

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 Background¹

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 km². 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 9th 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 10th 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 30 years (Grace Period) (40 years for training component) (10 years) Conditions for General untied Procurement:
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, 2014³

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: A⁴)

3.1 Relevance (Rating: ③⁵)

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	<u>The 10th 5-year Plan for National Economic and Social Development (2001–2005):</u> To increase higher education enrollment ratio to around 15% by 2005.	<u>The 12th 5-year Plan for National Economic and Social Development (2011-2015):</u> 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	<u>The 10th National 5-year Plan for Education (2001-2005):</u> 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.	<u>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):</u> 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	<u>The 10th 5-year Plan for Economic and Social Development in Anhui Province (2001-2005):</u> 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.	<u>The 12th 5-year Plan for Economic and Social Development in Anhui Province (2011-2015):</u> 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	<p><u>The 10th 5-year Plan for Education in Anhui Province (2001-2015)</u></p> <p>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 HEIs⁶).</p>	<p><u>The 12th 5-year Plan for Education in Anhui Province (2011-2015)</u></p> <p>To increase higher education enrollment ratio from to 36% in 2015; to increase the student enrollment in HEIs to more than 1,500,000.</p>

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 Province⁷, 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 Effectiveness⁸ (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 research⁹

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 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)
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 equipment¹⁰ 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 platforms¹¹ 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 procurement¹². 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: m² 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 30m²”, and teaching, research and administration building area should be “more than 20m²” in natural science faculties, “more than 15m²” in humanity and social science faculties and “more than 30m²” 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 laboratories¹³, the number of faculties/departments and graduate programs, the number of research projects and social (community) services¹⁴ 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 project¹⁵, 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)

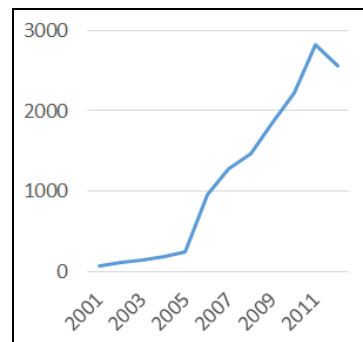
- An example of winning research projects: The large equipment sharing platform named the Analysis and Testing Center which was established based on the equipment procured under this project. The Center has acquired a number of research project such as ones from the National Natural Science Foundation.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



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

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 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 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 Effects¹⁶

(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 Education¹⁷: 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.

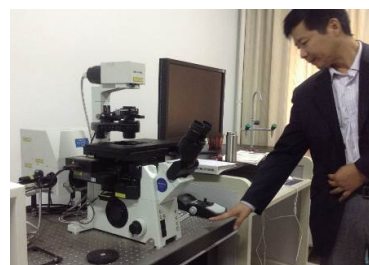
- Regarding the enhancement of research and social services, all targeted universities answered that the equipment developed by this project enabled them to construct key laboratories, acquire new research projects and provide new social services (however, at the universities that focused on procurement 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 criteria¹⁹, 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.

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



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

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 (2 nd 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 budget²¹. 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)