project was to upgrade higher education in both quality and quantity for two important institutions[2] in NHAR by supporting the construction of school buildings, the procurement of educational equipment and the training of teachers in Japan, thereby contributing to regional vitalization, market economy reform and environmental conservation.

Loan Approved Amount/ Disbursed Amount	2,636million yen / 2,633 million yen
Exchange of Notes Date/ Loan Agreement Signing Date	March, 2004 / March, 2004
Terms and Conditions	Interest rate: 1.5 % (0.75% for training component) Repayment Period: 30 years (40 years for training component) (Grace Period) (10 years) Conditions for Procurement: General untied
Borrower/ Executing Agency (Agencies)	The Government of the People's Republic of China / Ningxia Hui Autonomous Regional People's Government
Final Disbursement Date	August, 2011
Feasibility Studies, etc.	1. F/S: "Feasibility Study Report Central and Western China Talent Training Project" (Ningxia Educational Loan Project management Office, August 2003) 2. JICA report: 1) "FY 2001 Special Assistance for Project Implementation(SAPI) for the Higher Education Project in China" (August 2003) 2) "SAPI for a Higher Education Project in the People's Republic of China" (March 2004) 3) "SAPI for a Higher Education Project in China" (May 2005) 4) "The Supervision Survey Report on JICA Loaned Higher Education Project" (2010)

[1] Chinese Renminbi.

[2] The target universities at the time of appraisal were Ningxia University and Ningxia Medical College, currently Ningxia Medical University.

2. Outline of the Evaluation Study

2.1 External Evaluator

Naomi Murayama, OPMAC Corporation

2.2 Duration of Evaluation Study

Duration of the Study: August, 2013 – November, 2014

Duration of the Field study: December 2, 2013 – December 27, 2013,
March 9, 2014 – March 17,2014

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

3.1 Relevance (Rating:③[4])

3.1.1 Relevance to the Development Plan of China

China was admitted to the World Trade Organization (hereinafter referred to as "WTO") in December 2001 and has been aiming at high rates of economic growth, openness and reform through industrial structural adjustment. Disparities between coastal and inland areas, and between urban and rural areas, have been issues in China. To address increasing environmental issues, not only government initiatives but also a more comprehensive approach was needed, including human resource development and research on environmental conservation by higher educational institutions.

It was expected that the Project would contribute largely to regional vitalization, market economy reform and environmental conservation by human resource development through supporting tertiary education in one of China's inland areas. The Project objectives complied with "The 10th Five-Year Plan for National Economic and Social Development", "The 10th Five-Year Plan for Education", "China Western Development", "The 10th NHAR Five-Year Plan" and "The 10th NHAR Five-Year Plan for Education" at the time of appraisal.

At the time of the ex-post evaluation, the "National Mid- and Long-Term Reform and Development Plan for the Education Sector (2010-2020)" had been formulated in addition to "The 12th Five-Year Plan for National Economic and Social Development", "The 12th Five-Year Plan for Education", "China Western Development", "The 12th NHAR Five-Year Plan" and "The 12th NHAR Five-Year Plan for Education". In line with these plans, China has been promoting human resource development and regional disparity rectification for further economic growth, together with further openness and reform.

3.1.2 Relevance to the Development Needs of China

At the time of the appraisal, the quantitative demand for higher education was growing, against the background of an increase in the number of secondary graduates and government

[3] A: Highly satisfactory, B: Satisfactory, C: Partially satisfactory, D: Unsatisfactory

[4] ③: High, ②: Fair, ①: Low

policies for an increase in the number of higher education students. However, insufficient capacity of facilities and teaching staff at universities was an issue. In order to address this issue, the enhancement of higher education from the aspects of infrastructure, human resources and finance was needed. The Project supported the enhancement of higher education; therefore it was consistent with the development needs of China.

Table 1: Number of Post-secondary Students and Tertiary Enrollments in NHAR

Unit: thousand

	2007 (Target)	2007 (Actual)	2012 (Actual)
Post-secondary students	23.3	42.0	47.0
Tertiary enrollments	31.0	19.0	32.0
Ordinary tertiary enrollments	12.0	8.1	13.4

Source: NHAR people's government

Note: Higher education institutions (tertiary) include vocational technical schools, short-term higher education, four-year universities, and graduate schools. Ordinary tertiary institutes include only four-year universities and graduate schools. In this chart, these indicate institutions excluding graduate schools.

The number of tertiary enrollments in NHAR have increased drastically in recent years (Table 1). Tertiary enrollments in 2007 were substantially below the target, but then afterward sharply increased. In 2012, tertiary enrollments and ordinary tertiary enrollments were above the targets set at the time of appraisal. According to the Education Department of NHAR, this is attributed to acceptance of more students at higher education institutions following the development of buildings and equipment.

At the time of Project planning, there were four higher education institutes (four-year ordinary universities and short-term higher education) in NHAR, of which one was a central-government-run university, one was for short-term higher education, and two were NHAR-government-run ordinary universities. Two ordinary four-year universities, which were not for short-term higher education (equivalent to *senmon gakko* or technical schools in Japan) but under the control of NHAR, were selected as the target universities. The NHAR Higher Education Development Plan at the time of ex-post evaluation clearly stipulated that the NHAR government intended to develop these two universities (Ningxia University and Ningxia Medical University) intensively. So it can be said that these target universities were important for human resource development in NHAR at the time of ex-post evaluation.

NHAR's higher education budgets during the Project implementation period were tight. On the other hand, the development of school facilities and equipment was an urgent task in order to address the increasing need for higher education. From the viewpoint of corresponding to need, the timing of the financial support by the Project was very appropriate. The budget in 2012 was more

Table 2: Higher Education Budget in NHAR

Unit: RMB million

FY2001	FY2007	FY2012
288.77	821.54	2,372.34

Source: Responses to the questionnaire

than eight times larger than the one in FY 2001 (before Project implementation). The higher education institutes in NHAR have achieve a more remarkable development with the government budget based on the facilities and equipment developed by the Project (Table 2).

3.1.3 Relevance to Japan's ODA Policy

Japan's ODA Charter at the time of appraisal placed importance on assistance in the Asian region and assistance in human resource development; therefore the project objectives were consistent with Japan's ODA policy.

Furthermore, the Country Assistance Program for China, the Medium-Term Strategy for Overseas Economic Cooperation Operations and the Country Assistance Strategy for China at the time of appraisal made human resource development a priority from the viewpoint of support for openness and reform (market rules), environmental conservation, and regional development (including progress in Japan-China exchanges). The project objectives were therefore also consistent with Japan's aid policies.

This project has been highly relevant to the country's development plan and development needs, as well as to Japan's ODA policy. Therefore its relevance is high.

3.2 Effectiveness[5] (Rating: ③)

3.2.1 Quantitative Effects (Operation and Effect Indicators)

In this ex-post evaluation study, the evaluator analyzed the quantitative effects using indicators directly related to the three project components, i.e. building construction, the provision of educational equipment and training. Specifically, contributions to increases in the number of students were evaluated by analyzing the areas of school buildings (floorage), the monetary value per student of educational equipment and the utilization rate of school buildings and educational equipment for quantitative improvement.

For qualitative improvements, the educational environment was analyzed by floorage per student and the monetary value per student of educational equipment. The contribution made by the project to aspects of education and research was then evaluated based on the number of key faculties, key laboratories, research papers, research projects and so forth.

3.2.1.1 Improvement in Quantity

(1) Change in the number of students

In China, the number of higher education institutes and university students has sharply increased since the release of the "Action Plan for Educational Vitalization Facing the 21st Century" in 1998, which aimed at an increase in the university enrollment rate from 9.8% in

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

1998 to 15.0% in 2010. In the meantime, the number of higher education institutes in NHAR increased from four in 2002 to eight as of 2012. The number of university students also increased, 1.8 times, from 27 thousand in 2002 to 48 thousand in 2012.

On the other hand, the growth rate of student numbers at the target universities was less than the total for the autonomy as a whole (a 77.8% increase). According to the Education Department of NHAR, this is attributed to stopping the mass recruitment of candidates in order to prevent deterioration in the quality of education in recent years. This is not a problem, however, as the number of students at the target universities has steadily increased (Table 3).

Table 3: Increase in students at the target universities

Unit: person

	Baseline (2002)	Actual (2007)	Actual (2012)	Increase compared to baseline	Growth rate (%) (2002－2012)
Ningxia University	16,220	17,084	18,321	2,101	13.0
Ningxia Medical University	3,416	5,578	7,383	3,967	116.1
Total	19,636	22,662	25,704	6,068	30.9

Source: Responses to the questionnaire

(2) Change in school building areas

To meet the increase in university students mentioned above (1), each target university constructed teaching and laboratory buildings, libraries and so on. The education environment was improved as the extensions of school building area were more than the growth rate of students at any of the target universities (Table 4). Ningxia Medical University relocated to a new campus in July 2007. The relocation was planned in 2005 and the school building under the Project was constructed at the new campus (completed on December 2008).

The Project buildings account for a relatively large share of the building areas at each university. In particular, the proportion of the school building area at Ningxia Medical University, which has relocated to a new campus, is large at 31.3% (Table 4). The Project has played a significant role in mitigating the shortage of buildings and facilities[6] and in education and research activities by the timing of its implementation, which coincided with the need to reconstruct school buildings and relocate a campus.

Table 4: Change in school building areas at the target universities

Unit: m^2

	Baseline (2002)	Actual (2012)	Growth rate (%)	Project area	Project share (%)
Ningxia University	121,388	262,447	116.2	44,658	17.0
Ningxia Medical University	33,702	115,118	241.6	36,000	31.3

Source: Responses to the questionnaire

[6] The Project contributed to mitigating the shortage of buildings, which was an urgent issue for the target universities, by constructing around 20% to 30% of the total school building areas as of 2012.

(3) Change in the monetary value of educational equipment

In NHAR, the monetary value of educational equipment increased drastically. The Undergraduate University Establishment Standards of China of the Ministry of Education of the People's Republic of China has the following requirements: that the monetary value of educational equipment per student for science faculties is not less than RMB 5,000; for literature and social faculties, not less than RMB 3,000; for gymnastic and art faculties, not less than RMB 4,000. Neither of the target universities met this requirement before Project implementation. After Project completion, however, both the target universities met this requirement (Table 5).

Table 5: Monetary value of educational equipment

Unit: RMB

	Baseline (2002)	Actual (2007)	Actual (2012)
Ningxia University	3,999	7,547	15,343
Ningxia Medical University	2,911	10,633	16,961

Source: Responses to the questionnaire

The total amount of educational equipment greatly increased at both the target universities (Table 6). After Project implementation, the government budget for higher education rose sharply so that the Project share was only 10% to 20% of the total amount in 2012. Considering the limited total amount of educational equipment before commencement of the Project, however, it can be seen that the school buildings and equipment developed by the Project played an important role during Project implementation.

Table 6: Total amount of educational equipment

Unit: RMB million

	Baseline (2002)	Actual (2012)	Growth rate (%)	Project equipment	Project share (%)
Ningxia University	64.86	281.11	333.4	36.25	12.9
Ningxia Medical University	12.20	198.79	1,529.4	45.08	22.7

Source: Responses to the questionnaire

Moreover, as mentioned later, the Project played a role in the designation of Ningxia University as one of the Project 211[7] universities, in its accreditation as an institute awarding doctorate degrees, and in its being granted the honorable title "Excellent University" in the "Undergraduate University Teaching Level Evaluation"[8] conducted by the Ministry of Education of China. It also played a role in the upgrading of Ningxia Medical "College" to Ningxia Medical "University" in 2008. School facilities were greatly improved by the Project

[7] Project 211 is a national project, named from an abbreviation of "the 21st century" and "approximately 100 universities" respectively. To be designated as Project 211 by the Ministry of Education of the People's Republic of China means that the university is a at a top level in education, research and management. (Source: Japan Science and Technology Agency China Research Center, 2011, "2010 Current Situation and Trend of Higher Education in China")

[8] The evaluation system for higher education introduced by the Ministry of Education of China. Once every five years, school operations and the quality of education are evaluated. The first phase of evaluation was conducted from 2003 to 2008. The results are evaluated on a four-point scale.

and as a result, the target universities received good ratings, as mentioned above. This led to increases in the budget granted from the government to the target universities. Thus, the education and research environments were improved in a virtuous cycle created by the Project.

(4) Utilization rate of school buildings and educational equipment

As mentioned above, the school building areas and the monetary value of educational equipment increased as each target school quantitatively responded to the increase in students. However, effectiveness cannot be discussed if buildings and equipment are not actually utilized.

Table 7 shows the utilization rate of major school buildings. In each university, the utilization rate is 100% and thus it can be said that the buildings are sufficiently utilized.

Table 7: Utilization rate of major school buildings

Unit: %

	2007	2012
Ningxia University	100	100
Ningxia Medical University	100	100

Source: Responses to the questionnaire

Table 8: Utilization rate of major equipment

Unit: %

	2012 (a)	2012 (b)
Ningxia University	100	100
Ningxia Medical University	100	99

Source: Responses to the questionnaire
Note: Equipment in use (a) at price base, and (b) at operation rate

Table 8 shows the utilization rate of major equipment at the target universities. This is also a very high ratio, at more than 90% at both the universities. An atomic absorption spectrophotometer, for which utilization rate is high at Ningxia University, is an important piece of apparatus from an educational perspective. At Ningxia Medical University, advanced electron microscopes such as a transmission electron microscope are highly utilized and have an important role in research activities. Within NHAR some equipment procured under the Project is owned only by Ningxia Medical University. Such equipment is rented to other universities, research institutes and enterprises for a price matching that of the consumable goods needed to operate the equipment through an information platform for sharing facilities in NHAR. To a certain extent, the facilities developed by the Project, as mentioned later, have contributed to the designation of a State Key Laboratory Breeding Base at Ningxia University and a State Experimental Teaching Demonstration Center of Higher Educational Institutes at Ningxia Medical University.

As seen above, regarding quantitative improvement, the number of students, the monetary value of educational equipment per student, and school building areas at the target universities increased. The utilization rate of school buildings and equipment was also very high. In light of the above, it can be said that the construction of buildings and procurement of equipment under the Project contributed largely to quantitative improvement.

3.2.1.2 Improvement in Quality

(1) Floorage and monetary value of educational equipment per student

The Undergraduate University Establishment Standards of China required a 2006 national standard of floorage per student of more than 30 m^2 [9]. The floorage per student of Ningxia University was below this national standard and although it improved substantially, it had not achieved the standard as of 2012. In the case of Ningxia Medical University, the floorage per student was beyond the national standard. The construction of school buildings by the Project contributed to increasing the floorage (Table 9).

Table 9: Floorage per student

Unit: m^2

	Baseline (2002)	Target (increase of the floorage per student through the project)	Actual (2012)	
			Floorage per student	Increase of the floorage per student through the project
Ningxia University	6.3	2.02	14.3	2.4
Ningxia Medical University	28.1	4.34	30.7	4.9

Source: Responses to the questionnaire

The monetary value of equipment per student, as confirmed in Table 5, has improved further and creates a virtuous cycle, as mentioned above. The Project has had a positive effect on the increase in the monetary value of equipment. In light of the above, it can be recognized that the educational environment is improving.

(2) Changes in the number of key faculties and key laboratories

In China, since "Some opinions concerning the development of higher education institutions and key faculties" was proclaimed by the State Education Commission in 1993, the state or provincial governments have designated faculties and laboratories which closely relate to national development strategies and public welfare. These are labeled key faculties and key laboratories and supporting funds are intensively provided by the government in order to raise education and research to an international level (Table 10, Table 11)[10].

[9] For education and administration buildings at ordinary universities, the floorage per student for departments of science, engineering, agriculture and medicine is more than 20m^2, the floorage per student for departments of humanities, social sciences, and management is more than 15m^2, and the floorage per student for departments of physical education and arts is more than 30m^2.

[10] National key faculties are designated by the national government. Provincial or ministerial key faculties are designated by provincial governments, while ministerial key faculties are designated by provincial governments or ministries such as the Ministry of Education.

Table 10: Number of key faculties

	Baseline	Target	Actual	
	2002	2007	2007	2012
Ningxia University	NL: 0 PML: 12	NL: 2 PML: 15	NL: 0 PML: 12	NL: 1 PML: 17
Ningxia Medical University	NL: 0 PML: 4	NL: 3 PML: 16	NL: 0 PML: 9	NL: 0 PML: 17
Autonomous Total	NL: 0 PML: 16	NL: 5 PML: 31	NL: 0 PML: 29	NL: 1 PML: 38

Source: Responses to the questionnaire
Note: NL (National Level): National key faculty, PML (Provincial or Ministerial Level): Provincial or ministerial key faculty

As regards the number of provincial or ministerial key faculties, the actual numbers in 2012 were beyond the target although for national key faculties, the number did not increase enough to reach the target. Only one faculty was designated as a national key faculty in Ningxia University. The number of designated key faculties at the two target universities accounts for nearly 90% of the total in NHAR. There are some cases where the Project contributed to increasing the number of key faculties. For example, some apparatus in the "autonomous level key faculty of human anatomy and embryology" was procured under the Project. Also, some lecturers who had training in Japan under the Project played an important role in establishing the "autonomous level key faculty of industrial health and environmental hygienics".

