People's Republic of China

Ex-Post Evaluation of Japanese ODA Loan

Sichuan Higher Education Project

External Evaluator: Takako Haraguchi, OPMAC Corporation

0. Summary

This project aimed to improve teaching and research at eight major universities in Sichuan 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 is was in line with (i) the higher education policies of China and Sichuan Province, (ii) development needs for quantitative and qualitative enhancement of the universities, and (iii) Japan's assistance policies. Effectiveness/impact of the project 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 production of teachers for rural areas. 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 the determination of training host universities in Japan, delays in production of some equipment, as well as external factors such as severe acute respiratory syndrome (SARS) and the Great Sichuan Earthquake. 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

Research Building, Chengdu University of Traditional Chinese Medicine

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 high priority on development of human resources that are 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.

Sichuan Province (total population of 86,020,000 persons in 2000; total area of approx. 485,000 km^2) achieved high economic growth with an average annual gross domestic product (GDP) increase rate of 8.8% in the years 1996-2000. However, per capita GDP (4,784 yuan in 2000) still remained at 68% of the national average (7,078 yuan). Aiming towards promotion of a market economy and further economic development, the provincial government planned to increase the number of students in higher education to around 840,000 persons and the enrollment ratio to 15.5% 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 had to be addressed.

1.2 Project Outline

The objective of this project was to quantitatively and qualitatively enhance higher education at eight major universities in Sichuan Province (Southwest University of Science and Technology (SWUST), Sichuan Agricultural University (SAU), Chengdu University of Technology (CDUT), Southwest Petroleum University (SWPU), Sichuan Normal University (SNU), Xihua University, Chengdu University of Information Technology (CUIT), Chengdu University of Traditional Chinese Medicine (CDUTCM))[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 the market-oriented economic reform in Sichuan Province and reduction of disparity with coastal areas[3].

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

[2] The names of the universities are those as of today. The following universities had different names at the time of the ex-ante evaluation of this project:

- Southwest Petroleum University: formerly known as Southwest Petroleum Institute (renamed in 2000).
- Xihua University: formerly known as Sichuan University of Information Technology (merged with Chengdu Teachers' College and renamed in 2003).

[3] At the time of the ex-ante evaluation, the direct targeted outcome of the project was "to improve quantitatively and qualitatively higher education *in Sichuan Province*", and the indirect targeted? outcome (impact) was "to contribute

Loan Approved Amount/ Disbursed Amount	6,131 million yen / 5,911 million yen
Exchange of Notes Date/ Loan Agreement Signing Date	March 2002 / March 2002
Terms and Conditions	Interest Rate: 0.75% Repayment Period: 40 years (Grace Period: 10 years) Conditions for Procurement: Bilateral tied
Borrower / Executing Agency	The government of People's Republic of China / Sichuan Provincial People's Government (Education Bureau)
Final Disbursement Date	July 2009
Main Contractor (Over 1 billion yen)	None
Main Consultant (Over 100 million yen)	None
Feasibility Studies, etc.	- "Feasibility Research Report Central and Western China Talent Training Project", Sichuan International Engineering Consulting Corp, 2001. - "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 2012 – September 2013

Duration of the Field Study: March 17 – April 10, 2013 and May 26 – June 3, 2013[4]

to the market-oriented economic reform *in China* and reduction of disparity". However, since the targeted universities were only part of the HEIs in the province, the target area was lowered by one level for this ex-post evaluation.

[4] The field study period includes the periods for ex-post evaluation of the Chongqing Higher Education Project and the Gansu Higher Education Project.

3. Results of the Evaluation (Overall Rating: A[5])

3.1 Relevance (Rating: ③[6])

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 and the Western Development Project, which all aim at quantitative and qualitative development of higher education both at the times of ex-ante and ex-post evaluations of this project (Table 1).

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

	At the time of ex-ante evaluation	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; 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 to 33,500,000 by 2015; to develop HEIs in inland areas 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 Sichuan Province (2001-2005): To achieve annual economic growth rate of 8% by 2005; develop the key industries including electronic information, hydropower generation, mechanical metallurgy, pharmaceutical chemicals, beverage and food.	The 12th 5-year Plan for Economic and Social Development in Sichuan Province (2011-2015): To achieve annual economic growth rate of 12% by 2015; to develop the key industries including equipment manufacturing, electronic information, aerospace, Chinese medicine and biomedical.
Provincial level education sector plan	The 10th 5-year Plan for Education in Sichuan Province (2001-2015): To increase higher education enrollment ratio from 10.7% in 2000 to 15.5% in 2005; to increase student enrollment in HEIs to around 840,000 (including around 530,000 in regular HEIs[7])	The 12th 5-year Plan for Education in Sichuan Province (2011-2015): To increase higher education enrollment ratio from 25% in 2010 to 32.7% in 2015; to increase student enrollment in HEIs from 1,670,000 to 1,960,000 (from 1,590,000 to 1,650,000 in regular HEIs)

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

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

[6] ③: High, ②: Fair, ①: Low

[7] 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. In this report, "universities" include both universities and colleges that grant undergraduate or higher academic degrees unless otherwise mentioned.

While there were no large policy changes between the ex-ante and ex-post stages, in recent years more importance has been given to higher education development. Also, the key industries of Sichuan Province have shifted to those that require higher technologies.

