

Country Name	Capacity Development Project for Management Plan of Dam in China
People's Republic of China	

I. Project Outline

Background	In China, dams had been constructed throughout the country to secure water resources to meet the population growth and economic development, and there were 85,160 dams in 2005. Many of them had been constructed from the 1950s to 1970s, and some dams had such problems as not being able to deliver sufficient water supply to the downstream areas due to failure to store water to the designed water level and causing serious damage to the downstream areas by overflow and dam break by flood. Since 3,486 dams overflowed and/or broke between 1954 and 2005 in China, the government was working on rehabilitation and reinforcement of the dams that did not have adequate strength against flood ("dangerous dams"). However, China did not have sufficient technologies related to the safety operation and risk management of dams. Therefore, dissemination of technologies related to the proper dam management was urgently needed.												
Objectives of the Project	The project aimed at developing capacity of operation managers of large and medium-sized dams in China who participated in the training through understanding of Japanese dam management methods, development of the draft dam management manual, compilation of the recommendations for revision of the manual, and implementation of training in China using the draft manual, thereby disseminating the dam manual throughout China and improving dam management level.												
Activities of the Project	<ol style="list-style-type: none"> 1. Overall Goal: Dam management manual is disseminated throughout China and dam management level is improved. 2. Project Purpose: Capacity of operation managers of large and medium-sized dams¹ in China who participated the training is developed. 												
Activities of the Project	<ol style="list-style-type: none"> 1. Project Site: China 2. Main Activities: 1) establishment of the committee and working group for development of dam management manual, clarification of the present condition and issues of dam management in China, understanding of Japanese dam management methods, and development of draft manual; 2) trials of Japanese dam management method, review of trial results and practicality of the draft manual, and recommendation for revision of the draft manual at the four Model Dams²; 3) development of training curriculum by Human Resource Development Center/Ministry of Water Resource by utilizing the manual, training of lecturers, development of training materials by the lecturers and training for dam managers, and development of teaching materials for on-line education of "China Water Use Education Training Net" based on the manual 3. Inputs (to carry out above activities) <table style="width: 100%; border: none;"> <tr> <td style="width: 50%; border: none;">Japanese Side (at the time of project completion)</td> <td style="width: 50%; border: none;">Chinese Side (at the time of terminal evaluation)</td> </tr> <tr> <td style="border: none;">1) Experts: (long-term) 4 persons, (short-term) 18 persons</td> <td style="border: none;">1) Staff Allocated: 260 persons</td> </tr> <tr> <td style="border: none;">2) Training Received: 104 persons</td> <td style="border: none;">2) Land and Facilities: office for experts</td> </tr> <tr> <td style="border: none;">3) Equipment: equipment and vehicles for trails of Japanese management methods at Model Dams, vehicles.</td> <td style="border: none;">3) Local Cost</td> </tr> <tr> <td style="border: none;">4) Local Cost</td> <td style="border: none;"></td> </tr> </table> 			Japanese Side (at the time of project completion)	Chinese Side (at the time of terminal evaluation)	1) Experts: (long-term) 4 persons, (short-term) 18 persons	1) Staff Allocated: 260 persons	2) Training Received: 104 persons	2) Land and Facilities: office for experts	3) Equipment: equipment and vehicles for trails of Japanese management methods at Model Dams, vehicles.	3) Local Cost	4) Local Cost	
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Project Period	September 2009-December 2013 (Extension period: September -December 2013)	Project Cost	(ex-ante) 390million yen, (actual) 539 million yen										
Implementing Agency	Human Resource Development Centre (HRDC)/Ministry of Water Resource (MWR)												
Cooperation Agency in Japan	Incorporated Administrative Agency Japan Water Agency, Sanyu Consultants Inc.												

II. Result of the Evaluation

<Constraints on Evaluation>

(1) Evaluation judgment was made by analyzing the information/data collected by questionnaire. Site surveys were not conducted because the timing of the ex-post evaluation coincided with the busy time, the flood season, and it was difficult for the relevant officials to spare time for the evaluation mission.