Table 11: Number of key laboratories

	Baseline	Actual	
	2002	2007	2012
Ningxia University	NL: 0 PML: 0	NL: 0 PML: 5	NL: 0 PML: 9
Ningxia Medical University	NL: 0 PML: 0	NL: 0 PML: 1	NL: 0 PML: 5

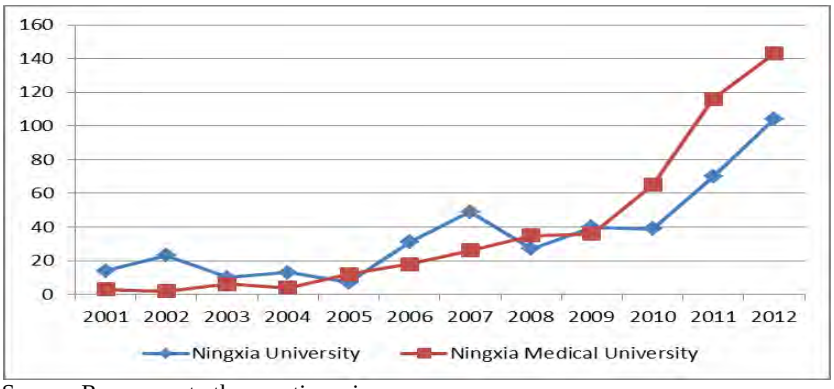
Source: Responses to the questionnaire
Note: NL (National Level): National key laboratory, PML (Provincial or Ministerial Level): Provincial or ministerial key laboratory

The number of provincial or ministerial key laboratories gradually increased in each target university. There is no national level key laboratory at this moment, but both Ningxia University and Ningxia Medical University have laboratories designated as "breeding bases" which are laboratories at the preparatory stage for becoming national level key laboratories. These breeding bases are due to become national key faculties in the near future. In the national key laboratory breeding base of energy chemical engineering at Ningxia University, for instance, three major pieces of apparatuses were procured in 2006 through the Project. These contribute to related research activities and human development at Ningxia University. In addition, the university provides a service for research and industrial product performance evaluations by allowing other science research and education institutes and enterprises to use the apparatus through the NHAR major scientific instrument cooperation platform. In the cerebropathy laboratory (national key laboratory breeding base) at Ningxia Medical University, a lecturer who participated in training on neuronal morphology in Japan works as the vice director. He is

now preparing for the establishment of a neuronal morphology laboratory within the cerebropathy laboratory. In this way, the Project has played an important role in developing key laboratories.

(3) Number of research papers, research projects, prizes awarded etc.

The number of research papers published in international scholarly journals such as Science Citation Indicators (SCI) has been increasing at both the target universities (Figure 1). Although the number was less than 20 at the target universities before project implementation, a large increase in articles since 2009 has been an outstanding feature. More high-quality research papers have been written thanks to facilities being expanded by the Project and larger research budgets being allocated than before Project implementation. As mentioned before, the Project has had a relatively large effect on the expansion of facilities and it is considered that the Project has contributed to the increase in research papers to some extent.



Source: Responses to the questionnaire
Note: SCI (Science Citation Indicators), EI (Engineering Index), ISTP (Index to Scientific & Technical Proceedings)

Figure 1: Number of articles in SCI, EI, and ISTP

The number of research projects has greatly increased during the last decade at all the target universities (Table 12). As mentioned in a later paragraph on social contributions and prizes awarded, some lecturers who participated in training under the Project were involved in these research projects and apparatus procured by the Project was utilized in the research projects.

Table 12: Number of research projects

	Baseline (2002)	Actual (2007)	Actual (2012)
Ningxia University	NL: 0 PML: 42	NL: 29 PML: 120	NL: 108 PML: 6,352
Ningxia Medical University	NL: 3 PML: 3	NL: 9 PML: 7	NL: 61 PML: 150

Source: Responses to the questionnaire
Note: NL (National Level): National research project, PML (Provincial or Ministerial Level): Provincial or ministerial research project

The number of social services, one of the so-called "university's three missions" (education, research and social service), has also been basically on the increase (Table 13). For instance, urgent technical issues in the NHAR coal-processing industry, such as the development of coal-water slurry producing technology and coal-derived olefin catalyst, detoxifying treatment and total utilization in the coal-processing process have been tackled through close cooperation between the National Key Laboratory of Energy Chemical Engineering, Ningxia University, and a coal processing enterprise. These have been core innovations in coal-processing resource recycling technology. At Ningxia Medical University, the faculty of oral-medical science has been engaged in voluntary medical activities. In all cases, equipment and facilities procured under the Project has performed a certain function.

Table 13: Number of social services

	Baseline (2002)	**Actual (2007)**	**Actual (2012)**
Ningxia University	2	46	140
Ningxia Medical University	8	1	6

Source: Responses to the questionnaire
Note: The definition of social services is in accordance with the Higher Education Law in China (passed by the 4th meeting of the 9th Standing Committee of the National People's Congress, on August 29, 1998).

As for the number of prizes awarded, there are many cases where prizes have been awarded to participants in training under the Project (Table 14). For example, a trainee from Ningxia University was awarded first, second and third prizes for NHAR Social Science Excellent Research for seven items of research including the "Study on Tiansheng Code and Tangut Legislative" (of these, there were three first prizes.). At the time of the ex-post evaluation, the trainee was directing research projects such as the National Social Science Fund key research project "China Tibet Tangut Literature Study", the Ministry of Education Key Research Base Important Project "Organized Publication on China Khara-khoto Chinese classical literature", and the National Higher Education Institutes Antiquarian Filing Research Project "Literature Study on Tangut Lapidary Character". In Ningxia Medical University, there have been many prizes awarded to participants in training under the Project such as the National Natural Science Fund project "Study on Immunity Protective Quality of Recombination Antigen of Echinococcus Granulosus and its Mechanism".

Table 14: Number of prizes awarded

	Actual (2007)	**Actual (2012)**
Ningxia University	NL: 0 PML: 1	NL: 0 PML: 5
Ningxia Medical University	NL: 0 PML: 13	NL: 0 PML: 21

Source: Responses to the questionnaire
Note: NL: National Level, PML: Provincial or Ministerial Level

Faculties at undergraduate schools and courses at graduate schools have also shown an upward trend (Table 15). In particular, at undergraduate level at Ningxia University, the number of students has remained at almost the same level for the last five years due to limited recruitment in order to maintain or improve the quality of education. However, master's courses at graduate schools have drastically increased at both the target universities as they have been aiming for higher education which is research-oriented. As of 2012, only Ningxia University

had doctoral courses but in 2013 Ningxia Medical University was also accredited as an institute able to award doctorate degrees in three courses: basic medicine, clinical medicine and public health and prevention medicine. Ningxia Medical University is starting to recruit ten students from September 2014.

Table 15: Number of undergraduate faculties and graduate courses

	Undergraduate			Master's course			Doctoral course		
	Baseline	Actual		Baseline	Actual		Baseline	Actual	
	2002	2007	2012	2002	2007	2012	2002	2007	2012
Ningxia University	54	69	68	29	48	152	0	3	23
Ningxia Medical University	10	12	17	12	28	59	0	0	0

Source: Responses to the questionnaire

In light of the above, as far as qualitative improvement is concerned, it can be seen that the educational environment is gradually improving and floorage and the monetary value of equipment per student also show an upward trend. As for the development of school buildings and equipment, there has been a substantial improvement, especially in educational equipment. Meanwhile, the project has contributed to the improvement of floorage to some extent. The project has had a profound effect on the increase in the designation of key faculties and laboratories. The project also contributed to the increase in the number of research papers, prizes awarded etc. as many of these used equipment procured and were produced by teaching staff who had participated in training under the Project. Therefore, the Project has played a significant role in improving the quality of education and research.

3.2.2 Qualitative Effect

Qualitative effects of the project are (1) the enhancement of the reputations of schools through an upgrade in the educational environment (effects of building construction and equipment procurement) and (2) improvements in the education system with institutional change (the effects of training).

(1) Effects of building construction and equipment procurement

Effects of building construction and equipment procurement include 1) good results on the "Undergraduate University Teaching Level Evaluation", 2) upgrades from college to university, 3) accreditation for institutes awarding doctorate degrees, and 4) designations as universities of "Project 211" through upgrading of the educational environment. In the "Undergraduate University Teaching Level Evaluation" conducted by the Ministry of Education of the People's Republic of China, each target university received good results due to improvements in floorage per student and in the rate that experiments are conducted through enhancements of equipment. Ningxia Medical "College" was upgraded to Ningxia Medical "University" in 2008 as, through

the implementation of the Project, the institute was able to meet the requirements for the quantity of experimental apparatus per student established by the Ministry of Education of China. Furthermore, the establishment of new faculties and accreditation for institutes awarding master's degrees were approved. Ningxia University was accredited as an institute awarding doctoral degrees. The Project indirectly contributed to the designation of Ningxia University as one of the universities of "Project 211" by the development of facilities under the Project.

(2) Effects of training

In case of NHAR, all training was related to specialized education and directly led to improvements in the level of education and research. At Ningxia University, the "International Joint Research Institute of; Shimane University, Japan & Ningxia University" was constructed. Collaborative research and symposiums in a wide range of areas have been held there to date. Ningxia Medical University has achieved impressive results in the "9 plus 3 program for pursuing a doctorate" with the College of Medicine, Shimane University (Box).

Box: Collaboration between Shimane University and Ningxia University and Ningxia Medical University

Academic co-operation between Shimane University and Ningxia started 1987 [11]. Around 2003, when Shimane University and Ningxia University sought sustainable means and a hub for academic exchange, the construction of school buildings was planned at Ningxia University, a target university of the Project. At that time, the "International Joint Research Institute of Shimane University, Japan & Ningxia University, China" was added as a construction component. Concurrently with this, the former Shimane Medical University was integrated into Shimane University. Shimane University and Ningxia Medical University (former Ningxia Medical College) concluded an exchange agreement in 2004. During the implementation of the Project, Shimane University received 44 trainees in total, 22 from Ningxia University and 22 from Ningxia Medical University.

International Joint Research Institute of Shimane University, Japan & Ningxia University, China

Since 2005, when the laboratory building was completed at Ningxia University, the International Joint Research Institute has held international symposiums every year and interdisciplinary collaborative research such as research in policies related to anti-desertification and depopulation measures have been conducted with Grant-in-Aid for Scientific Research from the Japan Society for the Promotion of Science. In addition, research on agriculture and zootechnics has continuously taken place with Ningxia University. After the completion of the training component of the Project, Shimane University provided research grants for researchers at Ningxia University using the budget of Shimane University and contributions from corporations. An increase in the number of students studying at Shimane University (from both the undergraduate and the graduate school of Ningxia University) has resulted from the extension of these academic activities and development of human resources has continued.

The medical school of Shimane University has received teaching staff who already hold master's degrees from Ningxia Medical University as special researchers (training within one year) under the Project training component. However, one year is too short to conduct research. The medical school of Shimane University therefore judged the educational effectiveness as insufficient and looked at measures by which these special researchers could go on to doctoral courses. At that time, the

[11] The exchange agreement between Shimane University and Ningxia University was signed officially in 1997.

Chinese side was suffering from a shortage of scholarship funds for candidates who wanted to study at graduate school. Therefore, the medical school of Shimane University established an epochal program called the “9 plus 3 program for pursuing a doctorate”. Under this program, teaching staff of Ningxia Medical University maintain their position and perform duties such as teaching and research etc. for nine months in China. For three months, they earn credits through an intensive course and video lectures in Shimane, finally completing their doctoral theses within four years. During the nine-month stay in China, an e-learning system is utilized. This program produces a steady flow of successful results as researchers who finished degrees at Ningxia Medical University continue to conduct collaborative research with researchers in Shimane University.

Successful factors in co-operation between Shimane University and Ningxia University and Ningxia Medical University are as follows:

1) They have common research themes as there are regional issues common to both Shimane and Ningxia, such as depopulation.
2) Shimane University develops human resources to be partners in collaborative research not by ending with short-term training but by promoting the completion of degrees.
3) The activities did not fade away through institutional decision-making on academic exchange with Ningxia nor through the influence of any individual professor.
4) Financial issues are avoided as international students are received with support for research expenses from Shimane University’s own funds, contributions from companies, research funds from foundations etc.

As there is also a geographical similarity, the academic exchanges between the universities have also developed into exchanges between Japan and China beyond university level such as sister-city affiliations at municipal level and support for trainees and international students by NPO located in Shimane. In the future, it is planned that the cooperative framework will be expanded in order that collaborative research may be conducted by establishing research networks not merely between Ningxia and Shimane University but among universities and researchers in the whole western region of China and so that more high-level and deep academic exchange may be conducted through the development of human resources not only from doctoral courses but also from master’s courses and at undergraduate level. For example, concrete activities are already underway such as an academic seminar co-hosted by Shimane University, Ningxia University and JICA on May 2013 in which many universities located in the Western region participated, including the target universities of Inland Higher Education Projects in other provinces.

3.3 Impact

3.3.1 Intended Impacts

(1) Impact on higher education at provincial level

The number of higher education institutes and the number of students at higher education institutes, the enrollment ratio, floorage per student and monetary value of educational equipment per student as a whole in NHAR increased (Table 16). Average floorage per student of the target universities increased from 10.6m^2 in 2002 to 14.7m^2 in 2012, but it did not reach the autonomous average (23.2m^2 in 2011). The Project impact does not seem to have been so great from the viewpoint of NHAR as a whole. One of the reasons for this is that the Project impact had lessened at the time of the ex-post evaluation because the Chinese government (including the autonomous government) budget for higher education had greatly increased.

Table 16: Impact on higher education at autonomous level

Purpose	Indicators	Baseline (2002)	Target (2007)	Actual (2007)	Actual (2012)
Quantitative improvement	Number of higher education institutions	4	4	7	8
	Number of students at higher education institutions (thousands)	27	30	29	48
	Higher education enrollment ratio (%) (=Appropriate age enrollment/ Appropriate age population)	7.3	13.5	23.0	30.0
Qualitative improvement	Floorage per student (m^2/student) (=floorage/number of students)	7.2	—	25.6	23.2
	Monetary value of educational equipment per student (RMB)	3,000	—	5,770	14,515

Source: Responses to the questionnaire
Note: floorage per student of autonomous total is the data in 2011.

(2) Impact on regional vitalization

At the time of appraisal, an impact on regional vitalization was expected through the dispatch of school teachers and doctors to rural areas, the provision of human resources to key industries, and the development of human resources through vocational training and adult education. As far as the dispatch of human resources is concerned, a system for dispatch to rural areas already existed so there had been some examples of the dispatch of teachers and doctors to rural areas for some time. The actual number, however, was only from a few to tens of people. Although some of the buildings and equipment developed by the Project are utilized, this is of less immediate relevance to the Project. As for adult education, numbers increased considerably but this is also not related to the Project[12].

As for providing human resources to key industries, the definition of "high-technology industries", recognized as key industries at the time of appraisal, is not clear. Thus each target university provided information on the development of industrial human resources and good practice under the Project. As a result, it was confirmed that the Project had made a large contribution to the development of industrial human resources (Table 17).

Table 17: The Project contributions to development of industrial human resources

University	Good practices
Ningxia University	• The Engineering College Testing Building B (Mechanical Engineering College Building) constructed under the Project is of great use for the development of human resources for machinery manufacturing. • Some equipment procured under the Project plays an important role in improving the level of experiments, teaching and research in the National Key Laboratory of Energy Chemical Engineering, the Agricultural College, the Chemical Engineering College, the Mechanical Engineering College, the Geographical Information College, the Humane Studies and Water Use Civil Engineering College and helps human resource development for NHAR key industries through the hardware. • That the university dispatched some teaching staff related to NHAR key industries to Japan

[12] Ningxia University: increase form 9,776 in 2002 to 16,137 in 2012
Ningxia Medical University: increase form 667 in 2002 to 6,452 in 2012

University	Good practices
	for training contributed to an increase in the quality of human resources development due to the enrichment of teaching staff through improvements in their levels of research and teaching.
Ningxia Medical University	• Thanks to the Project, the university's ability to develop competent medical and health specialists was enhanced and its contribution to medical and health industries in NHAR and the Western Region was improved. The pass rate for the Exams for Medical Practitioner and Trainee Doctor is continuously improving. In 2009, the university was selected as one of the "typical case national top 50 higher education institutes for graduates being employed"[13] by the Ministry of Education.

Source: Responses to the questionnaire

(3) Impact on the strengthening of market rule

In order to see the impact on the strengthening of market rule, the external evaluator confirmed the number of graduates from the financial management faculty of Ningxia University only. It was confirmed that the number increased from 615 in 2002 to 921 in 2012 but it was unclear what graduates do and where they play an active role after graduation. Therefore, the external evaluator could not confirm whether or not the Project had had an impact on the strengthening of market rule.

(4) Impact on environmental conservation

There is no obvious evidence of a direct contribution by graduates on environmental conservation and public health. However, each target university has conducted some activities, as shown in Table 18. The connection with the Project is the utilization of equipment procured under the Project in the case of research on digital forest industry system development. Also, in the case of the formulation of "the 12th NHAR Five-Year Plan for Urbanization", the contribution of teaching staff who participated in training under the Project can be observed.

Table 18: The contributions of the target universities to environmental conservation and public health

University	Good practices
Ningxia University	Environmental conservation projects in 2012: • the 12th NHAR Five-Year Plan for Urbanization • the 12th NHAR Five-Year Plan for Rural Development and Real-estate • Research on the "digital forest industry" system development based on ArcIMS (standing for Arc Internet Map Server) in mountain areas of Southern Ningxia at the late phase of the return of grain plots to forestry • Study on the protection of the polluted water treatment capacity of natural lakes and marshes • Study on precipitation and dew water resources in the Ocher Plateau drought area and their effects on the ecological system • Resistivity of energy plant on saline-alkali soil given by desulfurization waste and its effect on soil characteristic and others
Ningxia Medical University	• Social service through the Public Health Screening and Detection Center • Water quality inspection at schools

Source: Responses to the questionnaire

[13] The Ministry of Education has annually selected 50 universities that have a high placement rate and have been satisfied by students as "higher education institute graduates being employed in typical cases" since 2009.

3.3.2 Other Impacts

(1) Impacts on the natural environment

Construction work was started after the draft architectural design for the Project was approved by the NHAR environmental conservation bureau. The environmental conservation bureau monitored air contaminant, dust, discharged water, noise and so forth monthly during construction. As a result, all the requirements were fulfilled. In constructing the school buildings, the following reduction measures against environmental impact were taken. There were no protests or complaints against noise, vibration, dust and sediment discharge through construction, or water pollution by those using the facilities.

1. Cement and other easily-scattered particulate building materials were kept in storage or were prevented from scatter by covering. Prevention of dropping and scattering during conveyance and dust suppressing measures in discharging were made an obligation.
2. The surface of construction roads was swept once a day and sprinkled with water three times a day. Hardened asphalt was used for the surface. Car wash stations were set up. In sweeping industrial garbage, effective measures against secondary dust scattering were required.
3. Emission from vehicles had to meet the related national standard and vehicles beyond an acceptable level were prohibited from running on the construction roads.

After completion of the Project, effluent from laboratory discharges were treated in accordance with regulations. At Ningxia Medical University, a wastewater treatment plant was constructed and effluent discharged to drain pipes after being detoxified.

(2) Land Acquisition and Resettlement

The project was carried out on existing university properties, and thus there was no land acquisition or relocation of residents.