3.1.2 Relevance to the Development Needs of China

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

At the time of the ex-ante evaluation, 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 Sichuan Province (school intake rates in 2000 were 99.1% for primary education and 85.0% for secondary education). It was forecasted that the number of new entrants in HEIs would increase from 170,000 in 2000 to 250,000 in 2005. There were 43 regular HEIs in Sichuan Province, among which the eight targeted universities were the leading provincial universities[8]. They were expected to further expand their roles of producing human resources for the above-mentioned key industrial sectors and teachers for rural areas, but financial resources for developing the hardware (facilities and equipment) and software (teachers' training) aspects were limited. Also, there were few opportunities provided for the teachers to visit overseas.

At the time of the ex-post evaluation, although economic growth remained high at an annual average of 11.8% for the years 2000-2011, the need for narrowing the economic gap still exists in Sichuan Province: provincial per capita GDP is 26,133 yuan in 2011, which is 66% of the national average 39,442 yuan. The number of new entrants to HEIs in the province continued to increase from 270,000 in 2005 to 350,000 in 2011, and the need for quantitative and qualitative enhancement of HEIs remains high. On the other hand, the need for hardware development seemed to have been more satisfied compared to the time of the ex-ante evaluation, due to increased financial injection to provincial universities following the above-mentioned higher education development policies. The Education Bureau of Sichuan 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.

[8] National and public universities in China are under the jurisdiction of the state (Ministry of Education or other state government organizations) or local (sub-national) governments. In Sichuan Province, while the eight universities targeted by this project are all provincial (i.e. under the jurisdiction of the province), there are four universities that are under the jurisdiction of the state: Sichuan University, Southwest Jiaotong (traffic) University, University of Electronic Science and Technology of China, and Southwestern University of Finance and Economics, all overseen by the Ministry of Education. These four universities are listed in the "Project 211" (1996-), a national project to intensively support approx. 100 key universities to enhance their research capabilities by the 21st century. Among the target universities of this project, Sichuan Agricultural University is listed in the Project 211.

3.1.3 Relevance to Japan's ODA Policy

At the time of the ex-ante evaluation, Japan's Official Development Assistance (ODA) Charter (1992) placed emphasis on Asian regional support and human resources development support. Additionally, the Country Assistance Policy for China and the Medium-term Strategy for Overseas Economic Cooperation Operations and 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 mid-western region in China from the aspect of narrowing the economic gap. The project objective was consistent with such aid policies of Japan.

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[9] (Rating: ③)

The objective of the project, "quantitative and qualitative enhancement of higher education of the targeted universities", has been achieved based on the performance of quantitative indicators as well as qualitative information that are presented in the following sections.

3.2.1 Quantitative Effects (Operation and Effect Indicators)

(1) Quantitative expansion of teaching and research[10]

The number of students is increasing in all targeted universities. The hardware outputs of this project increased the aggregate floor area of school buildings and the monetary value of educational equipment. With respect to the aggregate floor area of school buildings, the ex-ante evaluation set out the target values for individual universities, and those were mostly achieved (Table 2 and Figure 1). The utilization rates of the facilities and equipment developed by this project are high at 90-100% (for facilities) and 80-100% (for equipment)[11] at all universities.

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[9] Sub-rating for Effectiveness was given with consideration of Impact.

[10] In the ex-ante evaluation, the target year for evaluating the quantitative indicators was set at 2005, which was after the planned project completion date. However, due to the delays in project implementation (see "3.3 Efficiency"), the ex-post evaluation set the actual comparison year at 2009, which was a year after the actual completion of major parts of each project component, and it analyzed the actual achievement in that year using the targets that were supposed to be achieved in 2005. When data for 2009 were not available, the comparison was made between 2005 and 2011. To show the situation at the time of ex-post evaluation, the data of 2011 were mainly used. While the field study was conducted from 2012 to 2013, the data for 2011 are considered to be the latest reliable data that have been checked and compiled.

[11] The utilization rates are based on responses to questionnaires provided by each targeted university. The definition of utilization rates at the time of ex-ante evaluation was "actual usage hours divided by planned usage hours". However, according to target universities, it was impossible to actually calculate the rates in such manner, because planned usage hours varied depending on the types of equipment. Therefore, the figures provided represent "the number of equipment that is currently used (i.e. in operation) divided by the total number of equipment procured". Also, some universities said that they could not provide any numerical answers, but could only comment that utilization was "high". Yet, the results of the visits to each university, observation of the facilities/equipment, and review of some usage records are consistent with the figures provided, and thus imply that the questionnaire responses more or less reflect the actual usage of the outputs of the project.

Therefore, it can be said that the project well responded to the needs for quantitative expansion of higher education (i.e. constant increase in the number of students).

The facilities and equipment related outputs of this project accounted for on average only 5% of the total facilities (in terms of floor area) and 2% of the total educational equipment (in terms of monetary value) of the targeted universities as of 2009 after project completion. Nevertheless, they played an important role of establishing a foundation on which later development works by the Chinese side took place. More specifically, (i) the project took a strategy to concentrate its resources to the development of key teaching/research areas that required to be strengthened, and (ii) the facilities and equipment developed under this project were highly valued and therefore became the decisive factor in determining the areas that were worth investing in further, which brought in other development funds. In particular around 2002 when it was difficult for the targeted universities to make large scale facility investments on their own, the effective role played by this project was larger than the actual percentages indicate.