< Special Perspectives Considered in the Ex-Post Evaluation >

(1) Interpretation of Indicators for the Project Purpose: In the terminal evaluation, achievement status of the two Indicators (i.e. setting of operational improvement targets of the dams by the training participants (Indicator 1-1) and improvement of at least one dam management work item (Indicator 1-2))

¹ Dams targeted by the project are large dams with water storage volume of 100 million m³ or more and medium-size dams with 10 million to less than 100 million m³.

² Panjiakou Dam in Hebei Province, Lushui Dam in Hubei Province, Lubu Dam in Zhejiang Province, and Liuduzhai Dam in Hunan Province.

was confirmed from the following three viewpoints: (i) setting of operational improvement targets at each Model Dam (Indicator 1-1 for the Model Dams), (ii) improvement of at least one management work item at each Model Dams (Indicators 1-2 for the Model Dams), and (iii) selection and implementation of management work item(s) from the dam management manual by the training participants (except for those from the Model Dams) for themselves or staff of the dams they belong to (Indicators 1-1 and 1-2 for the dams except for the Model Dams). Regarding (iii) above, the Indicators of the Project Purpose were interpreted in a broader sense taking into account that the participants were not necessarily in a position to decide the operational management targets. This ex-post evaluation followed the approach of the terminal evaluation, which is judged to be appropriate, and confirmed the achievement and continuation status of the Project Purpose using the above three viewpoints.

(2) Target year of the Overall Goal: Although the target year of the Overall Goal is not stated in the PDM, there is description in the Joint-Terminal Evaluation Report "(The Overall Goal is) the goal to be achieved three to five years after the project completion". In this ex-post evaluation, therefore, target year of the Overall Goal was set as 2018 (to be more precise, December 2018).

(3) Target dams for the Overall Goal: Although the type of the target dams for Overall Goal is not stated in the PDM, it is assumed to be the same as that of the Project Purpose: large and medium-sized dam. Since the dam management manual developed through the project can be referred to in the small dams, a ripple effect on them was noted as reference information.

(4) Target value of Indicators for the Overall Goal: According to the ex-ante evaluation sheet, specific target value was to be set by the time of mid-term evaluation, but it was not set during the cooperation period. Therefore, regarding Indicator 1 ("Number of dams where dam management manual was deployed (dissemination rate of manual)"), whether the actual number is considered sufficient for dissemination of the manual throughout China as stated in the Overall Goal was checked with reasons for judgment. As for Indicator 2 ("Number of dams to which the dam operations managers who participated in training in China belong"), achievement status of the training plan of HRDC/MWR was assessed. Since the target number of dams was not set in the plan, the number of trainees was used as an alternative indicator. Indicator 2 was considered practically achieved if the actual number of trainees reached the target in the plan.

1 Relevance

<Consistency with the Development Policy of China at the Time of Ex-Ante Evaluation and Project Completion>

The project was consistent with China's development policy of flood control as set forth in the "11th Five Year Plan for National Economic and Social Development of the People's Republic of China" (2006 - 2010) and the "12th Five Year Plan" (2011-2015).

<Consistency with the Development Needs of China at the Time of Ex-Ante Evaluation and Project Completion >

At the time of ex-ante evaluation, soft aspect of dam management was recognized as an important matter it was recognized as an important matter through enforcement of the "The Food Prevention Law of the People's Republic of China" (1997), etc. but concrete management method was not developed. It was therefore urgent to develop a dam management manual and capacity of the relevant staff. At the time of project completion, maintaining the effect of risk elimination at the large and medium-sized dams was a major activity in "Decision No. 1 on accelerating water conservancy reform and development" of the Communist Party of China (CPC) Central Committee and the State Council announced in 2011. For risk elimination and life extension, it was essential to properly operate the dams and to establish a risk management method in addition to reinforcement of facilities.

<Consistency with Japan's ODA Policy at the Time of Ex-Ante Evaluation>

The project was consistent with Japan's ODA policy on "cooperation for dealing with global problems such as environmental problems" under the main development agenda of "realizing sustainable development" in the Economic Cooperation Plan for China (2001).

<Evaluation Result>

In light of the above, the relevance of the project is high.