(3) Mutual understanding between Japan and China

It can be said that participants in the training in Japan were able to gain a deep understanding of Japan especially through human development and academic exchange with Japanese universities. In particular, due to the sister-city relationship between NHAR and Shimane Prefecture, both Ningxia University and Ningxia Medical University have very strong links with Shimane University. The exchange between each target university and Japanese universities is shown as in Table 19 and has already been described in the Box.

Table 19: Exchange between each target university and Japanese universities

University	Good practices
Ningxia University	Based on the International Joint Research Institute of Shimane University and Ningxia University constructed under the Project, academic exchanges continue after Project completion. Both Japanese and Chinese universities conduct research activities collaboratively and have tackled theoretical and experimental research on issues of the economy and society in underdeveloped mountain areas of Ningxia and Japan. As a result of multilateral and interdisciplinary collaborative research, scientific research such as "Study of Regional Development in China's Least Developed Areas – nurturing primary industries in Plateau", "Empirical research on the establishment of an ecological system in the Ningxia southern mountainous area" were conducted and academic books such as "Twenty-year Academic Exchange" and "Poverty reduction and environmental reclamation in Chinese rural areas" were published. Ningxia University and Shimane University continue to conduct exchange. More than 50 people from Ningxia University visited Shimane University and more than 200 experts and students from Shimane University visited Ningxia. A wealth of accomplishments from collaborative research and amicable cooperation between Ningxia University and Shimane University play a positive role in developing the relationship.
Ningxia Medical University	Ningxia Medical University established friendly relationship with Shimane University and Toyama Medical and Pharmaceutical University and conducted mutual visits and exchanges with them. Substantive results have been achieved in areas such as human resource training and academic exchange. Ningxia Medical University is looking for a new way to develop teaching staff through the "9 plus 3 program for pursuing a doctorate". And in order to reinforce cooperation in the academic and educational aspects of both universities, progress is being made on the exchange of master's students. At least two graduate students a year are dispatched to Shimane University and Ningxia Medical University lets them participate in scientific research activities for more than one year. Since Project implementation, Yinchuan City and Shimane Prefecture have held four successful "Ningxia Medical University- Shimane University International Symposiums". So far, more than 1,000 researchers from both the Japanese side and Chinese side have had academic interactions.

Source: Responses to the questionnaire

This project has largely achieved its objectives. Therefore its effectiveness and impact is high.

3.4 Efficiency (Rating: ③)

3.4.1 Project Outputs

The Project included the construction of school buildings, the enhancement of educational and research equipment, and the training of the target universities' personnel in Japan. The outputs of each component are as follows:

Table 20: Comparison of Outputs (planned and actual)

Items	Planned	Actual (achievement rate)
Buildings	2 universities total:75,000 m^2	2 universities total: 80,658 m^2 (107.5%)
Equipment	2 universities	2 universities: additional procurement (JPY 26 million)
Training	2 universities total: 45 staff	2 universities total: 48 staff (106.7%)

Source: JICA appraisal documents for the planned, and responses to the questionnaire for the actual data

As far as building construction is concerned, a few design changes were observed but basically the buildings were constructed as planned.

As for educational equipment, the model was changed for some of the digital equipment due to production ending during the process of procurement. Furthermore, as detailed in 3.4.2.2 Project Period, some apparatus was additionally procured in order to enhance effectiveness of the Project and research and education.

As regards the training component, all the trainees received training in their specialized fields for relatively a longer term than planned. In the case of NHAR, the universities effectively utilized relationships with Japanese universities where agreements for co-operation had already been signed such as Shimane University, and trainees were efficiently dispatched. Some trainees continued to study in doctoral courses and received academic degrees after the completion of one-year training under the Project. The Project achieved significant results in the aspect of the academic degrees of teaching staff needed for accreditation to key faculties and key laboratories and in collaborative research.

3.4.2 Project Inputs

3.4.2.1 Project Cost

Actual project costs amounted to 4,310 million yen (of this, the actual loan disbursement amounted to 2,633 million yen[14] against the estimated costs of 4,339 million yen (of this, the planned loan amounted to 2,636 million yen). The actual cots were mostly as planned (99%). While the appreciation of the yen against Chinese yuan was about two yen during project implementation, there was an average inflation rate of 3 % in China. Therefore, the Project was conducted mostly as planned in an efficient way.

3.4.2.2 Project Period

The project period planned at the time of appraisal was 63 months, or from January 2004 to March 2009. The actual project period was 92 months, or from January 2004 to August 2011, which was longer than planned: equivalent to 146% of the original plan. This was largely due to the delay of adding a procurement package in 2008 (nine packages were planned originally). The completion of procurement in the additional package was planned for the final disbursement date (August 2011) and equipment for Ningxia Medical University was procured. In this additional package, items accompanying apparatus procured in the prior packages were procured. These were necessary to utilize the existing apparatus efficiently and effectively and to enhance the effects of research and education and they included some equipment which contributed to the increase in the number of research papers and to academic results. Therefore, the addition is considered to be an important part of the outputs. Taking into consideration this additional package, the Project Period is evaluated to have been within the plan.

[14] According to data provided from the executing agency, this was JPY 2,632 million. As the executing agency received the fund in Chinese yuan through the Central government, the difference between this and the data provided by JICA depends on what the exchange rate was when the executing agency closes an account.

Regarding the training component, commencement was planned to be from the autumn term of 2004 at the time of appraisal. However, even if trainees entered doctoral courses as planned, it was very difficult for these international students with a language handicap to complete the course by March 2009. It can therefore be considered that there was a problem with scheduling.

3.4.3 Results of Calculations of Internal Rates of Return

Due to the nature of the Project, a quantitative analysis of the internal rate of return was not possible.

In light of the above, although the project cost was within the plan, the project period exceeded the plan. However, the delay was caused by the addition of important outputs for Project effectiveness. Therefore the efficiency of the project is high.

3.5 Sustainability (Rating: ③)

3.5.1 Institutional Aspects of Operation and Maintenance

Each target university has registered the buildings and equipment developed under the Project as fixed assets and conducts daily maintenance.

The Education Department inspects whether the target universities properly manage the buildings and main equipment procured under the Project. The audit office, which is equivalent to the Board of Audit in Japan, supervises the Education Department annually.

In daily operation and maintenance, each university has established regulations for operation and maintenance, each laboratory operates and is maintained in accordance with the regulations and there are no problems.

3.5.2 Technical Aspects of Operation and Maintenance

Each laboratory regularly conduct a routine maintenance check. Regarding equipment, operation manuals are provided and operation and maintenance procedures are shown on the wall near the equipment.

O/M procedures & regulations
(Ningxia Medical University)

Repair staff is allocated to each university department[15]. However, in case of malfunctions that cannot be fixed by these staff, reports are made to a laboratory and facility service center and repair outsourced following a review of the report. In

[15] Although the O/M system depends on universities, generally speaking, one O/ M staff is allocated to each university and each faculty. In addition, O/M staff is allocated to each team actually using the equipment. In case of malfunction, proper human resources are organized for coping with the malfunction.

particular, precision apparatus is not repaired within the university but the university asks manufacturers to perform maintenance for it. Daily maintenance at each laboratory is conducted without any problems.

3.5.3 Financial Aspects of Operation and Maintenance

The budget for operation and maintenance at each university is allocated from the university's own fund. If there is a shortage in the budget for operation and maintenance, the shortage is made up from the autonomous financial budget.

There is no evidence that the equipment lies neglected without maintenance and therefore, it is thought that the necessary resources for operation and maintenance are being provided.

Table 21: Operation and maintenance costs at each target university (annual)

Unit: RMB million

	2010	**2011**	**2012**
Ningxia University	Income: 511.07 Expenditure: 501.27 (O/M: 34.41)	Income: 1457.15 Expenditure: 1257.35 (O/M: 50.71)	Income: 725.74 Expenditure: 680.98 (O/M: 21.57)
Ningxia Medical University	Income: 192.51 Expenditure: 155.36 (O/M: 6.06)	Income: 597.39 Expenditure: 553.68 (O/M: 10.71)	Income: 346.26 Expenditure: 360.25 (O/M: 10.39)

Source: Responses to the questionnaire
Note: O/M = Operation and Maintenance cost

3.5.4 Current Status of Operation and Maintenance

At both the target universities, both buildings and equipment developed under the Project are appropriately maintained. Both universities have inventory books and maintenance logs for the major equipment and keep records on them. End-of-life equipment, such as PCs, has already been replaced using their own funds. However, other large and valuable equipment for experiment is well maintained and the utilization ratio (100%) is high (actual (a) in Table 8). In order to raise the utilization ratio, the education department has established a platform for sharing equipment and this is open to other universities.

No major problems have been observed in the institutional, technical and financial aspects of the operation and maintenance system. Therefore sustainability of the project effect is high.

4. Conclusion, Lessons Learned and Recommendations

4.1 Conclusion

The objective of the Project was to improve higher education in NHAR quantitatively and qualitatively by supporting the construction of buildings, the procurement of equipment and the training of teachers in the target universities. This objective was consistent with China's development plan and development needs as well as with Japan's ODA policy at the time of

both the appraisal in 2004 and the ex-post evaluation; therefore its relevance is high. The effectiveness and impact of the Project was high because quantitative indicators (building areas, amount of educational equipment) and qualitative indicators (number of key faculties and laboratories, number of research papers, etc.) have improved. Moreover, there are many cases of good practice in the utilization of buildings, equipment and training provided under the Project. Although the outputs were essentially completed in line with the initial plans, some equipment were additionally procured. While the project cost was within the plan, the project period exceeded the plan. Considering that the additional equipment, which was important for the Project effectiveness, was procured in the final stage of the Project implementation, this was unavoidable delay; therefore the efficiency of the project is high. No major problems have been observed in the institutional, technical and financial aspects of the operation and maintenance system and its current status is very good; therefore the sustainability of the project effects is high.

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

4.2 Recommendations

None.

4.3 Lessons Learned

[Project period of a higher education project with academic degrees in mind]

The planned project period for the training component at the time of appraisal was from July 2004 to March 2009. The component included training aiming at academic degrees. However, considering the preparation period and the language handicap, it was difficult to complete doctoral degrees in this period. Especially in such a project, the project period needs to be set with consideration for a preparation period that is sufficient and with a necessary period for degrees.

[Sustainable efficiency of the training component]

A training period of less than one year is too short to conduct specialized education. It also prevents institutions from developing partners who can conduct collaborative research. Therefore, Shimane University encouraged trainees under the Project to take degrees and developed human resources to conduct research on even ground with Japanese researchers. In order to achieve this, Shimane University put in place an environment that would enable maintain consecutive cooperation to be maintained. However, Shimane University had to bear a great burden for the preparation of an acceptance system. In light of the above, study in Japan for a degree is more desirable than short-term training for that there can be not only cultural interaction but also development of exchange activities that lead to consecutive cooperation such as collaborative research. On the other hand, since not every university is able to incur the

costs for these, combination with other schemes should be considered in order to reduce the costs of the accepting universities in the planning stage of the Project.

End

Comparison of the Original and Actual Scope of the Project

Item	Original	Actual
1.Project Outputs	2 target universities	As planned
1) school buildings	9 buildings such as laboratory buildings 75,000 m^2	9 buildings such as laboratory buildings 80,658 m^2
2) equipment	Biotechnology, energy resources science analysis, pasture research, anatomy, multimedia education etc.	As planned
	9 Package in total	Package 10 is added
3) training	45 staff from 2 target universities	48 staff from 2 target universities
2.Project Period	January 2004 – March 2009 (63 months)	January 2004 – August 2011 (92 months)
3.Project Cost		
Amount paid in foreign currency	2,636 million yen	2,632 million yen
Amount paid in local currency	1,703 million yen (119.1 million RMB)	1,678 million yen (138.4 million RMB)
Total	4,339 million yen	4,310 million yen
Japanese ODA loan portion	2,636 million yen	2,632 million yen
Exchange rate	1 RMB = 14.3 yen (As of July 2003)	1 RMB = 12.1 yen (As of August 2011)

People's Republic of China

Ex-Post Evaluation of Japanese ODA Loan Project

"Inland Higher Education Project (Regional Vitalization, Market Economy Reform Support, and Environmental Conservation) (Heilongjiang Province)"

External Evaluator: Takako Haraguchi, OPMAC Corporation

0. Summary

This project aimed to improve teaching and research at nine major universities in Heilongjiang Province through the development of their facilities and equipment as well as providing training for teachers. Relevance of the project was evaluated to be high, as it was in line with (i) the higher education policies of China and Heilongjiang Province, (ii) development needs for quantitative and qualitative enhancement of the universities, and (iii) Japan's assistance policies. Effectiveness/impact was also high, based on the observations that the project satisfied such needs, improved education activities by enabling more experiments, and improved research activities through outcomes achieved from advanced equipment and training, and thereby contributed to the promotion of the key industries as well as environmental conservation. Efficiency of the project was evaluated to be fair on the whole: although the project cost was within the plan, the project period exceeded the planned period due to delays in procurement. Sustainability was evaluated to be high, with no problem observed in institutional, technical and financial aspects, and due to the good status of operation and maintenance of the facilities and equipment developed by the project.

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

1. Project Description

Project Location

Building of the School of Pharmacy (Harbin Medical University)

1.1 Background[1]

In China, together with the remarkable economic development, several development issues have arisen such as narrowing internal disparity between coastal and inland areas, reducing poverty, preparing for joining in the World Trade Organization (WTO) and handling global issues. To deal with these issues, the Chinese government put a high priority on development of human resources that were essential for the accelerated efforts towards developing a market economy and narrowing economic gaps under the policy to strengthen reform and promote openness. Accordingly, the government set out a target to increase the higher education enrollment ratio to 15% as well as adopting a policy to strengthen higher education institutions (HEIs) in inland areas.

Heilongjiang Province is located in the northeastern end of China with a total population of 38,130,000 persons (2002) and a total area of approx. 469,000 km^2. Although the province achieved high economic growth, and per capita gross domestic product (GDP) (10,184 yuan in 2002) was higher than the national average (7,966 yuan), there was a wide gap between urban and rural areas. The provincial government aimed to promote a market economy and further economic development in the 10^{th} 5-year Plan in Heilongjiang Province (2001-2005). Also, the 5-year Plan for Education in Heilongjiang Province (2001-2005) planned to increase the number of students in higher education to around 495,000 persons and the enrollment ratio to 16.3% by 2005. However, in order to achieve such targets, existing constraints in the "hardware" aspects (such as school facilities and equipment), "software" aspects (teachers) as well as financial aspects of HEIs (totaling 48 institutions in 2002) had to be addressed.

Under such conditions, this project specified three development issues, namely, (i) regional vitalization, (ii) market economy reform support, and (iii) environmental conservation of Heilongjiang Province, and aimed to contribute to human resource development in order to address such issues by enhancing quality and quantity of higher education at major universities in the province.

1.2 Project Outline

The objective of this project was to quantitatively and qualitatively enhance higher education at nine major universities in Heilongjiang Province (Heilongjiang University, Harbin University of Commerce, Harbin University of Science and Technology, Harbin Medical University, Northeast Agricultural University, Harbin Normal University, Jiamusi University, Heilongjiang Institute of Technology, and Qiqihar University) by developing educational infrastructures such as buildings and equipment (improvement of the hardware aspects) and teachers' training (strengthening of the software aspects), thereby contributing to regional vitalization, market economy reform support, and environmental conservation of the province.

[1] This project is one of the (Inland) Higher Education Projects funded by Japanese ODA loans targeted to universities in 22 provinces, municipalities or autonomous regions in inland China.

Loan Approved Amount/ Disbursed Amount	4,972 million yen / 4,733 million yen
Exchange of Notes Date/ Loan Agreement Signing Date	March 2004 / March 2004
Terms and Conditions	Interest Rate: 1.5% (0.75% for training component) Repayment Period (Grace Period): 30 years (40 years for training component) (10 years) Conditions for Procurement: General untied
Borrower / Executing Agency	The government of People's Republic of China / Heilongjiang Provincial People's Government (Education Bureau)
Final Disbursement Date	August 2011
Feasibility Studies, etc.	- "Feasibility Study Report", Heilongjiang International Engineering Consulting Company, 2003. - "Special Assistance for Project Implementation (SAPI) for Higher Education Project in China", Japan International Cooperation Agency (JICA), 2003, 2004 and 2005. - "The Supervision Survey Report on JICA Loaned Higher Education Project", JICA, 2010.

2. Outline of the Evaluation Study

2.1 External Evaluator

Takako Haraguchi (OPMAC Corporation)

2.2 Duration of Evaluation Study

Duration of the Study: August 2013 – November 2014

Duration of the Field Study: October 27 – November 28, 2013 and March 23－31, 2014[2]

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

3.1 Relevance (Rating: ③[4])

3.1.1 Relevance to the Development Plan of China

The objective of this project is consistent with the five-year plans for economic and social development and the five-year plans for the education sector at both the national and provincial levels, as well as other education-related development strategies, which all aim at quantitative

[2] The field study period included the periods for ex-post evaluation of the Inland Higher Education Project (Regional Vitalization, Market Economy Reform Support, and Environmental Conservation) (Anhui Province) and the Inland Higher Education Project (Regional Vitalization, Market Economy Reform Support, and Environmental Conservation) (Anhui Province).

[3] A: Highly satisfactory, B: Satisfactory, C: Partially satisfactory, D: Unsatisfactory

[4] ③: High, ② Fair, ① Low

and qualitative development of higher education both at the times of appraisal and ex-post evaluations of this project (Table 1). While there were no large policy changes between the appraisal and ex-post stages, in recent years more importance has been given to higher education development, and the role of higher educated human resources in socio-economic development has become more clarified. Also, the key industries of Heilongjiang Province have shifted to those that require higher technologies.