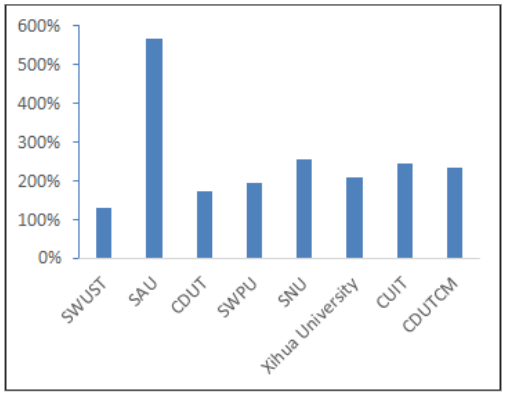
Table 2: School building area

Unit: m^2

	Actual value 2000	Planned value		Actual value		Actual value 2011
		2005	Portion under this project	2009	Portion under this project	
SWUST	319,508	1,103,608	25,000	973,490	26,152	1,119,226
SAU	253,477	447,477	30,314	695,420	31,155	1,092,842
CDUT	396,716	662,640	35,000	872,128	40,112	799,365
SWPU	205,074	478,874	48,500	903,762	56,500	922,005
SNU	370,000	850,000	20,000	1,113,775	36,353	953,828
Xihua University	292,380	592,380	30,000	937,816	46,300	967,748
CUIT	125,722	480,000	28,000	514,280	41,015	620,165
CDUTCM	172,768	290,000	16,000	538,975	17,401	545,847
Total	2,135,645	4,904,979	232,814	6,549,646	294,988	7,023,037

Sources: JICA appraisal documents; responses to the questionnaire.

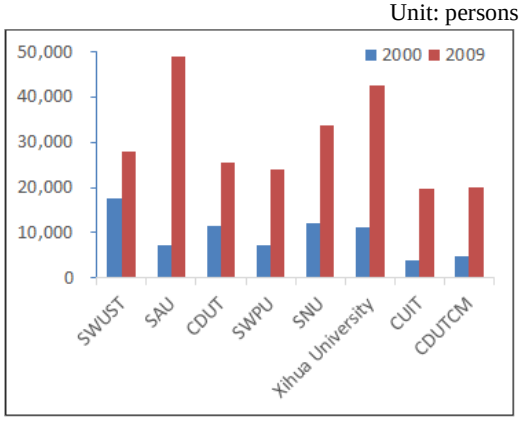
Unit: %



Source: responses to the questionnaire

Figure 1: Increase rates of monetary values of educational equipment, 2005-2009

Unit: persons



Sources: JICA appraisal documents; responses to the questionnaire

Figure 2: Number of students

(2) Qualitative enhancement

As shown in Table 3, the average school building area per student was slightly below, but more or less achieved, the target set in the ex-ante evaluation and the national standard, implying that the increase in students would not have adversely affected the conditions (quality) of teaching and research. The executing agency and the targeted universities explained the reason for such generally lower level of achievement than expected, stating that it took some time until a constructed building was registered as the university's capital asset. Monetary value of educational equipment per student satisfied the national standard in all targeted universities.

Table 3: School building area per student and monetary value of educational equipment per student

Units: m^2 or yuan

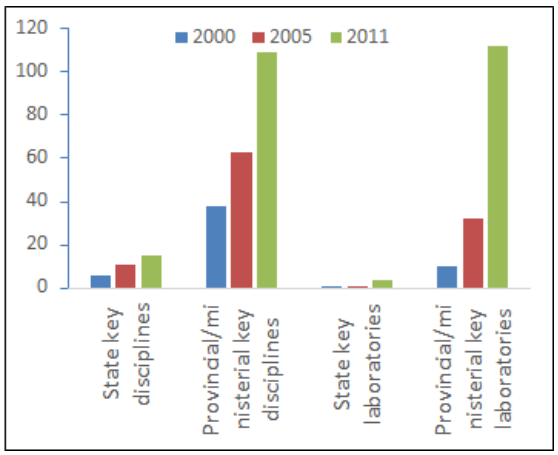
	School building area per student (m^2)						Value of educational equipment per student (yuan)	
	Actual 2000	Planned 2005		Actual 2009		Actual 2011	Actual 2005	Actual 2011
		Area per student	Increment through this project	Area per student	Increment through this project			
SWUST	18	32	0.71	35	0.94	40	7,376	12,219
SAU	34	31	2.11	22	0.99	30	6,313	10,605
CDUT	34	30	1.59	32	1.47	25	6,575	9,783
SWPU	29	30	2.99	37	2.31	33	8,530	11,273
SNU	31	29	0.68	25	0.82	22	2,285	5,103
Xihua University	26	24	1.21	22	1.09	21	3,291	4,044
CUIT	33	30	1.75	26	2.07	31	4,584	9,060
CDUTCM	35	23	1.29	25	0.81	25	6,057	8,946
Average	30	29	1.54	28	1.31	28	5,626	8,879

Sources: JICA appraisal documents; responses to the questionnaire.

Note: the national standard of school building area per student is "more than $30m^2$"; 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 (Interim Provisions for Establishment of Regular Undergraduate Schools, No.18 [2006]).