2 Effectiveness/Impact

<Status of Achievement for the Project Purpose at the time of Project Completion>

The Project Purpose was achieved by the project completion. At the time of terminal evaluation, at the four Model Dams, at least one operational improvement target was set through the trials of the dam management manual developed by the project (Indicator 1-1), and at least one management work item was improved (Indicator 1-2). As for the dams except for the Model Dams, 83% of the participants in domestic training conducted by HRDC selected the management work items from the dam management manual and implemented them for themselves or the staff of the dams they belonged to (Indicators 1-1 and 1-2).

<Continuation Status of Project Effects at the time of Ex-post Evaluation>

Achievement status of the Project Purpose is continued. At the Model Dams, the number of achieved operational improvement targets has been maintained or increased since the project completion. As for the dams except for the Model Dams, 87% of domestic training participants still utilize the dam management manual in their duties. Further, HRDC conducts training and on-line training utilizing the results of the project, including the dam management manual, on a continuous and regular basis based on its training plan.

<Status of Achievement for Overall Goal at the time of Ex-post Evaluation>

The Overall Goal was achieved by the time of ex-post evaluation. The dam management manual was approved and issued as an official instruction document (provisional edition) of MWR during the project, and, as of August 2016, the manual has been deployed at 3,108 dams by HRDC, which accounts for 77% of the large and medium-sized dams in China. The manual has also been distributed in the training by Dam Safety Management Centre, etc., which may suggest that the actual dissemination rate may be higher than 77% at the time of ex-post evaluation. From this, the level of achievement of this indicator is considered to be mostly sufficient in the context of the Overall Goal of disseminating the manual throughout China. The dissemination rate is expected to increase further by December 2018 through distribution of the manual at the time of training etc. (Indicator 1). The number of participants in the dam management training at HRDC is 3,213 persons (as of December 2016), which is slightly higher than planned (3,180 persons). The number of large and medium-sized dams, to which the training participants from the start of the project to December 2016 belong, is 89. According to the Implementing Agency, the dam management training will be held continuously because MWR places importance on it. It is therefore expected that the number of dams to which the training participants belong will be further increased by December 2018 (Indicator 2).

< Other Impacts at the time of Ex-post Evaluation>

There are no negative impacts on the natural and social environment caused by the project. According to the Implementing Agency, positive impacts are observed, including the followings. Since 2013, Dam Safety Management Center /MWR, which provided technical support for preparing the dam management manual, has conducted training using the results of the project such as the dam management manual etc. (total of 3,108 people attended the training). The Center also utilized the knowledge acquired from Training in Japan (i.e. warning for downstream areas, reservoir management, annual report, cost guarantee, coordination and adjustment of cascade reservoirs, and prevention of deposition of dam sediment) in revising “Dam Safety Management Regulations”, and the related items and regulations were newly included in the proposed revision. In addition, according to the questionnaire survey to 32 participants in the project’s domestic training, there was a case where a participant made appropriate water adjustment during drought and flood season to protect agricultural water in the downstream irrigation areas by utilizing the training results, and thus annual adjustment target was achieved. Further, according to a Japanese expert dispatched to another JICA technical cooperation project titled the Project for Development of the Capacity on Water Environmental Management in Heihejinpen Dam River Basin (2012-2015), the project team referred to descriptions of the dam management manual regarding laws, regulations and technical standards related to dams in China as well as the list of references when they prepared a technical manual on dam operation.

<Evaluation Result>

In light of the above, through the project, the Project Purpose was achieved at the time of project completion and the project effect is continued at the time of ex-post evaluation. The Overall Goal is achieved at the time of ex-post evaluation, and many other positive impacts are revealed. Therefore, the effectiveness/impact of the project is high.