Table 1: Main objectives of development plans related to this project

	At the time of appraisal	At the time of ex-post evaluation
National level development plan	The 10th 5-year Plan for National Economic and Social Development (2001–2005): To increase higher education enrollment ratio to around 15% by 2005.	The 12th 5-year Plan for National Economic and Social Development (2011-2015): To emphasize higher education for promoting industrial advances (quantitative targets include 87% of junior secondary graduates to go on to senior secondary school)
National level education sector plan	The 10th National 5-year Plan for Education (2001-2005): To increase student enrollment in HEIs to 16,000,000 by 2005; to develop human resources that have high skills in high technology, biotechnologies, manufacturing technologies etc. that are necessary for industrial structural adjustment; to strengthen support to HEIs that are relatively at a high level in western area; to strengthen support to fostering of teachers.	The 12th National 5-year Plan for Education (2011-2015) and National Mid- and Long-term Reform and Development Plan for Education Sector" (2010–2020): To increase higher education enrollment ratio from 26.5% in 2010 to 40% in 2020; to increase student enrollment in HEIs from 29,790,000 in 2009 to 33,500,000 by 2015; to develop HEIs in midwestern area with special focus on development of departments that are competitive and fostering of teachers.
Provincial level development plan	The 10th 5-year Plan for Economic and Social Development in Heilongjiang Province (2001-2005): To achieve annual economic growth rate of 9-10% or higher by 2005; develop the key industries including information technology biotechnology, automobile, petrochemical industry and pharmaceutical industry, etc.	The 12th 5-year Plan for Economic and Social Development in Heilongjiang Province (2011-2015): To increase GDP to more than two times the 2010 level by 2015; to develop key industries including biotechnology (focusing on pharmacy, agriculture, energy and manufacturing), manufacturing of new energy instrument (nuclear power, wind power, gas turbines, etc.), manufacturing of new agricultural machinery, manufacturing of transportation instrument, green food industry, steel and mining industry, coal chemistry and petrochemical industry, and forestry and paper industry, etc. To further promote reduction of urban-rural gaps in income and education, etc.
Provincial level education sector plan	The 10th 5-year Plan for Education in Heilongjiang Province (2001-2015) To increase higher education enrollment ratio from 14% in 2001 to 16.3% in 2005; to increase student enrollment in HEIs to around 495,000 (including around 396,000 in regular HEIs[5]).	The 12th 5-year Plan for Education in Heilongjiang Province (2011-2015) To increase higher education enrollment ratio from 34.8% in 2011 to 47% in 2015. Heilongjiang Powerful Province of Higher Education Construction Plan (2008) To plan and implement higher education plans as a key factor for socio-economic development of the province.

Sources: JICA appraisal documents; respective documents of the mentioned development plans.

[5] Regular (or standard) HEIs is a term referring to universities and colleges, including undergraduate programs of comprehensive universities and single-department colleges, specialized colleges (similar to junior colleges in Japan), and graduate programs. Adult higher education and higher vocational education institutions are not included. (Note for English translation only: in this report, "universities" include both universities and colleges that grant undergraduate or higher academic degrees unless otherwise mentioned.)

3.1.2 Relevance to the Development Needs of China

Development needs were observed for the quantitative and qualitative enhancement of education at the nine targeted universities at the times of both the appraisal and ex-post evaluations.

At the time of the appraisal, there was a need for quantitative expansion of higher education in order to narrow the economic gap mentioned in "1.1 Background" and following the increase of primary and secondary education in Heilongjiang Province (school intake rates in 2002 were 98.9% for primary education and 123.4% for secondary education). It was forecasted that the number of new entrants in regular HEIs would increase from 110,000 in 2002 to 150,000 in 2006. The nine universities targeted by this project were all leading universities under the jurisdiction of Heilongjiang Province[6], but their financial resources for developing the hardware (facilities and equipment) and software (teachers' training) aspects to address such increasing demand were limited. Also, there were few opportunities provided for the teachers to visit overseas.

At the time of the ex-post evaluation, the real GDP growth rate had been higher than 10% since 2002, and provincial per capita GDP was 35,711 yuan in 2012, which was 93% of the national average. Although this is a higher economic level than other inland provinces, the province still needed to maintain the growth and reduce gaps between urban and rural areas[7]. The number of new entrants to regular HEIs in the province continued to increase from 180,000 in 2006 to more than 200,000 in 2012, and the need for quantitative and qualitative enhancement of HEIs remains high. The nine targeted universities have continued to be the leading provincial universities. On the other hand, the need for hardware development seemed to have been more satisfied compared to the time of the appraisal, due to increased financial injection to provincial universities following the above-mentioned higher education development policies. The Education Bureau of Heilongjiang Province, the executing agency of this project, now puts more emphasis on the need to develop the software aspects such as improving the quality of teachers.

3.1.3 Relevance to Japan's ODA Policy

At the time of the appraisal, Japan's Country Assistance Policy for China, the Medium-term Strategy for Overseas Economic Cooperation Operations and the Country Assistance Strategy put priorities on human resources development from the viewpoint of

[6] The other major universities located in Heilongjiang Province are state-run Harbin Institute of Technology and Harbin Engineering University, which can obtain more funding than province-run universities, and therefore were not covered by this project.

[7] According to the provincial statistics of Heilongjiang, per capita disposable income in urban areas was 5,425 yuan in 2001, while per capita net income in rural areas was 2,283 yuan in the same year. In 2012, these were 17,760 yuan and 8,604 yuan, respectively.

support for openness and reform and post-WTO economic reform, and on assistance in the inland China from the aspect of narrowing the economic gap. The project objective was consistent with such aid policies of Japan. The Country Assistance Strategy upholds “regional vitalization and exchange”, “market economy reform support”, and “environmental conservation” as important areas of human resource development.

This project has been highly relevant to China’s development plans, development needs as well as Japan’s ODA policies, and therefore its relevance is evaluated to be high.

3.2 Effectiveness[8] (Rating: ③)

3.2.1 Quantitative Effects (Operation and Effect Indicators)

The number of students as well as various teaching and research-related indicators designated at the appraisal showed improvement between before and after this project. The set targets were achieved at the same as or better levels than expected. The effects of this project cannot be assessed by these indicators alone, since they measure operation and effects not only of this project but also of other projects (school building construction, equipment procurement, etc.) that were implemented around the same time by the province or target universities themselves. Nevertheless, by observing the use of the facilities and equipment developed and the activities of the teachers trained in Japan under this project, it was confirmed that this project constituted some factors which contributed to the improvement of the indicators.

(1) Quantitative expansion of teaching and research[9]

The number of students as well as the size of the facilities and equipment increased. The facilities and equipment developed under this project were mostly utilized, and therefore it can be said that they played the expected role as part of the response to the quantitative expansion of teaching and research.

First, the number of students increased far beyond the planned level at most of the targeted universities (Table 2).

[8] Sub-rating for Effectiveness was given with consideration of Impact. Taking into consideration the project objective and plan set at appraisal, this ex-post evaluation was designed based on the following definition of the key elements of effectiveness and impact of this project:

- Effectiveness: quantitative and qualitative enhancement of teaching and research at the targeted universities;
- Intended impact: enhancement of teaching and research at the provincial level, and contribution to provincial-level development in the areas of regional vitalization, market economy reform support and environmental conservation;
- Other impacts: strengthening of exchanges and cooperation with universities in Japan.

[9] In the appraisal, the target year for evaluating the quantitative indicators was set at 2007. However, due to the delays in project implementation (see “3.4 Efficiency”), the ex-post evaluation set the actual comparison year at 2012, a year after the project was actually completed (i.e. the equipment procurement competed).

Table 2: Number of students
(Total number of graduate, undergraduate and single depatment college students)

Unit: Person

	Actual 2002	Planned 2007 (Planned year of completion)	Actual 2007 (Planned target year)	Actual 2012 (A year after project completion)
Heilongjiang University	24,127	25,730	34,884	35,034
Harbin University of Commerce	13,026	18,781	21,980	25,384
Harbin University of Science and Technology	17,309	25,011	25,678	34,287
Harbin Medical University	5,581	10,746	9,891	11,690
Northeast Agricultural University	17,549	20,799	18,350	24,813
Harbin Normal University	16,136	19,882	43,362	40,015
Jiamusi University	19,820	25,620	23,649	24,497
Heilongjiang Institute of Technology	6,674	11,200	14,220	16,785
Qiqihar University	15,842	22,086	23,505	24,110
Total	136,064	179,855	215,519	236,615

Sources: JICA internal documents; responses to the questionnaire from the executing agency.

The floor area of school buildings also increased beyond the planned levels (Table 3). Most of the increase was funded by the province or the target universities (mainly private borrowing) outside of this project, and the floor area increased through this project accounts for only a small portion of the total increase (i.e. part of the areas of seven universities). As a whole, however, the expanded area of school buildings has played a fundamental role in bringing about the desired effects of this project. The buildings developed by this project are all fully utilized.

Table 3: School building area
(Classrooms, laboratories, libraries, gymnasiums and auditoriums)

Unit: m^2

	Actual 2002 Total area	Planned 2007		Actual 2007 Total area	Actual 2012	
		Total area	Portion under this project		Total area	Portion under this project
Heilongjiang Univ.	202,746	351,282	22,000	1,130,380	1,153,435	22,000
Harbin Univ. of Commerce	247,373	390,045	16,000	600,318	613,071	15,871
Harbin Univ. of Science and Technology	245,052	400,000	0	378,479	572,757	0
Harbin Medical Univ.	190,438	280,940	14,000	332,753	483,351	14,000
Northeast Agricultural Univ.	162,586	386,266	0	304,877	325,646	0
Harbin Normal Univ.	197,773	397,773	0	636,033	660,797	57,000
Jiamusi Univ.	291,055	422,994	27,000	332,502	358,990	27,000
Heilongjiang Institute of Technology	111,831	250,000	18,000	251,971	321,427	18,000
Qiqihar Univ.	213,530	298,000	31,000	270,092	286,406	33,462
Total	1,862,384	3,177,300	129,000	4,237,405	4,775,880	187,333

Sources: JICA internal documents; responses to the questionnaire from the executing agency.

As to the monetary value of educational and research equipment[10], the portion procured by this project increased to a level slightly below the planned value (Table 4). The reasons that the indicator did not reach the target at some universities are considered to be cancellation of procurement of some equipment (see "3.4 Efficiency) and arrival of the useful life of some other equipment such as personal computers that were installed at an early stage of project implementation. The total value of such equipment of the entire university substantially increased as well (mainly due to investments made by the provincial government and the universities themselves). While the equipment procured by this project now constitute only a part of the total value, the provincial Education Bureau and the targeted universities commented that they were particularly important during the project implementation stage when making large-scale investments on their own were difficult, and they continued to play a meaningful role at the time of ex-post evaluation.

Table 4: Total monetary values of educational and research equipment

Unit: thousand yuan

	University total		Portion under this project	
	Actual as of end 2002	Actual as of end 2012	Planned 2007	Actual as of end 2012
Heilongjiang University	130,050	318,270	34,980	36,250
Harbin University of Commerce	45,170	155,340	29,400	31,810
Harbin University of Science and Technology	80,540	307,960	60,460	46,060
Harbin Medical University	70,690	331,660	38,490	36,900
Northeast Agricultural University	73,710	357,000	67,450	40,270
Harbin Normal University	80,800	455,010	35,010	35,010
Jiamusi University	80,120	260,000	34,360	18,840
Heilongjiang Institute of Technology	32,730	92,590	36,570	38,820
Qiqihar University	73,460	280,740	25,900	25,930
Average	74,140	284,290	40,290	34,430

Sources: JICA internal documents; responses to the questionnaire from the executing agency.

The equipment procured by this project have generally been well used, and seven out of the nine targeted universities answered that the utilization rates of major equipment procured under this project were more than 90% to more than 100%. The remaining two universities said that the rates were around 70%, due to several reasons including replacement of old PCs with new ones, obsolescence of some equipment over time, changes in research themes, and insufficient parts at the time of arrival. Some measures to increase the utilization rates have already been taken: with respect to the insufficient parts, the concerned universities and the Education Bureau

[10] At appraisal, this indicator was not designated as an operation and effect indicator for this project. However, in the ex-post evaluation the indicator was considered necessary for confirming how the project responded to the quantitative expansion of teaching and research, and therefore the data was collected including those from before the project.

are considering to procure them; and in one case, a teacher has been newly recruited for an area of research that would require use of the non-used equipment. Also, utilization of large equipment has been enhanced by incorporating them into platforms for sharing of laboratory equipment [11] within universities and at Heilongjiang Department of Science and Technology.

Scanning electron microscope (SEM) that was booked for a month. Before this project, students had to travel to Harbin for laboratory work using SEM. (Qiqihar University)

On the visits made to each target university for ex-post evaluation, the evaluator made observations of major equipment focusing on the more expensive or highly-used ones, and confirmed that they were being utilized. All universities named many equipment as being useful, including laboratory analytical instruments, experimental equipment for teaching, computers and networking equipment. For example, Harbin University of Science and Technology mainly procured equipment with high unit prices and adopted a policy to avoid short lived equipment such as PCs, but instead to buy those usable for a longer term. According to the university, the transmission electron microscope, with which the university bought a full set of equipment for pretreatment of samples, is particularly well used, and was thus commended as an excellent equipment of the provincial laboratory equipment platform.

(2) Qualitative enhancement of teaching and research

It was found that the average school building area and the monetary value of equipment per student satisfied the national standard at most targeted universities, implying that the quality of teaching/research environment was ensured to a certain degree (Table 5). The increment in the area per student achieved through this project was below the planned value due to the rapid increase in the number of students.

[11] A system to which laboratories register their equipment for use by other faculties (schools) or outside institutions. In some cases, the equipment were concentrated to an integrated laboratory named such as Testing Center, and in other cases, the equipment were installed at individual laboratories, which allowed outside researchers to use them upon request.

Table 5: School building area (teaching, research and administration) per student and monetary value of educational equipment per student

Units: m^2 or yuan

	School building area per student (m^2)					Value of educational equipment per student (yuan)	
		Planned 2007		Actual 2012			
	Actual 2002	Area per student	Increment through this project	Area per student	Increment through this project	Actual 2002	Actual 2012
Heilongjiang Univ.	8.1	13.1	0.9	32.90	0.6	4,651	8,071
Harbin Univ. of Commerce	18.6	19.9	0.8	24.15	0.6	3,468	6,120
Harbin Univ. of Science and Technology	13.6	14.8	-	16.64	-	2,926	8,193
Harbin Medical Univ.	28.1	20.2	1.0	29.39	0.9	10,500	20,200
Northeast Agricultural Univ.	8.7	15.5	-	13.59	-	4,200	14,388
Harbin Normal Univ.	11.7	18.3	-	30.49	1.3	4,824	11,371
Jiamusi Univ.	14.4	15.8	1.0	27.50	1.0	3,969	10,614
Heilongjiang Institute of Technology	16.8	22.3	1.6	19.14	1.1	4,000	14,700
Qiqihar Univ.	13.4	13.3	1.4	29.20	1.3	4,637	10,954
Average	14.8	17.0	1.1	24.78	1.0	4,797	11,623

Sources: JICA internal documents; responses to the questionnaire from the executing agency.
Notes: The national standards of per student school building area of regular undergraduate schools are as follows: total school building area including canteens and dormitories should be "more than $30m^2$", and teaching, research and administration building area should be "more than $20m^2$" in natural science faculties, "more than $15m^2$" in humanity and social science faculties and "more than $30m^2$" in physical education and art faculties (Interim Provisions for Establishment of Regular Undergraduate Schools, No.18 [2006]). The national standard for value of educational equipment per student is "more than 5,000 yuan" for laboratory equipment in faculties of science and technology such as science, engineering, agriculture and medicine, "more than 3,000 yuan" for humanity and social science faculties, and "more than 4,000 yuan" for physical education and art faculties according to the above-mentioned Interim Provision No.18 [2006].

Various indicators to measure the achievements of progress in the areas of teaching and research, such as the number of key disciplines and key laboratories[12], the number of faculties/departments and graduate programs, the number of research projects and social (community) services[13] projects, the number of published research papers, the number of awards, the number of patents granted, etc., showed increasing trends (Table 6).

[12] Key disciplines and key laboratories are ones that the state or a local government designates as a base for teaching or research activities and to which resources are preferentially distributed. In this ex-post evaluation, the number of these was used as indicators to show high quality of disciplines and laboratories.

[13] As Social (or community) services, the number of research, testing, etc. commissioned by external organizations (government, companies, etc.) and the number of training courses conducted for those organizations were counted.

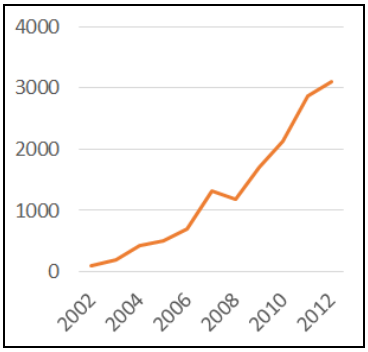
Table 6: Trend of major teaching/research indicators (total of the targeted universities)

Indicator	Actual 2002 or 2007 [1)]	Actual 2012
Number of key disciplines (state level)	5	12
Number of key disciplines (provincial/ministerial)	95	174
Number of key laboratories (state level)[2)]	2 (2007)	2
Number of key laboratories (provincial/ministerial)[2)]	34 (2007)	60
Number of undergraduate faculties/departments	326	525
Number of master's degree programs	205	794
Number of doctorate degree programs	57	223
Number of research projects (state level)	65	391
Number of research projects (provincial/ministerial)	239	745
Number of social services projects [3)]	95	466
Number of award-winning researches (state level)	0 (2007)	8
Number of award-winning researches (provincial/ministerial)	70 (2007)	228
Number of patented research outcomes	121 (2007)	1,094

Sources: JICA internal documents, responses to the questionnaire from the executing agency.
Notes: 1) Where the data of 2002 were eigher non-available or not comparable with the ex-post data due to difference in counting, the data of 2007 were used. 2) The number of key laboratories is a total of the eight universities that provided the data. 3) The number of social services projects is a total of the seven universities that provided the data (but 50 projects of Heilongjiang University in 2012 was excluded because the data of 2007 was not available from that university).

Although such improvements are the outcome of the overall higher education development policies mentioned in "3.1 Relevance", many cases are attributable to the outcome of this project through utilization of the facilities/equipment developed under the project and/or involvement of teachers who received training in Japan in teaching/research activities under this project. Below are some examples.

- Example of being designated as key disciplines: the project inputs were concentrated to the development of key disciplines of biology and chemistry. Accordingly, the Chemistry Building was constructed, analytical and testing instruments such as microscopes were procured, and teachers who were candidates to be leaders of the key disciplines were sent to Japan for training. Such development also accelerated the development of provincial (i.e. designated by the province) key disciplines. For example, a discipline "Genetics" was designated as a second-level provincial key discipline in 2006, and then it became a first-level provincial key discipline in 2011, because "Biology" that contains "Genetics" as a constituent



Source: prepared based on responses to the questionnaire from target universities.