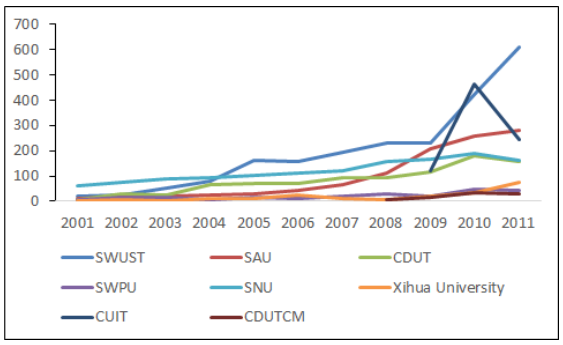
Various indicators to measure the achievements of progress in the areas of teaching and research, such as the number of key disciplines and key laboratories (which the state or a local government designates as a base for teaching or research activities and preferentially distributes resources), the number of faculties/departments and graduate programs, the number of research projects and social (community) services projects, the number of published research papers, the number of awards, the number of patents granted, etc., showed increasing trends. Although such improvements are the outcome of the overall higher education development policies mentioned in "3.1 Relevance", part of it is 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. In particular, the

number of provincial or ministerial key laboratories and research papers published in international journals significantly increased comparing before and after the implementation period of this project (Figures 3 and 4), and it was observed in many targeted universities that new key laboratories were approved mainly based on facilities/equipment developed under this project, and that the training/research in Japan promoted the participating teachers to start publishing articles in international journals. Individual cases of direct outcome of this project are described in "3.2.2 Qualitative effects".



Sources: JICA appraisal documents; responses to the questionnaire

Figure 3: Total number of key disciplines and key laboratories of the 8 targeted universities



Source: responses to the questionnaire
Note: the figures represent the total numbers of research papers included in SCI (Science Citation Index), EI (Engineering Index) and ISTP (Index to Scientific & Technical Proceedings) databases.

Figure 4: Total number of internationally-published research papers by each of the 8 targeted universities

3.2.2 Qualitative Effects[12]

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

The visits to and the observation at the targeted universities confirmed the following outcomes of the project: the facilities and equipment developed under this project have enhanced the comprehensive skill capacity of students by enabling the provision of practical classes and more experiments, and have promoted research activities that often have a distinctive character of the region. Also, the training in Japan (in the respective fields of teaching/research and in university management) has helped participating teachers have broader

[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 Education Bureau of Sichuan Province (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, 88 persons from the 8 universities (including 26 ex-participants in teachers' training in Japan) were interviewed. With respect to interviews with universities in Japan that accepted teachers for training from the target universities, the evaluator visited 2 of them and contacted several more universities by telephone or e-mail.

views, find new research topics, deepen and improve the quality of research, and improve ways of university management. Notably, the training courses in university management were only 3 weeks long, but highly appreciated by most of the teachers interviewed for this ex-post evaluation: specific points that many of them mentioned include the smooth proceeding of the training programs based on careful preparation, diversified and specialized programs and contents, and the discussions held on the issues that China is also facing, such as how to cope with the declining birth rate and job shortage. For both specialized fields and university management training, many targeted universities sent candidates for executive positions, which contributed to university-wide expansion of the effects of training outcomes.

Table 4 below summarizes notable effects of the project on teaching and research at each targeted university.

Table 4: Qualitative effects on each targeted university

Southwest University of Science and Technology (SWUST)	SWUST had been producing human resources and research outputs to support high tech industry such as electronic information and mechanical engineering since before this project. Using both the building constructed and large laboratory equipment developed under this project, SWUST established a university-wide platform of teaching and research equipment (Center of Analysis and Testing) in 2006. As a result, use of the equipment became more frequent. Another building the project constructed, Student Science and Technology Center, is being used as a unique place to promote students' research and innovation, which has led to good results in student contests such as electronic design or robot. The Student Science and Technology Center was designated as an experimental model teaching center at the provincial level in 2007 and at the state level in 2008.
Sichuan Agricultural University (SAU)	SAU had been listed in the "Project 211[13]", and its level of teaching and research level had been relatively high from even before this project. Since the Comprehensive Teaching and Experimenting Building was constructed under this project, teaching and research have been further enhanced, as shown in the winning of the second prize of the State Science and Technology Advancement Award[14] several times and the upgrading of some disciplines such as horticulture to the first level state key disciplines. Also, based on the connections with Japanese universities that started from the teachers' training under this project, some students have begun to study in doctoral programs in Japan. Joint research efforts with universities in Japan in fields such as rice quality management were strengthened.
Chengdu University of Technology (CDUT)	CDUT has had a comparative advantage in the field of geology from before the project, and its level has been further enhanced through the development of equipment under this project. For example, a scanning electron microscope (SEM) procured under the project enabled the Laboratory of Geology to analyze the micro structure of rocks, landslides, etc., which encouraged the designation of the laboratory as a state key laboratory in 2007. Also, the SEM course opened in 2012. As to the training component, for example, a faculty member of the College of Tourism and Urban-rural Planning[15] used what she had studied about hot springs in Japan to start research on hot springs in Sichuan Province after her return to CDUT. She published a book on hot springs development, and gave lectures in another JICA project[16] about the subject matter. Some research results have already been put into practical use. They include soil analysis and conservation of ecosystems of slope land on highways or in the Three Gauges Dam area, software development, etc.

[13] See footnote 8 of the "Project 211".

[14] The State Science and Technology Advancement Award is one of the science and technology awards granted at the national level. In 2012, for example, a total of 212 prizes including grand, first and second prizes were awarded in the whole country. The number of second prizes was 187.

[15] "College" or "School" of universities in China is similar to "Faculty" in universities in Japan.

[16] Revitalization Project Based on the Promotion of Tourism Industry Using Sichuan Province's Hotspring Resources (grassroots technical cooperation project, 2010-2013).