Achievement of Project Purpose and Overall Goal

Aim	Indicators	Results																			
(Project Purpose) Capacity of operations managers of large and medium-sized dams in China who participated the training is developed	(Indicator 1-1) Operational improvement targets of the dams are set by the dam operations managers who participated in the training	Status of the Achievement: mostly achieved (Terminal Evaluation*) -Model Dam: At least one operational improvement targets were set for each dam (see the table of Indicator 1-2 for the target number). -Except for Model Dam: 83% of the 381 trainees who responded to the questionnaire conducted by the project answered that they practiced the contents of the manual to improve their work. *The achievement status was assessed based on the information at the time of terminal evaluation because the status at the time of project completion could not be confirmed. Regarding Liuduzhai Dam, at least one operational improvement target should have been set as the Terminal Evaluation Report states that at least one target was achieved. However, available documents do not mention the number of targets set, and the officers in charge at the time of ex-post evaluation do not have the information on how many targets were set at the time of project completion. *By nature of this indicator, confirmation of continuation status is not applicable. See Indicator 1-2 for the state of achievement of the operational improvement targets and utilization of the contents of the manual.																			
	(Indicator 1-2) At least one dam management work item is improved.	Status of the Achievement: achieved (continued) (Terminal Evaluation) -Model Dam: At least one improvement target was achieved at each dam. -Except for Model Dam: (see the results of Indicator 1-1). (Ex-post Evaluation) -Model Dam: achievement status of operational improvement targets is maintained or improved. -Except for Model Dam: 87% of the trainees to which the questionnaire was sent for the ex-post evaluation replied that they utilize the contents of the manual in dam management work. <Achievement status of operational improvement targets in the Model Dams at the time of terminal evaluation and ex-post evaluation > <table border="1" data-bbox="619 1682 1497 1888"> <thead> <tr> <th></th> <th>Panjiakou</th> <th>Lushui</th> <th>Lubu</th> <th>Liuduzhai</th> </tr> </thead> <tbody> <tr> <td>Number of targets set through the project</td> <td>24</td> <td>5</td> <td>4</td> <td>N/A</td> </tr> <tr> <td>Number of achieved targets at the time of terminal evaluation</td> <td>18</td> <td>5</td> <td>3</td> <td>1</td> </tr> <tr> <td>Number of achieved targets at the time of ex-post evaluation</td> <td>24</td> <td>5</td> <td>3</td> <td>2</td> </tr> </tbody> </table>		Panjiakou	Lushui	Lubu	Liuduzhai	Number of targets set through the project	24	5	4	N/A	Number of achieved targets at the time of terminal evaluation	18	5	3	1	Number of achieved targets at the time of ex-post evaluation	24	5	3
	Panjiakou	Lushui	Lubu	Liuduzhai																	
Number of targets set through the project	24	5	4	N/A																	
Number of achieved targets at the time of terminal evaluation	18	5	3	1																	
Number of achieved targets at the time of ex-post evaluation	24	5	3	2																	
(Overall Goal) Dam management manual is disseminated throughout China and dam	(Indicator 1) Number of dams where dam management manual was deployed (dissemination rate of manual)	(Ex-post Evaluation) mostly achieved -Manual is deployed at 77% of large and medium-sized dams (i.e., 3,108 out of 4,033) nationwide by post and distribution in the training by HRDC (It is also deployed at 1,300 small dams). The manual has been also distributed in the training by Dam Safety Management Centre, etc. (number not available).																			

management level is improved	(Indicator 2) Number of dams to which the dam operations managers who participated in training in China belong	(Ex-post Evaluation) achieved -The number of trainees at HRDC slightly exceeded the target number. The number of large and medium-sized dams, to which the participants in the training after the start of the project belong, is 89.				
	(Alternative Indicator) The number of participants reaches the target number set in the training plan of HRDC.	<Number of participants in training in China and number of dams to which the participants belong to> (as of December 2016)				
		Timing	Type of training	Target number of trainees	Actual number of trainees	Gross number of dams to which trainees belong
		During the project	Training at HRDC	480	480	94
		After the project (2014-2016)	Training at HRDC	900	931	163
			On-line training	1,800	1,802	134
		Total (Gross)		3,180	3,213	391
	Total (Net)		N.A.	N.A.	224 of which, large and medium: 89 small: 135	

Source: Terminal Evaluation Report, Project Completion Report, questionnaire survey to HRDC/MWR, Model Dams, and Dam Safety Management Centre, and questionnaire survey by MWR to the participants of the project's domestic training (32 persons).