Figure 1: Total number of internationally- published research papers by each of the targeted universities

was designated as a fist-level key discipline[14]. An ex-participant in teachers' training in Japan became the leader of the discipline. (Qiqihar University)

- Example of winning research projects: after the training in Japan, a teacher remained in Japan as a researcher and to obtain a doctoral degree, and was engaged in research as well as research & development in the field of biometrics. After returning to China, she won large research projects such as the one funded by the National Natural Science Foundation of China. (Harbin University of Science and Technology)

- Example of social services: based on the research in computational intelligence which he was engaged in his training in Japan and using the equipment procured under this project, a teacher provided a Chinese company with technical assistance in developing an automatic control system for wastewater treatment. The system developed is used in four out of more than ten wastewater treatment plants in the Songhua River basin, including the monitoring center in Harbin. (Harbin University of Science and Technology) (Besides this university, many universities reported cases of social services that benefited from this project.)

- Example of research papers: The number of internationally-published research papers, i.e. those cited in the SSCI, SCI, EI or ISTP[15], produced by ex-participants in teachers' training in Japan under this project amounted to 43 during the period from 2002 to 2012. The total impact factors[16] of those papers were more than 169.77. (Harbin Medical University)

- Example of patented research results: a resin composite material with a high dielectric constant that was developed using the transmission electron microscope (TEM) and other equipment procured under this project received a patent. The teacher engaged in this development learned about the research techniques using TEM in Japan. (Harbin Normal University)

[14] The first-level disciplines are the large category and the second-level disciplines are the small category. When a fist-level discipline is designated as a key discipline, all subordinate second-level disciplines become key disciplines as well.

[15] SSCI (Social Science Citation Index), SCI (Science Citation Index), EI (Engineering Index) and ISTP (Index to Scientific & Technical Proceedings) are all citation indices for internationally-published research papers.

[16] The impact factor is a measure of importance of an academic journal, based on the number of citations.

3.2.2 Qualitative Effects[17]

(1) Effects on enhancement of teaching and research at each targeted university

Regarding effects of the hardware components, it was confirmed from interviews with the provincial Education Bureau and targeted universities as well as document review that the educational/ experimental facilities and equipment developed under this project have contributed to the improvement of the following aspects to a certain extent.

- The national undergraduate education level evaluation by the Ministry of Education[18]: during the implementation period of this project, three of the targeted universities underwent the national undergraduate education level evaluation. Heilongjiang University and Qiqihar University were evaluated as "Excellent", and Heilongjiang Institute of Technology was evaluated as "Good". They commented that the equipment procured by this project contributed to such evaluation results through improvement of teaching conditions.

- Improvement of conditions for teaching and experiments: all targeted universities commented that they were able to eliminate shortages of facilities and equipment due to the rapid increase in students and that they became capable of providing more practical education by acquiring additional equipment and increasing the proportion of laboratory classes. For example, a teacher at Harbin Medical University said that before the project, he could only show students micrographs that were published in journals, and after the project, he became able to show them micrographs that he took using the equipment procured under this project. Also, at the Comprehensive Practice Center of Economic Management of Harbin University of Commerce, students are now able to simulate company management, international trade, banking, stock transactions, futures transactions, etc. using computers procured under this project (that accounted for almost all of the computers of the Center during project implementation, but at the time of ex-post evaluation, 60% were those purchased by the university after the project) and software donated by companies. Students in 38 out of 58 majors of Economic

[17] In this ex-post evaluation, it was difficult to exclude effects of activities that were not under this project from the planned quantitative indicators. Therefore, while taking the trends of the indicators into consideration, qualitative information (collected by document review, questionnaires and interviews) was used to understand how specifically this project is related to such trends. The evaluator conducted individual or group interviews in a semi-structured manner with the provincial Education Bureau (executing agency) and, at each targeted university, with persons in charge of the project implementation as well as ex-participants in teachers' training in Japan. In total, 147 persons from the 9 universities (including 46 ex-participants in teachers' training in Japan) were interviewed. With respect to interviews with universities in Japan that accepted teachers for training from the targeted universities, the evaluator visited one of them and contacted several more universities by telephone or e-mail.

[18] An evaluation conducted by the Ministry of Education of China to assure quality of higher education. 198 universities and 87 universities were evaluated in 2007 and 2008, respectively. The evaluation criteria are multifaceted including university management, teaching staff, students, facilities and equipment, academic disciplines/graduate programs, etc. The assessment is made in four levels, "Excellent", "Good", "Qualified", and "Not Qualified".

Management use the Center, and many of them got successful results in various student competitions. The Center was designated as a provincial-level experimental teaching model center in 2006, and as a state-level experimental teaching model center in 2008.

- Regarding the enhancement of research and social services, all targeted universities answered that the equipment developed by this project enabled them to construct key laboratories, acquire new research projects and provide new social services (see also "3.2.1 Quantitative Effects).

Students practicing model business activities at the Comprehensive Practice Center of Economic Management

(Harbin University of Commerce)

Equipment for mechanical and electrical systems. A new experimental course was opened using these equipment. (Heilongjiang Institute of Technology)

Laser molecular beam epitaxy (Laser MBE) system used for analysis of new functional materials, etc. (Harbin University of Science and Technology)

As to effects of the software component, ex-participants in the teachers' training in Japan provided the following comments. In each point, the numbers in ( ) represents the number of universities (out of the nine universities) where the interviewed teachers said the project was "useful" for the concerned aspect.

- Promotion (5 universities): after returning from Japan, teachers became core staff members (such as heads of schools, deans, heads of research center, professors, qualified doctoral advisors, etc.) of the respective universities.

- Teaching method (7 universities): teachers were able to learn about the state of undergraduate and graduate teaching in Japan. Although it is difficult to directly apply it to undergraduate education in China (because the number of undergraduate students is much higher), they are utilizing a part of what they learned in their teaching after returning from Japan. For example, some started allowing undergraduate students to conduct experiments with graduate students. For graduate students, some teachers introduced to them the seminar style and experiments in smaller groups.

- Operation of laboratory equipment (2 universities): some teachers learned how to operate advanced laboratory equipment. After returning to their universities, such experience and knowledge was useful when similar equipment was purchased either under this project or using other budget resources.

- Approach and style of research (8 universities): teachers were impressed by the attitude towards research in Japan, such as seriousness, attention to details, and thoroughness in pursuing the answer, and tried to incorporate such attitudes after returning to their respective universities.

- Contents and direction of research (6 universities): some teachers decided on research themes in Japan, and these determined the direction of their research thereafter. They brought back new research themes to their universities, and students began to be involved in research in such themes.

- Foundation for overseas activities (2 universities): training under this project provided a foundation for overseas research to some universities and participating teachers. It then opened a path to research in western countries and publication of papers in international journals. Some ex-participants in the university management course said that after they learned about internationalization of universities, they began to put more weight on the candidates' overseas experience when recruiting teachers.

Besides such positive responses, all targeted universities pointed out that the 6-month duration of training, which was applied to the majority of teachers, was too short for participants to deepen their specialization skills. Therefore, some teachers extended their stay or revisited Japan using other financial resources or on their own.

The table below summarizes notable effects, including those mentioned above, of the project on teaching and research at each targeted university.

Table 7: Qualitative effects at each targeted university

Heilongjiang University	Overall, the university implemented the project smoothly and achieved good results. Arts and sciences were well balanced in both procurement of equipment and training in Japan. A teacher who had learned about the Bills of Exchange and Promissory Notes Act of Japan contributed a lot to drafting of the bill to revise the Commercial Law of China that is currently being processed. There were also unique cases of training in Japan such as the one for collection of documents related to China-Japan political history before World War II.
Harbin University of Commerce	The equipment procured, mostly PCs and language laboratories, are well utilized at the time of ex-post evaluation. A case that has a unique feature is the Comprehensive Practice Center, which is equipped with the simulators for business activities such as company management, money and banking and investment (developed mainly with the equipment under this project). Joint research with companies as well as social services are active. The project equipment is used also for adult education. Besides, the university conducted administration management training for officials of developing countries with use of the project equipment. So far nine courses were held.
Harbin University of Science and Technology	With the aim to develop as a research university, the procurement under this project was focused on large equipment. The transmission electron microscope, with which the university fully developed equipment for pretreatment of samples, is particularly well used and was thus commended as excellent equipment of the provincial laboratory equipment platform. Teachers achieved results after returning from training in Japan, such as in areas of research and development and basic research in biometrics, development of an automatic control system and use of that system for waste water treatment plants along the Songhua River, publication of a book on environmental laws that are referred to by the government, and so on. The training component and procurement component were linked to each other in many cases. Also, there are recognized cases of indirect contribution of graduates to key industries and environmental protection.

Harbin Medical University	The university installed a number of equipment at the Teaching Building of the School of Pharmacy constructed using the local currency portion of the cost of this project. The status of operation and maintenance of such equipment is good, producing a number of good practices, i.e., positive impacts on research, clinical services and teaching. The university had sustained a wide range of exchanges with Japanese universities, and such relationships were reinforced through this project. The International Office advised on which university to visit based on the degree of matching.
Northeast Agricultural University	The university had been very active in social services including development of new breeds of soybeans and corns, to which the general purpose laboratory equipment procured under this project contributed. Educational effects and good practices by ex-participants in teachers' training in Japan were also observed. The operation and maintenance status is also good: for example, the language laboratories developed in 2008 are still highly utilized.
Harbin Normal University	While being a normal university, it had placed importance on scientific research. Therefore, most of the equipment procured under this project were large analytical instruments. The university constructed a common experimental center facility as an additional output of this project, and registered all project equipment to the large equipment sharing platform of Heilongjiang Province for utilization for social services. However, some of the equipment has not been fully functional: the transmission electron microscope could not be used with an analytical instrument that was intended to be used together, because the delivered equipment had a different specification than expected; and some equipment have had unspecifiable problems since they arrived. There are many good practical outcomes of research results and academic exchanges with Japan involved by ex-participants in the teachers' training, such as opening of new courses and setting of new research themes.
Jiamusi University	The School of Life Sciences used the equipment procured under this project for establishment of the Testing Center (equipment sharing platform), which is also registered to the large equipment sharing platform of Heilongjiang Province. The equipment have basically been well utilized although there have been some cases of troubles. In a visit to one university for the ex-post evaluation, an instrument was being underutilized, although it was only a very small part of the procured equipment, since the trouble had not been solved because there was no response received to an inquiry sent to the manufacturer. Also, some language laboratory equipment were broken down as they became old. On the other hand, the university made full use of the opportunities of training in Japan under this project. After their return to China, teachers have promoted research, education (they opened a number of new experiment courses) and social services (some of which have been commercialized in the field of pharmacy) with the use of the equipment procured by this project. Also, some teachers who returned from Japan also contributed to the upgrading of the Japanese Language Program.
Heilongjiang Institute of Technology	Every year, 80% of a total of more than 500 graduates from the School of Automobile and Traffic Engineering, where a Japanese auto manufacturer has human resource development center, are employed in the automobile industry. The project benefited the school in that a teacher who was trained in Japan and the laboratory equipment promoted research and enhanced practical skills of graduates. The teacher also published a book on his research in hybrid engine vehicles. Another example was found at the School of Surveying and Mapping Engineering, where there is a collaborative relationship with a worldwide optical instrument manufacturing company (it opened a showroom within the school as the university purchased a number of its products under this project) and provision of surveying services to Harbin City.
Qiqihar University	The university attached high value to this project, and carefully selected the equipment that was limited to large equipment for laboratories in priority disciplines. At the same time, the university sent teachers of those laboratories to Japan for training. The procured equipment were all registered to the university-wide equipment sharing platform, which initially started with the project equipment only. Booking procedures and management of the equipment are all conducted online. When a visit was made to the university in mid-November 2013, the scanning electron microscope, the most frequently-used equipment, was fully booked until the end of the following month. Many of the ex-participants in the training in Japan were promoted to discipline leaders or took management positions such as the head of the science and technology office and deans of graduate programs. They are actively engaged in joint research with professors in the host universities in Japan as well as student exchanges with those universities. Also, in one case, the equipment procured by this project was used for development of an instrument for river water purification that was put into practical use.

Sources: Prepared based on responses to the questionnaire from targeted universities, interviews with them, information from their websites, etc.

3.3 Impact

3.3.1 Intended Impacts

(1) Enhancement of teaching and research at the provincial level

Table 8 shows some higher education indicators at the provincial level. Improvement is seen in the quantitative indicators such as higher education enrollment rate that were planned at appraisal. As the targeted universities of this project are all top ranked among regular HEIs of the province in terms of size and other criteria[19], it can be said that they have lead such improvement.

Table 8: Higher education indicators of Heilongjiang Province

	Actual 2002	Planned 2007	Actual 2007	Actual 2012
Number of regular HEIs	48	58	68	79
Number of students enrolled in regular HEIs	443,000	542,000	635,000	705,000
Enrollment rate in HEIs	15.3%	17%	26.8%	38.8%
School building area per student (average of targeted universities) (m^2/person)	36.79 m^2	8 m^2	32.70 m^2	25.13 m^2

Sources: Prepared based on JICA internal documents, responses to the questionnaire from the executing agency, provincial statistics, etc.

(2) Contribution to regional vitalization, market economy reform support, and environmental conservation

Regarding the three development issues intended at appraisal, namely, (i) regional vitalization, (ii) market economy reform support and (iii) environmental conservation, sufficient quantitative data to show the overall trend could not be collected for ex-post evaluation. Also, as large-scale universities tend to simultaneously implement a number of development projects, which made it difficult to see the impact of this project. Nevertheless, at least certain cases of contribution of this project were observed in all targeted universities, including the ones that the facilities and equipment were used for research that would benefit the development and environment of the province and the concerned cities, and that teachers who were trained in Japan were playing important roles in the educational aspect (i.e. through development of good graduates) and the research aspect (through university-industry collaboration and social services). Many cases are reported particularly in the area of environment.

(i) Regional vitalization

First, regarding how the project provided human resources to the province's key industry (information technology, biotechnology, automobile, petrochemical industry and pharmacy), the

[19] For example, the total number of students of the nine targeted universities accounted for 34% of the total number students of all of the 79 regular HEIs in the province (data are all as of 2012). Also, according to "China Colleges and Universities Rankings 2012" of the Chinese Universities Alumni Association, all targeted universities were ranked between the 3rd to the 13th places in Heilongjiang Province (the first and second places were taken by Harbin Institute of Technology and Harbin Engineering University, both state-run and outside the scope of this project).

targeted universities did not have precise data on employment status of graduates. Therefore, the number of graduates who majored in those fields was evaluated instead. From the available data the number of such graduates (ranging between 100 and 2,000 persons depending on university) showed an increasing trend. In this relation, targeted universities also commented that a certain portion of the graduates are employed in the concerned industry, and this project contributes to regional vitalization indirectly through improvement of graduates' practical skills. For example, a teacher of Heilongjiang Institute of Technology conducted research on hybrid engine and made observation visits to relevant vehicle manufacturers during his training in Japan. He continued his research after returning to China, and published research papers and a book on the structural principles and maintenance of hybrid engine vehicles. He also said that the practical skills of students improved by using the equipment for electro mechanical experiments procured by the project. More than 80% of a total of 520 graduates from the School of Automobile and Traffic Engineering are employed in the automobile industry.

Utilization of the outputs of this project in vocational education and adult education was observed only at two target universities. For example, Harbin University of Commerce named examples of the use of the multimedia systems, accounting systems and information systems developed under this project.

As to the project's contribution through dispatch of teachers and doctors to rural areas, only Harbin Medical University said that it dispatched around 1,000 doctors every year. All other universities seldom dispatched human resources to rural areas, and including Harbin Medical University, particular connection with this project was not observed.

(ii) Market economy reform support

The number of graduates in the related fields (i.e. economics, law, accounting, finance, etc.) is generally increasing (ranging between less than 100 and 1,000 persons depending on university). Five universities acknowledged the indirect contribution of this project, mainly instruction by teachers who were trained in Japan, to provision of human resources with higher practical skills. Also, there were cases of contribution of some facilities/equipment and teachers through social services and university-industry collaboration. For example, a teacher of the College of Law of Heilongjiang University learned about Japan's Bills of Exchange and Promissory Notes Act during his training in Japan under this project, and expanded what he had learned in Japan in the late 1990s. After returning from Japan, he became known as a leading expert in laws of bills of exchange in China. Sponsored by the China Law Society, he led and completed the drafting of the part related to laws of bills of exchange in the draft bill to revise the Commercial Law of China. According to him, the draft bill was about to be put to the state legislation process. He also said that the training in Japan under this project led the College to start an annual conference on civil and commercial laws of China with a Japanese law association.

(iii) Environmental conservation

The number of graduates in the environment-related fields is increasing (ranging between less than 100 and 1,000 persons depending on university). Most of the targeted universities acknowledged indirect contribution of this project to environmental conservation through providing graduates with higher practical skills. At the same time, those universities all reported concrete cases where research outcomes, university-industry collaboration and social services using the procured equipment and the ideas or methods that teachers learned in Japan contributed to environmental measures. For example, a teacher of Northeast Agricultural University used part of the agricultural mechanical techniques that he had learned in the training in Japan when he participated in a project to improve wind generation motor technology in Shangzhi County. According to him, the improved machinery has already been produced and distributed. As another example, Jiamusi University uses part of the project equipment in water quality monitoring of the Songhua River that is commissioned by the government of Jiamusi City.

3.3.2 Other Impacts

(1) Impacts on the natural environment

No negative impacts were observed. By the time of the appraisal, all targeted universities had completed the necessary domestic procedures of environmental clearance with the environmental impact assessments (EIA) approved by the environmental protection department of the province or the cities where the universities are located. Some noises, vibrations and dusts due to the building construction and foul water due to the use of the constructed facilities had been expected but to a small scale. During the project implementation period as well as after project completion, each school said that it has been taking necessary measures of exhaustion, water discharge and noise control and that it implemented environmental monitoring as planned.

(2) Land acquisition and resettlement

As planned in the appraisal, there was no land acquisition and resettlement associated with this project.

(3) Strengthening of exchanges and cooperation with universities in Japan

Impacts of the project on strengthening of exchanges with universities in Japan were observed. In some cases new relationships were built with universities in Japan, and in other cases the existing relationships were strengthened after the project. While there were a few cases where the exchanges were developed to university-level cooperation (e.g. Heilongjiang University and Kochi University of Technology), most of the exchanges seemed to be at the teacher (individual) or faculty levels, including invitation of teachers from Japan for lectures, sending students to Japan for study and joint research.