Southwest Petroleum University (SWPU)	SWPU had been active in research related to development of petroleum and other natural resources. Unlike other targeted universities that mainly procured advanced laboratory equipment, SWPU procured basic teaching equipment such as computers and language laboratory (LL) classrooms. As a result, the need of the whole university for such basic equipment was satisfied, as it had moved to within the city of Chengdu and opened a new campus. Regarding the training in Japan, a faculty member of the School of Mechanical and Electric Engineering learned about a three-dimensional computer aided design (3D CAD) software in Japan, and after his return developed a new drilling bit for oil wells, which won prizes and was patented and put into practical use. In the area of educational management, the same teacher introduced the seminar-style teaching method that he learned in Japan. Also, the head of the personnel department, based on what he learned in the university management course, started to provide support of career design for teachers by promoting teachers' training overseas and establishing a "center for capacity development of teaching staff".
Sichuan Normal University (SNU)	SNU is a comprehensive university mainly for producing teachers. This project developed facilities and equipment of the Physics Education Laboratory, which was open to students and enhanced their practical capacity. As a result, more students have come to apply for national level student contests in electronics, etc. and have won prizes. Also, the construction of the music building that has piano rooms, a performing theater and an auditorium, together with the procurement of equipment including 60 pianos, have contributed to students' creativity. Regarding the training outcome, a faculty member of the College of Clothing who learned pottery in Japan established the pottery course after she came back to SNU. At the same time, the project procured equipment for teaching pottery, which is a good example of coordination of the hardware and software components.
Xihua University	This project developed educational facilities and equipment related to the fields of mechanical engineering and electrical engineering. At the School of Mechanical Engineering and Automation, the procurement of equipment such as a modular production and processing (manufacturing) system enabled classes to conduct experiments that had not been possible before the project. In another case, a faculty member of the School of Electrical and Information Engineering has continued joint research on topics which she started with the university in Japan which she attended under this project, such as biological monitoring and health surveillance and diagnosis of cardiac diseases. This collaborative relationship has developed into a joint application for an international patent, introduction of a double degree programs, and also led to her and her counterpart teacher in Japan obtaining positions at both universities. The host university in Japan commented on such relationship, stating that it had selected its partner among universities in inland China based on future prospects in human resource development for manufacturing, together with strategic consideration given to advantages on the Japanese side (i.e. securement of graduate students to study in Japan).
Chengdu University of Information Technology (CUIT)	Formerly known as Chengdu Meteorology College, CUIT had been advanced in the field of meteorology from before this project. The mainframe computer procured under this project was used for numerical model computation for meteorological forecasts until recently (by the time of this ex-post evaluation, a more powerful computer was additionally purchased for research, and the one procured under this project is used mainly for teaching purposes). As a result of the development of experimental equipment for teaching such as laser equipment, the ratio of classes with experiments increased to 90%. Also, a vice president who attended the university management training course in Japan still keeps and refers to the training materials distributed during the course in developing a student-centered campus such as flexible classroom layouts and a full open shelf library. The library is known as one of the best libraries in the southwestern area, with more than 640,000 visitors in total and 360,000 titles of books used in 2012. In addition, there are many cases of joint research projects with the government or companies and practical realization of research results using the equipment procured under this project and/or by the teachers who participated in the training program in Japan. For example, a meteorological radar signal processing system is already widely used by the China Meteorological Administration. Other cases include development and practical use of an information system and flue-gas desulfurization techniques.
Chengdu University of Traditional Chinese Medicine (CDUTCM)	CDUTCM had been a leading university in the area of modernization of traditional Chinese medicine in Sichuan Province, China's largest producer of medicinal herbs. The Research Building and laboratory equipment such as various types of microscopes and analytical apparatuses developed under this project are all frequently used, contributing to the upgrading of education. A faculty member who participated in the training at a leading virus research institution in Japan used the experience of advanced virus research and equipment management for establishment of the first traditional Chinese medicine antivirus laboratory in China. Also, there are many cases of development of Chinese medicine jointly by CDUTCM and pharmaceutical manufacturers in China and Japan which made use of the equipment procured under this project and/or by the teachers who participated in the training in Japan.

Sources: JICA, "The Supervision Survey Report on JICA Loaned Higher Education Project", 2010; responses to the questionnaire and interviews; websites; etc.

LL classroom. The university procured basic teaching equipment for its new campus. The condition of the equipment including personal computers (PCs) is still good (SWPU).

Graduate students using an atomic absorption- photometer (School of Biological Engineering, Xihua University).

Liquid chromatograph mass spectrometer that became one of the main equipment of the state key laboratory (Institute of Animal Nutrition, SAU).

(2) Use of the procured equipment

By the time of the ex-post evaluation, nearly seven years had passed since the majority of the equipment procured under this project was installed. Therefore, some PCs and monitors have passed their useful lives and have already been disposed of in accordance with the university regulations. However, it was confirmed from the visits to and interviews with the targeted universities that most of the other major teaching/research equipment was still used in good conditions and effective at the time of the ex-post evaluation. Underlying factors for such good status of the equipment may include: (i) the project selected the equipment that would be advanced and at the same time useful for a long time, and for that purpose an expert in equipment from Sichuan Agricultural University joined the project implementation team as the deputy leader of equipment and led the selection process, and (ii) each targeted university has carefully used the equipment with proper maintenance (see "3.5 Sustainability" for details).

3.3 Impact

3.3.1 Intended Impacts

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

Table 5 shows selected higher education indicators at the provincial level. Improvement is seen in the indicators for quantitative expansion such as the number of students and enrollment ratios, in which this project is partly involved through the expansion of the facilities and equipment at the 8 targeted universities.

On the other hand, school building area per student which represents qualitative improvement does not show an increasing trend in the province taken as a whole. Although the same indicator has improved at the targeted universities from below the provincial average before the project to above it after the project, its effects on improvement of the figures in the entire province, where there are 94 HEIs (including 31 universities), is limited. Nevertheless, given the fact that the targeted universities are all leading universities in Sichuan Province, the upgrading of teaching and research level at these universities as shown in Table 4 could be considered as the upgrading of teaching and research level of the entire province.