The outcomes of individual cases of exchange are described in Table 7. Overall, almost all of the interviewed ex-participants in the teachers' training under this project said that they had been strongly impressed by the elaborateness of teaching and research activities at universities in Japan and seriousness of the Japanese people, and had come to feel more familiar with Japan. Generally, western countries tend to be more preferred as the place to visit, but many teachers who participated in this project said that they talked about their research and life in Japan to their colleagues and students, who then gained a better understanding of Japan.

This project has mostly achieved its objectives, therefore its effectiveness and impact is evaluated to be high.

3.4 Efficiency (Rating: ②)

3.4.1 Project Outputs

The actual production of the outputs is summarized in "Comparison of the Original and Actual Scope of the Project" on the final page of this report (the floor area of the buildings constructed for each university is in Table 3). The "hardware" outputs were mostly produced as planned while there were a few additional building construction, cancellation of some education and research equipment (due to reasons such as discontinuation following the delay in project implementation), and small changes in the specifications and location of some other equipment.

As for the "software" outputs, the total number of teachers sent to Japan for training was below the planned number, while some universities sent more teachers than planned to respond to demands. The main reasons for such an overall decrease include difficulties in securing the host universities with the areas of research that matched the teachers' (trainees') research areas, difficulties to send internally-appointed teachers (trainees) after the postponement of the training schedule due to project implementation delays, and reallocation of the project funds from training to procurement of equipment. Some invitation of experts from Japan were cancelled, because sending Chinese teachers to Japan were given higher priority. Unlike Inland Higher Education Projects (ODA loan projects) in other provinces, this project sent only a small number of personnel to the university management course. According to the provincial Education Bureau, this was because overseas training of government officials were restricted at the time this project was being implemented.

During the project implementation period, the provincial Education Bureau organized various training courses for personnel of the targeted universities in charge of implementation of this project. The subjects included procurement, project management, accounting, intellectual property rights, etc. The Education Bureau also organized study tours to Inland Higher Education Projects in other provinces in order to upgrade those personnel's project management skills: on a visit to Chongqing Municipality, participants received guidance from the Municipal Education Commission (the executing agency), and on visits to other provinces, they made

observations of the universities targeted in those provinces such as Jilin University.

Laboratory Building

(Jiamusi University)

Part of this building was constructed as an additional output of this project. A common laboratory (equipment sharing platform) was established there.

(Harbin Normal University)

The project-related documents that are still well managed.

(Northeast Agricultural University)

3.4.2 Project Inputs

3.4.2.1 Project Cost

As shown in the table below, the total project cost was 8,801 million yen (of which the Japanese ODA loan was 4,733 million yen), which was within the plan (ratio against the plan: 92%).

Table 9: Planned and actual project costs

Unit: million yen

	Plan (appraisal)			Actual		
	Foreign currency	Local currency	Total	Foreign currency	Local currency	Total
1. Building construction	0	3,418	3,418	0	3,490	3,490
2. Equipment	4,409	1,047	5,456	4,568	577	5,145
3. Training	231	0	231	160	0	160
4. Price contingency	95	1	96	0	0	0
5. Physical contingency	237	169	406	0	0	0
Total	4,972	4,635	9,607	4,729	4,067	8,796

Sources: JICA internal documents, responses to the questionnaire from the executing agency.
Notes: As the actual amount in the table does not include the disbursement charges, the total amount is different from the amount mentioned in the main text. Also, due to rounding down of the fractions smaller than 1 million yen, the breakdown and total amounts may not match. The exchange rates applied were: (planned) 1 yuan=14.3 yen; (actual) 1 yuan=13.8 yen.

3.4.2.2 Project Period

As shown in Table 10, the actual project period was 90 months, which was longer than the planned 61 months (ratio against the plan: 148%). The major reason reported by the provincial Education Bureau was that the procurement process was complicating and thus took a longer time than planned. On the other hand, the Education Bureau learned from Inland Higher Education Projects in preceding provinces and switched the procurement packaging from procurement by type of equipment to procurement by university in midstream in order to

minimize the effect of the delays to each university. Also, it tried to avoid effects of frequent personnel turnovers by strictly controlling documentation and handing over tasks to the succeeding staff. Such efforts of project management by the executing agency are worth noting..

Table 10: Planned and actual project periods

	Plan (appraisal)	Actual
Signing on Loan Agreement	March 2004	March 2004
Building construction	June 2004	May 2010 (The originally-planned portion was completed in the planned period)
Procurement of equipment	March 2007	August 2011
Training	March 2009	August 2011
Project completion (lengths of months)	March 2009 (61 months)	August 2011 (90 months)

Sources: JICA internal documents, responses to the questionnaire from the executing agency.

3.4.3 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 was not possible.

Although the project cost was within the plan, the project period exceeded the planned period, and therefore efficiency of the project is evaluated to be fair.

3.5 Sustainability (Rating: ③)

3.5.1 Institutional Aspects of Operation and Maintenance

As planned during the appraisal, the facilities and equipment developed under this project are operated and maintained by each targeted university, and the Education Bureau of Heilongjiang Province, the executing agency, oversees them. All targeted universities added the developed facilities and the equipment to the universities' fixed assets, and established the operation and maintenance system with clearly defined responsibilities and procedures through establishing regulations such as the procedures for maintenance of large equipment and fund management, work regulations on experiment teaching, the procedures for fixed asset management, etc. The division of responsibilities among related organizations is clear, and there are no issues recognized with respect to the number of staff in charge of operation and maintenance.

3.5.2 Technical Aspects of Operation and Maintenance

No problem was observed in the technical aspects as all targeted universities regularly carry out maintenance and inspection of the facilities and equipment, and outsource repair works to contractors such as suppliers when necessary. To secure the skills necessary to operate and maintain large or sensitive laboratory equipment, the universities appoint full-time technical

staff for each instrument or laboratory to manage the equipment in an integrated manner. At all targeted universities, the manuals and precautions are posted near individual instruments for easy reference. Also, it was reported that teachers in charge of sensitive equipment receive technical training regularly from the manufacturers.

3.5.3 Financial Aspects of Operation and Maintenance

The targeted universities are all overseen by the provincial government. Their budgets consist of subsidies from the state or province and own income such as tuitions and fees. Although the financial data were only partially available, the budgets of the province and individual universities are generally stable or in an increasing trend, and revenues and expenses are well-balanced at each university (Tables 11 and 12). Based on the interviews, it can be said that the necessary budget for operation and maintenance is ensured in the university budget[20]. None of the main facilities and equipment developed under this project were found unused due to lack of budget for operations and repairs.

Table 11: Financial expenditure of Heilongjiang Province

Unit: billion yuan

	2010	2011	2012
Total expenditure	254.1	339.8	369.6
% of increase of expenditures in the education sector over the previous year	12.2%	25.0%	45.7%

Source: Prepared based on statistics from provincial Education Bureau.

Table 12: Revenues, expenditures and operation and maintenance (O&M) expenses of the targeted universities

Unit: thousand yuan

	2010		2011		2012	
Heilongjiang University	Income	611,487	Income	822,881	Income	855,389
	Expenditure	611,929	Expenditure	857,702	Expenditure	877,682
	of which O&M	2,150	of which O&M	2,210	of which O&M	2,250
Harbin University of Commerce	Income	416,758	Income	754,955	Income	592,250
	Expenditure	362,858	Expenditure	724,476	Expenditure	496,352
	of which O&M	1,845	of which O&M	2,254	of which O&M	2,668
Harbin University of Science and Technology	Income	282,830	Income	470,800	Income	370,590
	Expenditure	282,830	Expenditure	470,800	Expenditure	370,590
	of which O&M	2,470	of which O&M	2,520	of which O&M	2,850
Northeast Agricultural University	Income	409,210	Income	634,530	Income	681,870
	Expenditure	422,290	Expenditure	495,960	Expenditure	759,020
	of which O&M	9,030	of which O&M	13,850	of which O&M	5,840

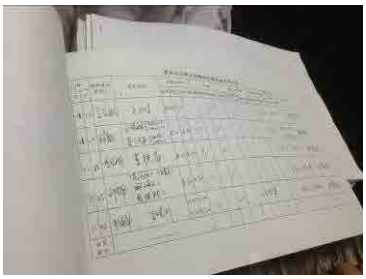
[20] Although the data were not available, all universities said that they use income from testing services and other services using equipment for maintenance of the equipment.

	2010		2011		2012	
Harbin Normal University	Income	746,628	Income	1,133,466	Income	822,833
	Expenditure	746,628	Expenditure	1,133,466	Expenditure	822,833
	of which O&M	1,968	of which O&M	2,709	of which O&M	3,671
Jiamusi University	Income	438,255	Income	552,889	Income	576,012
	Expenditure	438,255	Expenditure	559,563	Expenditure	575,663
	of which O&M	15,960	of which O&M	24,609	of which O&M	45,855
Heilongjiang Institute of Technology	Income	254,121	Income	321,677	Income	314,149
	Expenditure	254,121	Expenditure	321,677	Expenditure	314,149
	of which O&M	266	of which O&M	230	of which O&M	479
Qiqihar University	Income	391,696	Income	495,734	Income	493,286
	Expenditure	346,581	Expenditure	495,618	Expenditure	493,286
	of which O&M	431	of which O&M	534	of which O&M	813

Source: Responses to the questionnaire from target universities.
Note: The O&M expenditures of Jiamusi University are one digit larger than other universities. It was explained that the amounts included personnel costs and were double checked.

3.5.4 Current Status of Operation and Maintenance

In all targeted universities, the equipment developed by this project are registered in the maintenance and management database. Based on observation and review of usage or inspection records, it was confirmed that the equipment were mostly in good condition. A user of equipment must record the usage as well as the conditions of the equipment every time they use it. A few pieces of equipment were out of order. While most of them were under repair, a very small part of them such as the confocal laser scanning microscope of Jiamusi University had no prospect for repair as the manufacturers had not responded to the inquiries from the universities. All universities said that there is no problem in purchase and stock of spare parts that are produced.


Log book for large laboratory instruments.
(Heilongjiang University)

No major problems have been observed in the institutional, technical and financial aspects of the operation and maintenance system. Therefore sustainability of the project effect is high.

4. Conclusion, Lessons Learned and Recommendations

4.1 Conclusion

This project aimed to improve teaching and research at nine major universities in Heilongjiang Province through the development of their facilities and equipment as well as providing training for teachers. Relevance of the project was evaluated to be high, as it was in line with (i) the higher education policies of China and Heilongjiang Province, (ii) development needs for quantitative and qualitative enhancement of the universities, and (iii) Japan's assistance policies. Effectiveness/impact was also high, based on the observations that the

project satisfied such needs, improved education activities by enabling more experiments, and improved research activities through outcomes achieved from advanced equipment and training, and thereby contributed to the promotion of the key industries as well as environmental conservation. Efficiency of the project was evaluated to be fair on the whole: although the project cost was within the plan, the project period exceeded the planned period due to delays in procurement. Sustainability was evaluated to be high, with no problem observed in institutional, technical and financial aspects, and due to the good status of operation and maintenance of the facilities and equipment developed by the project.

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) The targeted universities are recommended to continue the proper use of the facilities and equipment developed under this project in teaching and research, as well as to extend the knowledge that has been gained from exchanges with Japan.

(2) The Education Bureau and the targeted universities that have unusable equipment (e.g. a microscope not fully functioning) are recommended to solve the problems as soon as possible (e.g. purchase of necessary parts).

4.2.2 Recommendations to JICA

The higher education human resources who were developed by this project and who have gained a good understanding of Japan (i.e. teachers of the targeted universities) should be regarded as resource persons for future cooperation projects with China. Therefore, information on those human resources should be maintained. Utilization of the (Inland) Higher Education Projects web site, which is currently operated for the provinces where the Projects are still being implemented, could be considered. Possible ways to utilize the website for the provinces where the (Inland) Higher Education Projects have been completed could include updating of the information on, and encouraging posting from, those “completed” provinces.

4.3 Lessons Learned

(1) Minimizing effects of delays in procurement of equipment

At some of the targeted universities, the utilization rate of equipment was slightly decreasing due to the obsolescence of some equipment following the delay in the procurement process. Future projects should select a procurement method and type of contract that can flexibly respond to such situations (i.e. where procurement is delayed and it turns out that the initially-planned equipment can no longer fulfill the education and research needs at the time of arrival). If such flexible procurement and contract is not possible, selecting equipment which are least vulnerable to procurement delays (e.g. avoiding short-lived PCs) should be considered.

Also, procurement packaging by university, which minimized the effects of delays to each university in this project, could be considered in similar projects as well in relation to procurement costs.

(2) Avoiding lack of parts upon arrival of equipment

In this project, some equipment lacked necessary parts when they were delivered, and thus were not fully usable. The executing agency made a detailed investigation and found that there were defects on the sides of the manufacturers and suppliers. In addition, however, it was explained that in some cases, the teachers who had prepared the procurement list for the concerned equipment had not clearly listed all necessary parts because those parts were assumed to come with the main equipment. In other cases, all parts had not been fully checked upon arrival of the equipment, and it was too late to complain when the deficiency was found. Such cases are only a very small part of the whole, but the practice should be improved in future projects: it is important to clearly mention all accessories and parts in the procurement list and to fully check them when receiving the equipment.

(3) Making achievements in short-term teachers' training

In order to raise efficiency of short-term training such as half a year, the applicant teachers should prepare clear research plans in advance and show them to the host universities. Also, in order to produce large impacts, JICA could possibly prepare a system to support re-visits by ex-trainees to Japan and visits by Japanese advisors to China (e.g. approach the host universities in Japan and provide information and opportunities, etc.).

End

Comparison of the Original and Actual Scope of the Project

Item	Original	Actual
1. Project Outputs	Target: 9 universities in Heilongjiang Province	Target: same as planned
(a) Hardware i) Building construction	10 buildings such as experimental building for 6 universities; total floor area of 129,000m^2	Completed: 11 buildings such as experiment building for 7 universities (a university additionally constructed a part of a building, but no data on floor area of that portion was available); total floor area of 130,333m^2
ii) Procurement of educational equipment	Chemistry, material science, environmental science, basic medicine, public health, pharmacy, mechanical engineering, electric engineering, automobile engineering, language, economic management, etc.	Areas of education: same as planned Total 833 items 4,917 pieces
(b) Software Teachers' training in Japan or acceptance of experts from Japan	Total 179 persons (including 4 experts from Japan)	Total 140 persons sent to 50 Japanese universities or institutions (experts from Japan: none)
2. Project Period	March 2004 – March 2009 (61 months)	March 2004 – August 2011 (90 months)
3. Project Cost Amount paid in Foreign currency	4,972 million yen	4,733 million yen
Amount paid in Local currency	3,635 million yen (254 million yuan)	4,068 million yen (295 million yuan)
Total	9,607 million yen	8,801 million yen
Japanese ODA loan portion	4,699 million yen	4,556 million yen
Exchange rate	1 yuan = 14.3 yen (As of July 2003)	1 yuan=13.8yen (average during 2004-2011)

People's Republic of China

Ex-Post Evaluation of Japanese ODA Loan

"Shandong Tai'an Pumped Storage Power Station Project"

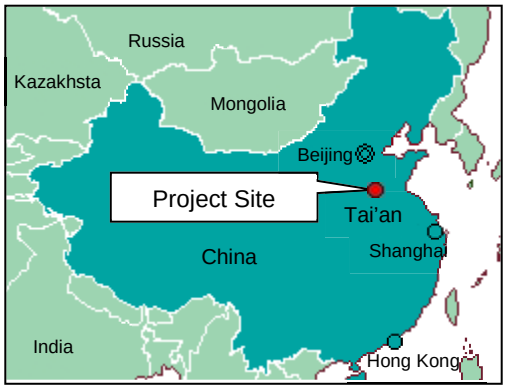
External Evaluator: Masahiro Oseko, OPMAC Corporation

0. Summary

This project was implemented with the purpose of constructing a pumped storage power station at a location in Shandong Province, where air pollution was worsening as a consequence of thermal power generation, in order to realize an environmentally-friendly, efficient power supply, thereby contributing to the economic development of the province. The project was consistent with China's development policy, needs and Japan's ODA policy, and therefore the relevance was high. Primary operation indicators such as maximum output of the power station have been achieved, and positive impacts have been observed in terms of the employment of local residents and regional development. However, as the project has only partially achieved air pollutant emission reduction targets (effect indicators), the effectiveness and impact of the project was fair. The project was implemented efficiently within the planned cost and project period. Therefore, the efficiency of the project is considered high. There have been no problems in terms of institutional, technical and financial aspects of the operation and maintenance of the project, accordingly sustainability of the project is judged to be high.

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

1. Project Description



Project Location

Entrance of Underground Power Station

1.1 Background

China became the world's second largest power generation country in the late 1990s as a result of their emphasis on developing electric power as the driving force to support strong economic growth. China's power generation capacity has continued to grow in response to strong economic growth, at over 10% per year since the 2000s when they emerged from the

Asian economic crisis. Meanwhile, despite environmental issues having been exacerbated with thermal power plants making up over 70% of China's power supply, the development of coal-fired power plants has gone ahead against the backdrop of the increased power demand associated with economic development and China's abundant supply of coal resources. China has thus failed to effectively utilize its abundant hydropower resources.

Shandong, a coastal province of China, is blessed with an abundance of minerals, agriculture, fisheries and energy, and makes up part of the Bohai Bay Economic Rim which has become the driving force of the Chinese economy. Although the province has its own power system (Shandong power network), it has been almost completely reliant on thermal power generation. Furthermore, there is significant disparity between the maximum and minimum load, and output adjustment had been implemented through thermal power plant Daily Start and Stop (DSS) operations[1]. However, DSS operations have increased environmental impact, shortened the life of power generation equipment, decreased thermal efficiency, caused unplanned power outages, and increased operation and maintenance cost as a result. Notably, the air pollution in Shandong Province was primarily from coal combustion, with particulates and sulfur oxides emitted from the power plants comprising a substantial portion of the province's total emissions. Consequently, the environmental impact was becoming more pronounced every day.

1.2 Project Outline

The objective of this project was to realize an environmentally friendly, efficient power supply by constructing a 1,000MW pumped storage power station in Shandong Province where air pollution was worsening, thereby contributing to the economic development of the province.

Loan Approved Amount / Disbursed Amount	18,000 million yen / 9,182 million yen
Exchange of Notes Date / Loan Agreement Signing Date	March 2001 / March 2001
Terms and Conditions	Interest Rate: 0.75% Repayment Period: 40 years (Grace Period: 10 years) Conditions for Procurement: General untied (Consulting Services: Bilateral tied)
Borrower / Executing Agency	The government of People's Republic of China / State Grid Corporation of China
Final Disbursement Date	July 2011
Main Contractors (over 1 billion yen)	Marubeni Corporation (Japan)

[1] DSS refers to the repeated starting up and shutting down of the power plant within a single day in response to changes in power demand. Power plants often operate during the day when power demand is high, and shut down at night.

Main Consultant (over 100 million yen)	Electric Power Development Co.,Ltd. (Japan)
Feasibility Studies, etc.	F/S on power generation: SINOHYDRO Corporation Ltd., 1998 F/S on transmission/transformation: Shandong Electric Power Engineering Consulting Institute Cor. Ltd., 2000
Related Projects	World Bank (1992-1999) Loan for "Zouxian Thermal Power Project" ($ 800 million)

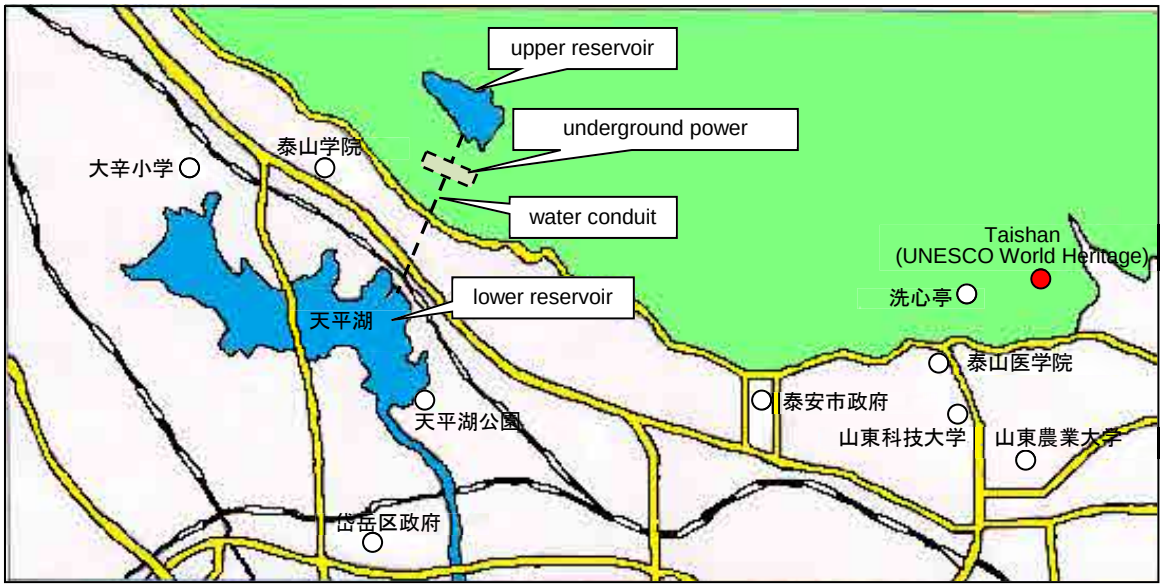


Figure 1: Location of the Project Site

2. Outline of the Evaluation Study

2.1 External Evaluator

Masahiro Oseko, OPMAC Corporation

2.2 Duration of Evaluation Study

Duration of the Study: August 2013 – November 2014

Duration of the Field Study: 30 November – 12 December 2013, 22 and 29 April 2014

2.3 Constraints during the Evaluation Study

In this ex-post evaluation it was attempted to acquire various data and confirm status through interviews and questionnaires on the executing agency (State Grid Corporation of China) and the operation and maintenance agencies (Taishan Pumped Storage Power Co., Ltd. for power generation facility and Shandong Electric Power Group Corp for transmission/transformation facility). However, it was unable to obtain necessary information such as the effect indicators of the frequency of DSS operations of thermal power plants and the amount of coal and oil consumption in Shandong Province during the evaluation period but only

managed to collect partial answers to questionnaires and interviews on financial officers. A pumped storage power plant performs pumping during off-peak periods of low power demand and discharges water and generates power during peak periods of high power demand. Therefore, whether or not an efficient power supply is being implemented effectively is determined by analyzing not only the typical operational status of the power plant, but also whether the plant is operating to match the regional power supply and demand in line with the local government's policies in relation to pumped storage power plant operations. However, since it was unable to confirm the policies and process relating to the operation of pumped storage power plants by the information from the project executing agency and the operation and maintenance agency, there was no choice but to conduct analysis based on the partial data that was available. The results of this ex-post evaluation shown below were derived under those constraints.

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

3.1 Relevance (Rating: ③[3])

3.1.1 Relevance to the Development Plan of China

The "9th Five-Year Plan (1996-2000)" at the time of the project appraisal listed specific measures for emerging away from the conventional policy of increasing power generation capacity to a policy of adjusting power structure, strengthening the transmission and distribution network, and promoting electricity price reform. With regards to environmental considerations, the 9th Five-Year Plan also called for the expansion of clean energy (pumped storage power and small hydroelectric stations in poor and rural areas, etc.) and closure and prohibition on the new construction of small thermal power plants. Environmental considerations continued to be emphasized in subsequent five-year plans, and the "12th Five-Year Plan (2011-2015)" in effect at the time of this ex-post evaluation listed "conversion to a resource-saving and environmentally-effective use society" as one of the “ten big tasks” to improve the quality of economy (to correct imbalances and improve sustainability). This five-year plan also set the following emission reduction goals by 2015 with respect to main contaminants: 8% for chemical oxygen demand (COD), 8% for sulfur dioxide (SO_2) and 10% for nitrogen oxide (NOx). In addition, the “12th Five-Year Plan for Energy Development (2011-2015)” also set the "binding targets" to suppress the primary energy consumption at the level of 4.1 billion tce (tons of coal equivalent), and to increase the proportion of non-fossil energy to 11.4% of the primary energy consumption, of which hydroelectric power should account for two-thirds.

In response to these national government policies, the Shandong Province government planned the Tai’an Pumped Storage Power Station project in their “Shandong Province 9th Five-Year Plan (1996-2000),” and set the goal of reducing coal consumption in the province by

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

[3] ③: High, ②: Fair, ①: Low

approx. 150,000 tons per year by constructing this pumped storage power station. The “Shandong Province 12th Five-Year Plan (2011-2015)” in effect at the time of this ex-post evaluation adopted six guiding principles. One of these guiding principles, "maintain green development," specified energy saving, emission reduction and expansion of environmental conservation as codes of conduct. In addition, the first of four emphasized points in this plan's energy policy is "review coal-fired power generation," and the plan set the goal of reducing the proportion of coal-fired power plants throughout the province from 92% in 2011 to 71% by 2015. The second emphasized point is "massive development of new energy," which encourages pumped-storage power generation along with nuclear power, wind power and solar power.

3.1.2 Relevance to the Development Needs of China

The maximum load and minimum load in Shandong Province were estimated to be 13,300MW and 8,300MW respectively in 2000. These figures however have continued to grow along with the subsequent expansion of economic activity, and the disparity between the max. and min. load continues to expand each year (Table 1). In addition, Shandong Province is almost completely reliant on thermal power generation, and the output adjustment is done through DSS operations of thermal power plants responding to the significant disparity between the max. and min. load. But DSS operations have shortened the life of power generation equipment, decreased thermal efficiency as a result of repeated start and stop and intermediate output, caused unplanned power outages, and increased operation and maintenance cost. Although the proportion of thermal power generation is slightly declining, there is still a heavy reliance on it (Table 2), and thus a need for alternative power generation is still high.

Table 1: Maximum load and minimum load

Unit: MW

Year	2008	2010	2012
Maximum load	33,349	44,872	50,697
Minimum load	14,258	17,044	20,895
Max. and min. load disparity	19,091	27,828	29,802

Source: Tai’an Pumped Storage Power Station

Table 2: Proportion of thermal power generation

Unit: %

Year	2008	2010	2012
Proportion of thermal power generation	99.72	99.12	98.03

Source: Tai’an Pumped Storage Power Station

3.1.3 Relevance to Japan’s ODA Policy

The “(Former) Official Development Assistance Charter (Former ODA Charter) (1992)” at the time of appraisal of the project emphasized the East Asia region as well as environmental issues and population problems. The “Economic Cooperation Program for China (2001)”

formulated under the Former ODA Charter raised “cooperation to deal with global issues such as environment” as its first priority, and referred to energy consumption as one of the major causes of environmental issues. JICA’s “Medium-Term Strategy for Overseas Economic Cooperation Operations (1999)” placed emphasis on the “environment,” “food and poverty” and “focus on inland areas to correct regional disparities.” And the energy sector assistance policy described in JICA’s “Country Assistance Strategy for the People’s Republic of China” more specifically prioritized support such as the (1) promotion of hydropower development, (2) enhanced transmission and distribution network development and (3) use of low-sulfur coal, and introduction of desulfurization equipment and coal washing technology in thermal power generation while taking into account the overall situation of power supply and demand, environmental considerations, coal transport capacity, private sector investment, etc. The project, implemented with the purpose of constructing a pumped storage power plant in order to realize an environmentally-friendly efficient power supply, was deemed highly consistent with Japan's ODA policy at the time of the appraisal.

This project has been highly relevant to the Chinese development plan, development needs, as well as Japan’s ODA policy. Therefore its relevance is high.

3.2 Effectiveness[4] (Rating: ②)

3.2.1 Quantitative Effects (Operation and Effect Indicators)

In JICA’s appraisal documents, effect indicators, namely, the reduction of coal and oil consumption as well as NOx, SO_2 and CO_2, were established for the goal of “suppression of fuel consumption (air pollution prevention) along with improvement of thermal power plant operations by decreasing DSS operations” as an effect of this project. However, operation indicators for the Tai’an Pumped Storage Power Station were not defined in these appraisal documents. Therefore, it was decided in consultation with Taishan Pumped Storage Power Co., Ltd. to carry out this ex-post evaluation using the operation indicators shown in Table 3. The target values shown in Table 3 were not established at the time of appraisal, but they were established by the company at the time the power station commenced its operations. Regarding these operation indicators, the good operational conditions of the station was confirmed with maximum output and unplanned power outages in line with the target values, and the overall circulation efficiency and pump efficiency target values were achieved.

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

Table 3: Operation Indicators

	Target	Actual		
		2008 (1 year after completion)	2010 (3 years after completion)	2012 (5 years after completion)
Maximum output (MW)	1,000	1,000	1,000	1,000
Overall circulation efficiency (%)	75	81	81	79
Pump efficiency (%)	93.62	93.69	93.69	93.69
Unplanned power outages (hours/year)	0	0	0	0

Source: Tai'an Pumped Storage Power Station
Overall circulation efficiency = (sending-end output) / (power for pumping) x 100 (%)
Pump efficiency = (pump output) / (shaft power) x 100 (%)

Table 4 shows the effect indicators for the project agreed upon at the time of appraisal, which are air pollutant emission reduction effects associated with the improvement of thermal power plants' operations caused by the construction of the Tai'an Pumped Storage Power Station[5]. Since the target year by which the target values were to be achieved was not set at the time of appraisal, the ex-post evaluation was conducted by focusing on the changes in target values in five years after project completion. Looking at the changes from 2008 to 2012, the reduction in NOx emission has been fluctuating but its target was almost achieved. However, the reductions in SO_2 and CO_2 did not reach the target values. It should be noted that although a trend of reduced sending-end output (net power) can be seen in Table 4 from 2010 onwards, the staffs interviewed at the Tai'an Pumped Storage Power Station viewed this trend as a part of fluctuation within the range of ordinary variation but not as a true trend of decrease.

Table 4: Air pollutant emission reduction effects (Effect Indicators)

	Target	Actual (Years after completion in parentheses)				
		2008 (1 year)	2009 (2 years)	2010 (3 years)	2011 (4 years)	2012 (5 years)
Sending-end output (GWh/year)	—	251	145	309	264	163
Reduction in NOx emission (ton/year)	1,800	1,732 (96%)	1,001 (56%)	2,132 (118%)	1,822 (101%)	1,125 (63%)
Reduction in SO_2 emission (ton/year)	2,900	2,016 (70%)	1,164 (40%)	2,481 (86%)	2,120 (73%)	1,309 (45%)
Reduction in CO_2 emission (ton/year)	348,400	264,127 (76%)	152,584 (44%)	325,161 (93%)	277,807 (80%)	171,525 (49%)

Source: Tai'an Pumped Storage Power Station
Figures in parentheses indicate the ratio of values to the targets.

[5] The amount of air pollutants discharged from thermal power plants are calculated according to the coefficients specified by the Shandong Province Energy Saving Office. Coefficients are 6.90g/kWh for NOx, 8.03g/kWh for SO2 and 1.0523kg/kWh for CO_2. It must be noted that the suppression effect of air pollutants is better to be evaluated by the frequency of DSS operations of thermal power plants and the amount of coal and oil consumption in the province. However, as stated above in "2.3 Constraints during the Evaluation Study," the sufficient information was not available. Therefore, discussing with the staff of Tai'an Pumped Storage Power Station, it was decided to apply these coefficients as alternative way while it is not necessarily the best way to evaluate the suppression effect of air pollutants by the project.

3.2.2 Qualitative Effects

The qualitative effect anticipated at the time of appraisal of the project was "improved stability and economic efficiency of power system as a result of decreased DSS operations." Almost all of the 14 people such as relocated and neighboring residents who were interviewed face-to-face in the field survey as a part of this ex-post evaluation felt that voltage had been stabilized and power outage hours had been reduced. They were thus satisfied with the power supply. However, as the power supplied from the Tai'an Pumped Storage Power Station is connected to the regional power network and the supply areas cannot be identified, these effects cannot be deemed entirely attributable to this project alone. Information about improvement in the economic efficiency of power system was not available.

3.3 Impact

3.3.1 Intended Impacts

(1) Impact on economic development

In recent years, both Shandong Province and Tai'an City have maintained GDP growth rate of 10% to 20% (Table 5, Fig. 2) and steady GDP per capita growth (Table 6, Fig. 3). However, as the power supplied through this project is connected to the regional power network together with power supplied by other power generation facilities, it is difficult to identify the level of contribution of the project to this economic growth.

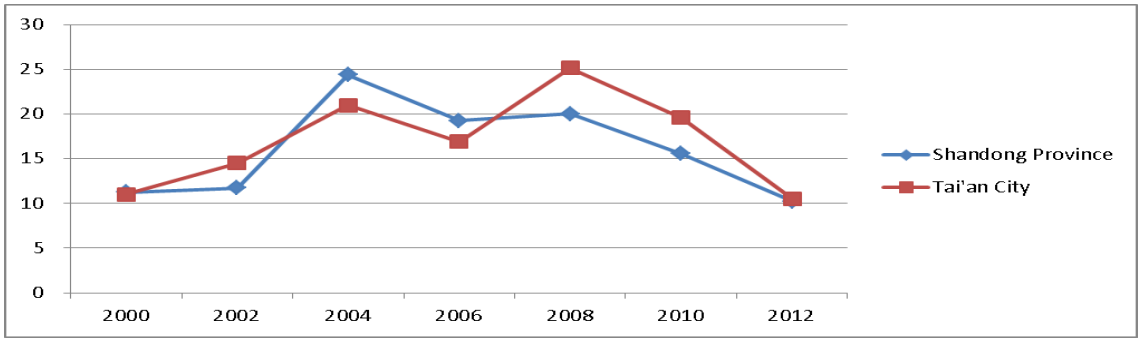
Table 5: Nominal GDP growth rate

Unit: %

Year	2000	2002	2004	2006	2008	2010	2012
Shandong Province	11	12	24	19	20	16	10
Tai'an City	11	14	21	17	25	20	11

Source: Shandong Province Statistical Yearbook 2013, Tai'an City Statistical Yearbook 2013

Unit: %



Source: Shandong Province Statistical Yearbook 2013, Tai'an City Statistical Yearbook 2013

Figure 2: Nominal GDP growth rate

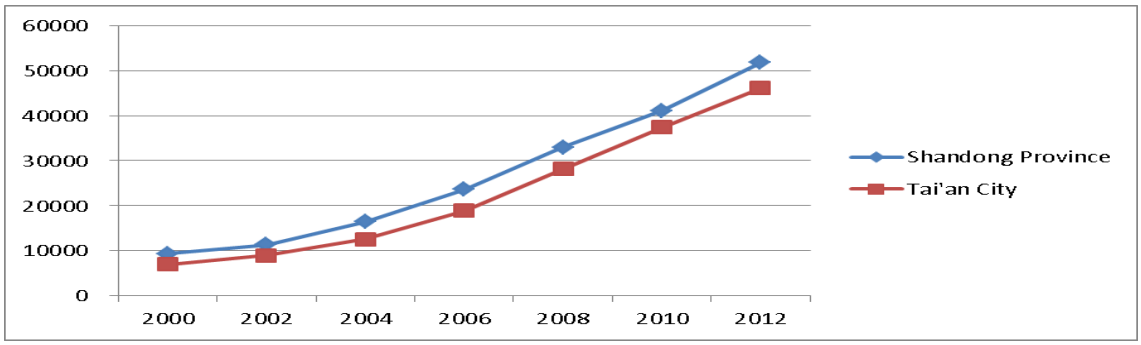
Table 6: Nominal GDP per capita

Unit: Yuan

Year	2000	2002	2004	2006	2008	2010	2012
Shandong Province	9,326	11,340	16,413	23,603	32,936	41,106	51,768
Tai'an City	7,031	9,002	12,608	18,863	28,179	37,376	46,130

Source: Shandong Province Statistical Yearbook 2013, Tai'an City Statistical Yearbook 2013

Unit: Yuan



Source: Shandong Province Statistical Yearbook 2013, Tai'an City Statistical Yearbook 2013

Figure 3: Nominal GDP per capita

(2) Employment opportunities for local residents

The project employed approx. 500 local people per year during the execution period, and continues to employ about 270 people per year after completion of the project (Table 7). The project thus had and continues to have a positive effect on the local economy by providing employment opportunities.