Table 5: Higher education indicators of Sichuan Province

	Actual 2000	Planned 2005	Actual 2005	Actual 2009	Actual 2011
Number of HEIs	86	94	72	92	94 (of which universities with undergraduate programs: 31)
Number of students enrolled in HEIs	235,470	840,000	775,436	1,035,934	1,139,316
Enrollment rate in HEIs	10.7%	15.5%		22% (national average: 24.2%)	27% (national average: 26.9%)
School building area per student (m^2/person)	32.3 (average of targeted universities: 28.0)	29.8	29.7 (2006)	25.4 (average of targeted universities: 28.0)	NA (average of targeted universities: 28.4)

Sources: JICA appraisal documents; JICA, "The Supervision Survey Report on JICA Loaned Higher Education Project", 2010; China Statistical Yearbook 2011; Educational Statistical Yearbook of China 2011; Sichuan Province Statistical Yearbook 2011

(2) Contribution to promotion of market-oriented economic reform, reduction of disparity, development of rural areas and reform of state-owned enterprises

The titled impacts were expected in the ex-ante evaluation. Although the information was limited to the results of the interviews with the executing agency and individual targeted universities and observations, they are considered to have been achieved to a certain extent through production of graduates in the key industries, promotion of research and development (R&D), fostering of teachers for rural areas, and training for laid-off workers.

1. Promotion of market-oriented economic reform: the number of graduates in the fields of accounting, law and financial management increased by between 100 and 500 persons in all targeted universities except CDUTCM (whose area of specialization is not very relevant to this subject). Two of them commented that the project contributed to promotion of a market economy through the enhanced capacities of those graduates.

2. Reduction of disparity: an increasing number of graduates from the targeted universities found jobs in Sichuan's key industries such as electronics, heavy machinery, engineering, food, pharmaceutics, railways and power generation. In each targeted university, the job placement rate was around 80-90% in both 2005 (during project implementation) and 2011 (after project completion), generally showing an increasing trend. Five targeted universities said that this project contributed to a higher capacity of human resources in the key industries through the enhanced capacities of their graduates in research and operation of laboratory equipment as well as through broader views and knowledge of the teachers. Also, as mentioned above, it was observed in several targeted universities that

the research outcomes involving the outputs of this project were put into practical use in some key industries[17].

3. Development of rural areas: in 2011, 58 out of the 727 graduates from SNU became teachers in rural areas. Also, a faculty member of CDUTCM who participated in the training in Japan is currently assigned as a vice governor of Mili Tibetan Autonomous County, Liangshan Yi Autonomous Prefecture in Sichuan Province, and working on poverty reduction through measures including introduction of growing of Chinese medicinal herbs. Although the direct relationship between this particular case and the project is not clear, the fact that the project selected such a qualified candidate for training in Japan and thereby helped him widen his views could be seen to have indirectly contributed to development of rural areas.

4. Support to reform of state-owned enterprises (addressing the issue of laid-off workers): three targeted universities use the facilities constructed under this project to train laid-off workers. The total number of laid-off workers trained at these three universities was 1,371 in 2005 and 1,616 in 2009.

3.3.2 Other Impacts

(1) Impacts on the natural environment

No negative impacts were observed. By the time of the ex-ante evaluation, 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 Sichuan 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. All universities reported that during the construction phase they controlled the noises, etc. and thus kept the negative effects at a minimum. After project completion, the above-mentioned environmental protection departments conducted environmental monitoring for all universities. Both of the two targeted universities that provided information on the monitoring results reported that the parameters were within the standard.

(2) Land acquisition and resettlement

As planned in the ex-ante evaluation, there was no land acquisition and resettlement associated with this project.

[17] As for the issue of disparity, however, it was stated in "3.1.2 Relevance to the Development Needs of China" that the gap in per capita GDP between Sichuan Province and the national average has not been narrowed due to the nation-wide economic development.

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

It was observed in several targeted universities that academic exchanges with universities in Japan have been enhanced through this project. In some cases such as that of SAU, joint research or teachers' visits that had existed before the project was reinforced, while in other cases as seen in the case of Xihua University the project created a relationship with a new partner university in Japan which later developed to various and active exchange.

CUIT planted cherry blossom trees and placed a monumental stone in memory of this project in the courtyard of the building constructed under the project (inscription: "(being separated only by) a narrow strip of water")

Basically, it was each targeted university's responsibility to find host universities in Japan and arrange for the training by communicating with them individually. However, many universities could not find their partners in the initial stage of the project. To respond to such situation, JICA provided various support such as holding of workshops to promote exchange with participation by targeted universities of the Higher Education Projects and interested Japanese universities in 2004 and thereafter, opening of the Higher Education Projects website to share information among participants in the Projects from 22 provinces as well as Japanese universities, and setting up of the help desk by hiring consultants. The above-mentioned case of Xihua University was made possible as a result of these efforts. At the same time, Xihua University reported a different case where the host university did not have the particular field of study that it was interested in and therefore the training outcomes were not achieved as expected. These cases indicate the importance and difficulty of matching the fields of study.

The outcomes of individual cases of exchange are described in Table 4. Overall, almost all of the interviewed 26 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 had a better understanding of Japan. There was also a case where an ex-participant sent his students to doctorate programs in Japan.

This project has largely achieved its objectives, therefore its effectiveness 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 2). The hardware outputs (facilities and equipment) were developed mostly as planned with some differences as follows:

- Building construction: floor area increased by 127% compared to the plan, mainly due to the increase in demand.
- Procurement of equipment: it is difficult to precisely compare the actually-procured equipment with the original plan prepared in the project appraisal stage, because detailed consideration and final selection took place after the commencement of the project. However, the colleges/disciplines to which equipment were installed and the major equipment items installed were mostly in accordance with the plan.

Student Science and Technology Center of SWUST. Located in Mianyang, the city closest to the center of the Great Sichuan Earthquake. All exterior walls fell off in the earthquake, however, they were promptly repaired.

A piano room at the Music College of SNU.

The Great Sichuan Earthquake on May 12, 2008 damaged some buildings that were completed or under construction with detached exterior walls and broken glasses. However, all those damages were promptly repaired using funds from the Chinese side, and did not cause any major problems.

As for the software outputs (i.e. training of teachers at the targeted universities in Japan or invitation of teachers from Japan), adjustments were made in the number of participants (especially accounting for a large increase of trainees for the university management course) and the lengths of stay to cope with the funding status and needs of each university. Accordingly, the actual number of participants were 268 persons compared to the planned 223 persons (120% of the plan), but the actual person months was 648 person months compared to the planned 1,009 person months (64% of the plan).

3.4.2 Project Inputs

3.4.2.1 Project Cost

As shown in the table below, the total project cost was 11,039 million yen (of which the Japanese ODA loan was 5,911 million yen), which was 127% of the plan. However, considering

the increase of the output, it can be said that the cost incurred was more or less as planned. The major reasons for the increase or decrease in each cost item are as follows:

- Building construction: the cost increased due to the increase of the floor area (output).
- Equipment: the cost increased as the contract amount exceeded the estimates made in the appraisal.
- Training: the cost decreased due to the shortening of the training period as mentioned above.

Although the training costs had been planned to be funded from the ODA loan, it was actually borne 100% by each targeted university. This was because the large scale of education and the urgent need for the quantitative expansion of the hardware urged the decision to use the ODA loan fund to fulfill the pressing needs for buildings and equipment.

Table 6: Planned and actual project costs

Unit: million yen

	Plan (appraisal)			Actual		
	Foreign currency	**Local currency**	**Total**	**Foreign currency**	**Local currency**	**Total**
1. Building construction	3,912	2,129	6,041	4,005	4,968	8,973
2. Equipment	1,575	323	1,898	1,906	0	1,906
3. Training	281	0	281	0	160	160
4. Price contingency	72	8	79	0	0	0
6. Physical contingency	292	123	415	0	0	0
Total	6,131	2,583	8,715	5,911	5,128	11,039

Sources: JICA appraisal documents; project completion report; responses to the questionnaire.
Note: The exchange rates applied were: (planned) 1 yuan = 15 yen; (actual) 1 yuan = 14.17 yen.

3.4.2.2 Project Period

As shown in Table 7, the actual project period was 85 months, which was significantly longer than the planned 36 months (ratio against the plan: 236%) due to the following reasons:

- The breakout of SARS in 2002-2003 delayed the start of each project component.
- Due to the above-mentioned delay, the list of equipment had to be reviewed again, and it took time to make necessary adjustment to the list (some equipment that the targeted university urgently or highly needed was procured using its own fund). Also, the manufacturing of certain equipment with complicated and highly specialized specifications took a longer time than originally planned.
- The initially prepared training plan had to be adjusted due to SARS. Also, as the conditions for accepting teachers were not sufficient in Japan, matching of those sending teachers and those receiving the teachers did not go smoothly.
- The Education Bureau was heavily involved in rescue and recovery operations for a period of at least for six months after the Great Sichuan Earthquake in 2008.

Table 7: Planned and actual project periods

	Plan (appraisal)	Actual
Signing on Loan Agreement	March 2002	March 2002
Building construction	July 2004	August 2008
Procurement of equipment	December 2004	March 2009
Training	April 2005	September 2008
Project completion (lengths of months)	March 2005 (36 months)	March 2009 (85 months)

Sources: JICA appraisal documents; project completion report; responses to the questionnaire.

3.4.3 Results of Calculations of Internal Rates of Return (IRR)

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

Although the project cost was mostly as planned, 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 ex-ante evaluation, the facilities and equipment developed under this project are operated and maintained by each targeted university, and the Education Bureau of Sichuan 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. 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

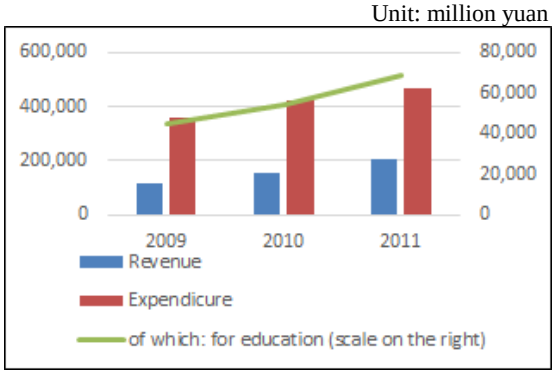
No problem was observed in the technical aspects as all targeted universities regularly carry out maintenance and inspection of the facilities and equipment, and outsource repair works to contractors such as suppliers when necessary. To secure the skills necessary to operate and maintain large or sensitive laboratory equipment, the universities appoint full-time technical staff for each instrument or laboratory to manage the equipment in an integrated manner. Also, some universities send laboratory staff to training in operation and maintenance in order to maintain the necessary skills level.