Table 7: Employment opportunities for local residents

Unit: person

Year	During the Construction				After the Project Completion		
	2000	2002	2004	2006	2008	2010	2012
Civil Work	150	450	780	260	—	—	—
Operation & Maintenance	35	70	120	160	270	274	280

Source: Tai'an Pumped Storage Power Station

3.3.2 Other Impacts

(1) Impacts on the Natural Environment

At the time of the appraisal, the project was classified as a Category A project under the "JBIC Environmental Guidelines for ODA Loans (1999)," and the impact on the natural environment was monitored accordingly. Water quality (10 items including water temperature, pH, suspended solids, DO, BOD), air quality (SO_2, NO_2, TSP) and noise level (Ld, Ln)[6] were

[6] DO: Dissolved Oxygen, BOD: Biochemical Oxygen Demand, SO2: Sulfur Dioxide, NO2: Nitrogen Dioxide, TSP: Total Suspended Particular, Ld: Day Sound Level, Ln: Night Sound Level

monitored by Shandong Agricultural University every three months during the construction period. While it was planned to promptly find causes and take necessary actions when reference values were exceeded, no major negative effects were reported during the construction period.

Upper Reservoir

Since the commencement of operation of the power station, Tai'an Shandong Water Environment Monitoring Center has monitored 28 items of water quality such as water temperature, smell, turbidity, color, pH, and free CO_2 once a year. All measurement results had been within the reference values up to the present time of this ex-post evaluation. The project has also incorporated vegetation conservation, tree planting, installation of sewage treatment facilities, waste management and workers' education as measures of environmental protection, and no major complaints have been received from local residents both during and after the construction of the project.

Although the upper reservoir constructed as a part of the project is located in the Taishan National Scenic Area grade 2 protected area, it does not encroach on the UNESCO World Heritage Site (Taishan National Scenic Area grade 1 protected area) nor affect that site whatsoever.

(2) Land Acquisition and Resettlement

The actual cost for the land acquisition and resettlement of residents were below the planned cost (Table 11). This was the result of the water level of the lower reservoir finally being 165.0m above sea level lower than the planned level of 165.5m, eliminating the need to acquire land and relocate residents between 165.0m and 165.5m above sea level.

Table 8: Land Acquisition and Resettlement

	Plan	**Actual**
Resettlement	Approx. 50 people from 20 households	37 people from 14 households
Land Acquisition	Approx. 140 ha	117 ha

Source: Tai'an Pumped Storage Power Station

The project provided compensation, alternate land and housing to relocated residents. The ex-post evaluation field survey team visited seven relocated households and conducted in-depth interviews with them. All the residents reported significant improvements in their living environment and high levels of satisfaction. As community infrastructures and living environment of these families improved along with their resettlement, the breadwinners can

leave their families free from anxiety and work away from home, and their salary has increased by three- to five-fold as a result. One of the relocated households interviewed opened its own grocery shop with the compensation, and its household income is now about 10 times more than before. It should be noted that the rural household registration of the 29 out of 37 relocated residents aged 60 years and younger were changed to urban household registration[7] along with their resettlement to urban areas. As a result of this, these residents are now secured with the accessibility to employment, schooling, medical care and a variety of social services in urban areas. Guaranteeing relocated residents these social rights, it was extremely significant from the perspective of compensation of resettlement and elimination of social disparity.

(3) Local Development

The urbanization of rural area was also a significant impact caused by the road construction in the project. For instance, a large-scale complex development of approx. 30 apartment buildings, hospitals, schools, kindergartens and mosques were expected to be completed in 2014[8] in Chang Jia Cun, a community of Hui Muslims located near the lower reservoir. Furthermore, according to the interviews of the chairman of residents' committee and residents of the Chang Jia Cun area, the construction of the road network connecting city centers with the upper reservoir located in the Taishan National Scenic Area has activated the local economy and increased employment opportunities for local residents with restaurants, grocery shops and souvenir shops opened along the roadside as the number of tourists and passersby increases.

Development of Chang Jia Cun area

As stated above in "2.3 Constraints during the Evaluation Study," a pumped storage power plant project should be evaluated by the degree of achievement of operation and effect indicators while looking at the regional power supply status such as the balance between power supply and demand. However, since it was not possible to obtain sufficient data and information about overall power supply status including generation policies of pumped power plants, there was no choice but to conduct analysis based on the partial data that was available.

In terms of effectiveness, while the target values for the operation indicators and NOx reduction were achieved, the target of effect indicators such as SO2 and CO2 reduction amount

[7] In China, farmers are registered as rural households and non-farmers as urban households in accordance with the "Family Register Registration Ordinance" promulgated in 1958. Economic disparity and inequality in terms of access to public services between urban and rural residents have been pointed out as negative effects of this system.

[8] Investors included Tai'an City, Taishan Pumped Storage Power Station Co., Ltd., companies and local residents.

were not achieved. Regarding impact, a contribution to the local economy in the form of regional development and employment could be seen while a negative impact on the natural environment has not been observed.

Taking account of a comprehensive set of factors stated above, it can be deemed that this project has somewhat achieved its objectives. Therefore its effectiveness and impact are fair.

3.4 Efficiency (Rating: ③)

3.4.1 Project Outputs

The output of the project, namely, the construction of the upper reservoir, improvement of the lower reservoir, construction of water tunnels and a power station with four generators and transmission-transformation facilities, was executed as planned (Table 9).

Table 9: Output (planned and actual)

Output	Planned	Actual
Upper reservoir	Approx. 10 million m^3	11.08 million m^3
Lower reservoir (improvement)	Approx. 22 million m^3	22.35 million m^3
Water tunnels	Upper reservoir – Power station, Power station – Lower reservoir	As planned
Power Station	Underground power station Generators 250MW×4	As planned
Transmission/transformation facilities	Switch yard, 220kV transmission lines, transformation station (substation)	As planned
Consulting Services	· Assistance in bidding activities, review of detail designs, assistance in construction supervision, environmental measures · Man month: 63 M/M	· As planned · Man month: 68 MM

Source: Tai'an Pumped Storage Power Station

The man-months of consulting services exceeded the initial plan because the time required for report writing following the completion of consulting services took longer. The consultants effectively managed the assistance in tendering activities, detailed design review, construction supervision support and environmental consideration leaving the related Chinese organizations highly satisfied.

3.4.2 Project Inputs

3.4.2.1 Project Cost

The originally estimated total project cost at the appraisal was 59,756 million yen, and the actual project cost at completion was 51,095 million yen, which is equivalent to 86% of the planned cost (Table 10). This was a result of international competitive bidding for the import of electrical and mechanical equipment which reduced procurement costs, and the reduction of consulting services paid for in local currency as much as possible. The use of foreign currency (Japanese ODA Loan disbursement) was only about 50% of the plan. This was mainly because

that, along with the cost suppression effect through international competitive bidding, the import value-added tax (about 17%) which was subject to the tax exemption for ODA loans was included in the cost estimation at the time of the appraisal.

Table 10: Project Cost (planned and actual)

Unit: million yen

	Planned (Note 1)			Actual (Note 2)		
	Foreign Currency	Local Currency	Total	Foreign Currency	Local Currency	Total
Civil work	743	20,384	21,127	233	22,684	22,917
Machine and equipment	15,593	13,273	28,866	8,754	17,385	26,139
Consulting services	220	2,587	2,807	195	695	890
Land acquisition and resettlement	0	1,248	1,248	0	1,149	1,149
Price escalation	598	2,301	2,899	0	0	0
Contingency	846	1,963	2,809	0	0	0
Total	18,000	41,756	59,756	9,182	41,913	51,095

Source: Tai'an Pumped Storage Power Station
Note 1: Exchange rate: 1 yuan = 13 yen (Source: JICA appraisal documents)
Note 2: Exchange rate: 1 yuan = 13.39 yen (average between 1999-2011)
(Source: International Financial Statistics; Yearbook)

3.4.2.2 Project Period

The planned project period was 82 months from March 2001 (signing of the Loan Agreement) to December 2007 (completion of the official trial run of No.4 generator). The project was completed ahead of time with a total period of 76 months, or equivalent to 93% of the plan, from March 2001 (signing of the Loan Agreement) to June 2007 (completion of the official trial run of No.4 generator) (Table 11).

Table 11: Project Period (planned and actual)

	Planned	Actual
Land acquisition and resettlement (upper reservoir)	Jan. 2000 – Dec. 2000	Apr. 2000 – Nov. 2000
Signing of L/A	Mar. 2001	Mar. 2001
Civil work of upper reservoir	Nov. 2000 – Oct. 2005	Jan. 2002 – Aug. 2005
Installation of generating facilities	Oct. 2000 – May 2003	Jan. 2002 – Feb. 2007
Construction of underground facilities	Feb. 2001 – Dec. 2007	Jan. 2002 – Feb. 2007
Land acquisition and resettlement (lower reservoir)	Oct. 2000 – Feb. 2001	Apr. 2000 – Nov. 2000
Civil work of lower reservoir	Apr. 2001 – Jul. 2004	Jan. 2002 – Jul. 2004
Installation of transmission/ transformation facilities	Jan. 2002 – Mar. 2005	Jan. 2002 – Dec. 2005
Trail run of No.1 generator	Dec. 2007	Jul. 2006
Trail run of No.2 generator	Dec. 2007	Oct. 2006
Trail run of No.3 generator	Dec. 2007	Jun. 2007
Trail run of No.4 generator	Dec. 2007	Jun. 2007

Source: Tai'an Pumped Storage Power Station

Delay in water tunnels construction works was apprehended due to a large volume of seepage water caused by the high groundwater level at the bottom portion of the upper reservoir. But it was prevented from realization by taking countermeasures in advance such as a meticulous repetitive implementation of flooding and draining tests on the water drawing system. According to the interview with the Tai'an Pumped Storage Power Station, Shandong Electric Science Research Institute, a research institute of the State Grid Corporation of China, was involved in the testing and trial running of generator No.3 and 4 for research purposes, reducing the time for testing and trial running and thereby shortened the entire construction period.

3.4.3 Results of Calculations of Internal Rates of Return (Reference only)

3.4.3.1 Financial Internal Rate of Return (FIRR)

At the time of the appraisal of the project, the FIRR in the 30 years of the project life was calculated to be 6.8% accounting construction cost, power purchase cost for water pumping, operation and maintenance cost and tax as costs while income from electricity sales as revenue. At the time of this ex-post evaluation, the power station is under a fixed amount long-term contract with a power supply destination or Shandong Electric Power Group Corp. regardless of the amount of power generation (refer to 3.5.3). Thus, there are no power purchase cost for water pumping and no income from electricity sales. Recalculation of FIRR therefore is not very much applicable. Only as a reference, with the data available from the Tai'an Pumped Storage Power Station, the construction cost, operation and maintenance cost and tax as expenses and the fixed contract amount as revenue in the 30 years of the project life, the FIRR at the time of this ex-post evaluation is recalculated to be 6.84%.

3.4.3.2 Economic Internal Rate of Return (EIRR)

Given that EIRR was not calculated at the time of the appraisal, and the necessary information and data such as the economic benefits, construction and maintenance cost for alternative thermal power plants and the willingness to pay (WTP) for air pollution reduction were not available, the ex-post evaluation did not undertake a recalculation of EIRR.

Both project cost and project period were within the plan. Therefore efficiency of the project is high.

3.5 Sustainability (Rating: ③)

3.5.1 Institutional Aspects of Operation and Maintenance

The organization undertaken the construction of this project, “Shandong Taishan Pumped Storage Power Station Co., Ltd.,” continues to manage operation and maintenance of the power station. The company is under the umbrella of the State Grid Xinyuan Company LTD., the

power transmission and distribution network company of the State Grid Corporation of China[9] (the executing agency for this project), and is financed by State Grid Xinyuan Company LTD. (50%), Shandong Electric Power Group Corp (44%) and Tai'an Taishan Investment Co., Ltd. (6%).

Shandong Taishan Pumped Storage Power Station Co., Ltd. is comprised of 2 directors, 3 deputy directors, 15 engineers, 40 technicians and 24 clerical staff as of the end of November 2013. According to the interviews conducted at the company, this number of staff is currently sufficient for their operations. The average ages of the directors is 52, deputy directors is 49, engineers is 37, technicians is 32 and clerical staffs is 36, which are relatively young. Directors and deputy directors are supposed to be transferred every five years, and there have been no personnel changes among engineers, technicians and clerical staff since the commencement of operations in 2006. From these, no major institutional problem are expected regarding operation and maintenance of the power station.

3.5.2 Technical Aspects of Operation and Maintenance

The power station has obtained ISO9001 (Quality Management Systems) and ISO14001 (Environmental Management Systems) and takes thorough care in quality management and environment management.

All of the power station personnel including clerical staffs are bachelor or master degree holders in the field of technology or business administration. And all engineers under the directors have obtained government qualifications such as Senior Engineer or Engineer and have high technical competencies[10]. The supervising organizations, State Grid Xinyuan Company LTD. and Shandong Electric Power Group Corp, provide regular training to the power station staff concerning operations, reliability improvement, control systems, machine inspection, irrigation facilities monitoring, etc. once a year. These agencies provide training to all staff members of power plants and stations under their umbrella, and therefore have substantial teaching materials, training content and experienced lecturers.

Operation and maintenance manuals and system brochures are prepared for operation, inspection, maintenance and repair of facilities and equipment prescribing rules, regulations and specific work procedures. Daily operations are performed in accordance with these manuals and brochures, and supervisors check the compliance with manuals in workplaces on a daily basis.

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[9] The State Grid Corporation of China was founded in December 2002 as a result of the company split of State Electric Power Corporation, the executing agency at the time of the project appraisal. The corporation was divided into five power generation groups and two transmission and distribution networks following the electric power reform policy of "Plant-Grid Separation." The State Grid Corporation of China currently controls the transmission and distribution networks of 26 provinces, self-governing districts and government-ruled municipalities, and has jurisdiction in 88% of China area-wise excluding southern China, which is controlled by China Southern Power Grid Company.

[10] Job classes of administrative officers certified by provincial governments. A qualified Engineer is a job class of an engineer and the highest-class engineer is the Senior Engineer.

3.5.3 Financial Aspects of Operation and Maintenance

Tai'an Pumped Storage Power Station generates power under the direction of Shandong Electric Power Group Corp[11], the power system operator of Shandong power grid, and the total amount of power generated by the station is taken over by Shandong Electric Power Group Corp. The station is under a fixed-amount long-term (indefinite-term) contract, regardless of the amount of power generation, with Shandong Electric Power Group Corp. The fixed annual contract sum of 415 million yuan the plant receives under this agreement secures its managerial stability (Table 12). This fixed annual fee was set by the National Development and Reform Commission taking into account a 5% annual return on investment and other terms and conditions, and has not changed since 2009. According to the interviewees of the Finance Department of the State Grid Corporation of China and the Tai'an Pumped Storage Power Station, the contract fee can be subject to change in the future as a consequence of changes in economic conditions, but it has never been up for discussion so far.

Table 12: Revenue and expenditure

Unit: million yuan

Year	2007	2008	2009	2010	2011	2012
Revenue	345	402	415	415	415	415
Expenditure	295	346	357	403	395	283
Profit	50	56	58	12	20	132

Source: Tai'an Pumped Storage Power Station

3.5.4 Current Status of Operation and Maintenance

In the power station, generator local discharge, switch temperature, disconnector temperature, unit vibration and others are monitored online 24 hours a day by automatic devices, while generator stator insulation diagnosis is conducted regularly according to a manual. Regarding transmission-transformation facilities, leakage of electricity, insulation and breakdown voltage of circuit arresters, water vapor measurement of GIS (gas insulated switchgear), circuit protection inspection and others are conducted regularly according to a manual. These data have been recorded and stored and a proper operation and maintenance situation was confirmed in the field survey of this ex-post evaluation. Maintenance equipment is also well maintained according to the regulations concerning the inspection, repair and storage.

It was visually confirmed in the field survey that the inside and outside of buildings of the power station and transmission-transformation facilities were kept clean and well-organized. It was observed in the filed survey that a minor repair work in a building was conducted after setting up a tent over the site to prevent dust from affecting nearby equipment. Such close attention was paid to the maintenance of facilities and equipment of the station. In addition,

[11] This is a subsidiary wholly owned by the State Grid Corporation of China and in charge of the operation and maintenance of the power system in the whole area of Shandong Province.

small group quality control activities (QC circles) were encouraged and the achievements of employees who have made suggestions for improvements around the facilities were displayed with their photographs.

No major problems have been observed in the institutional, technical and financial aspects of the operation and maintenance system. Therefore sustainability of the project effect is high.

4. Conclusion, Lessons Learned and Recommendations

4.1 Conclusion

This project was implemented with the purpose of constructing a pumped storage power station at a location in Shandong Province, where air pollution was worsening as a consequence of thermal power generation, in order to realize an environmentally-friendly, efficient power supply, thereby contributing to the economic development of the province. The project was consistent with China's development policy, needs and Japan's ODA policy, and therefore the relevance was high. Primary operation indicators such as maximum output of the power station have been achieved, and positive impacts have been observed in terms of the employment of local residents and regional development. However, as the project has only partially achieved air pollutant emission reduction targets (effect indicators), the effectiveness and impact of the project was fair. The project was implemented efficiently within the planned cost and project period. Therefore, the efficiency of the project is considered high. There have been no problems in terms of institutional, technical and financial aspects of the operation and maintenance of the project, accordingly sustainability of the project is judged to be high.

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

4.2 Recommendations

4.2.1 Recommendations to the Executing Agency

None

4.2.2 Recommendations to JICA

None

4.3 Lessons Learned

None

Comparison of the Original and Actual Scope of the Project

Item	Original	Actual
1. Project Output	1) Upper reservoir (newly-established) 10 million m^3 2) Lower reservoir (repaired) 22 million m^3 3) Water tunnels Upper reservoir – Power station Power station – Lower reservoir 4) Power station Underground power station Generators 250MW×4 5) Transmission/transformation facilities switch yard 220kV transmission lines transformation station (substation) 6) Consulting Services 63 M/M	1) Upper reservoir (newly-established) 11.08 million m^3 2) Lower reservoir (repaired) 22.35 million m^3 3) As planned. 4) As planned. 5) As planned. 6) Consulting Services 68 M/M
2. Project Period	March 2001 – December 2007 (82 months)	March 2001 – June 2007 (76 months)
3. Project Cost Amount paid in Foreign currency	18,000 million yen	9,182 million yen
Amount paid in Local currency	41,756 million yen	41,913 million yen (2,525 million yuan)
Total	59,756 million yen	51,095 million yen
Japanese ODA loan portion	18,000 million yen	9,182 million yen
Exchange rate	1 yuan = 13 yen (as of March 2001)	1 yuan = 13.93 yen (average between 1999-2011)