3.5.3 Financial Aspects of Operation and Maintenance

The targeted universities all belong to the government of Sichuan Province, and their budgets consist of subsidies from the province and own income such as tuitions and fees. The provincial budget is generally in an increasing trend, and expenditures to the education sectors is also increasing (Figure 5).

In all targeted universities, cost for operation and maintenance of the facilities and equipment is part of the university budget and managed under standardized procedures. Normally, certain amount of the operation and maintenance budget is allocated from such expense items as operating expenses. Also, laboratories spend part of the laboratory operating expenses, research fund and income from social services (e.g. consulting services) for routine maintenance of equipment. Revenues are constantly increasing in all targeted universities, and operation and maintenance expenses are stable (Table 8) [18]. In the interviews for the ex-post evaluation, both management and laboratory-level staff of all targeted universities said that the necessary amounts of operation and maintenance cost were secured.

Unit: million yuan



Source: Sichuan Province Statistical Yearbook 2011
Note: The revenue only includes provincial fiscal revenue. Deficits are compensated by the central government.

Figure 5: Budget of Sichuan Province

Table 8: Operation and maintenance expenditures related to this project

Unit: thousand yuan

	2009	2010	2011
SWUST	1,000	1,000	1,000
SAU	3,742	2,398	2,617
CDUT	14,000	14,000	14,000
SWPU	1,100	1,130	1,150
SNU	2,137	2,224	2,226
Xihua University	600	600	600
CUIT	220	280	130
CDUTCM	1,600	1,800	1,800

Sources: Responses to the questionnaire; "The Supervision Survey Report on JICA Loaned Higher Education Project", 2010
Note: the figures of CDUT represent the total operation and maintenance cost for the whole university.

[18] The evaluator confirmed, through the data provided through the questionnaire, that the revenues and expenditures of each university were at a surplus or balanced in recent years.

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 status of usage as well as the condition of the equipment every time they use it.

Operation manual and other notices posted besides the scanning electron microscope (CDUT)

Most of the laboratories which were visited had posted the operational procedures and maintenance plan for each instrument on the wall or in a place easily seen by users, and such procedures seem to be well followed. Also, it was observed that for sensitive equipment, the environment of the laboratories was managed by recording room temperature and humidity.

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.

No major problems were observed in the operation and maintenance system, and 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 eight major universities in Sichuan 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 is was in line with (i) the higher education policies of China and Sichuan Province, (ii) development needs for quantitative and qualitative enhancement of the universities, and (iii) Japan's assistance policies. Effectiveness/impact of the project 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 production of teachers for rural areas. 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 the determination of training host universities in Japan, delays in production of some equipment, as well as external factors such as severe acute respiratory syndrome (SARS)

and the Great Sichuan Earthquake. 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

To take advantage of the relationship that have been cultivated through this project, it could be effective to update the Higher Education Projects website even with respect to the completed projects as much as possible (e.g. reports on exchange after the project completion and related reports such as this ex-post evaluation report; articles requested to ex-participants), so that it would serve as a focal point for continuing and expanded exchange for universities in China and Japan.

4.3 Lessons Learned

(1) Effectiveness of the training component

In the area of assistance in higher education, in addition to assistance in hardware, it is effective to provide software-type assistance (such as teachers' training) in a way that is responsive to existing needs. Past higher education assistance projects have proven effectiveness in training on individual fields of teaching and research, and this was also confirmed in this project. In addition, university management courses such as the ones implemented under this project could be effective even in short training periods, if participants are selected who are candidates for executive positions and have potential to extend the outcomes, and based on careful planning by the host universities as was the case in this project.

Also, as seen in a case of Xihua University, if the exchange is strategically important or beneficial not only to the Chinese side but also to Japanese universities, it is more likely to be continued and expanded upon.

(2) Indicator setting for evaluation

In this project, as well as in other Higher Education Projects in China by Japanese ODA loans, although it was targeted to a limited number of universities (and particular facilities/equipment and teachers of those universities), many effectiveness indicators were ones which measure provincial-level situations (such as aggregated education indicators of the

province) or indicators which measure aspects beyond the direct benefits of the project. This ex-post evaluation used those indicators to evaluate Impact. In order to measure the net effect of the project, the ex-ante evaluation should distinguish indicators that measure direct outcomes and indicators that do not measure.

End

Comparison of the Original and Actual Scope of the Project

Item	Original	Actual
1. Project Outputs	Target: 8 universities in Sichuan Province	Target: same as planned
(a) Hardware i) Building construction	11 buildings such as research building; total floor area of 232,814 m^2	Total floor area of 294,988 m^2
ii) Procurement of educational equipment	Science, engineering, medicine, pharmaceutics, basic research, art, PC, etc.	Areas of education: same as planned Total 5,552 items
(b) Software Teachers' training in Japan or acceptance of experts from Japan	Total 223 persons (including 34 experts from Japan)	Total 268 persons from 42 Japanese universities or institutions (including 31 experts from Japan)
2. Project Period	March 2002 – March 2005 (36 months)	March 2002 to March 2009 (85 months)
3.Project Cost Amount paid in Foreign currency	6,131 million yen	5,911 million yen
Amount paid in Local currency	2,584 million yen (172 million yuan)	5,128 million yen (362 million yuan)
Total	8,715 million yen	11,039 million yen
Japanese ODA loan portion	6,131 million yen	5,911 million yen
Exchange rate	1 yuan = 15 yen (As of September 2001)	1 yuan = 14.17 yen (Average between 2003 and 2009)