3 Efficiency

The project cost exceeded the plan (ratio against the plan: 138%), and the project period slightly exceeded the plan (ratio against the plan: 108%) since it took time to pilot the management technologies for some dams. Therefore, the efficiency of the project is fair.

4 Sustainability

<Policy Aspect>

Dam management continues to be an important issue in the "13th Five Year Plan for National Economic and Social Development of the People's Republic of China" (2016-2020). The Communist Party of China promulgated "Opinions on Promoting River Chief System" in December 2016, which stressed the enhancement of water resource management and protection, including the importance of management and protection of water resources of dam reservoirs. The legal environment is also being strengthened. For example, revision of "Dam Reservoir Safety Management Ordinance", which makes use of the knowledge acquired through the project, is ongoing.

<Institutional Aspect>

There is no change in the dam management structure of MWR, HRDC/MWR, and the Model Dams. Four people are assigned to Department of Dam Management /MWR to provide policy guidance on dam safety management, and 10 staff members are assigned to dam management training at HRDC. The number of personnel is sufficient since it meets the quota set by MWR. As for the Model Dams, there are 130 staff members at Panjiakou, 290 at Lushui, 30 at Lubu, and 140 at Liuduzhai. According to the Implementing Agency, the personnel necessary for appropriate dam management is secured at the Model Dams because the number of staff of each dam has reached the quota standard³ of MWR.

<Technical Aspect>

Almost all the counterpart personnel at HRDC and the Model Dams continue to work in their respective organizations and utilize the knowledge and deliverables accumulated through the project in their duties. According to the Implementing Agency, dam management status of the Model Dams is appreciated by the central and local water resource management authorities; therefore, the Model Dams have sufficient technical capacity for management based on the dam management manual. As for the equipment and vehicles for warning provided to Lushui Dam, an equipment manager is assigned, and the maintenance is properly carried out. The warning system for downstream areas introduced and tested by the project is in operation.

<Financial Aspect>

An annual budget of 400,000 yuan was allocated to the dam management training of HRDC from fiscal year (FY) 2014 to 2016. The budget was considered sufficient because, during the period, the training was implemented as planned and the expenditure was within the budget. According to HRDC, the necessary budget is expected to be secured in future since MWR places importance on dam management. With respect to the Model Dams, the allocated budget in FY 2016 was 11.8 million yuan at Panjiakou, 7.64 million yuan at Lubu, 7.35 million yuan at Liuduzhai, and 4.65 million yuan at Lushui. For three years from FY 2014, the budget amount at Panjiakou, Lubu and Liuduzhai is gradually increasing and is maintained at Lushui. The necessary budget is considered to have been secured at the Model Dams because the expenditure was within the budget range and their dam management is regarded as appropriate. The budget is likely to be secured in future judging from the past record. According to the Implementing Agency, for large dams, the budget for safety management is basically secured because its financial sources and expense items are made clear by the government.

<Evaluation Result>

In light of the above, no problem has been observed in terms of the policy/institutional/technical/financial aspects. Therefore, the sustainability of the effectiveness through the project is high.

³ The number of staff of some dams is less than the quota. According the Implementing Agency, the quota was determined based on the technical level in the past, but the number of the necessary personnel (i.e. quota standard) is reduced in recent years due to increased automation of the management system. (For example, personnel for patrol becomes unnecessary because of installation of surveillance cameras, etc.)

5 Summary of Evaluation

The project achieved the Project Purpose (i.e. capacity development of operations managers of large and medium-sized dams in China who participated in the training). The effect of the project is continued and the Overall Goal (i.e. dissemination of dam management manual throughout China and improvement of dam management level) has been achieved. Regarding the sustainability, no problem has been observed in terms of the policy/institutional/technical/financial aspects to maintain the project effects. As for the efficiency, both the project cost and period exceeded the plan. Considering all of the above points, this project is evaluated to be highly satisfactory.

Recommendations & Lessons Learned

Lessons learned for JICA:

-A deliverable of the project (i.e. dam management manual) is continuously used after the project completion because it was approved as a formal instruction document (provisional edition) of the government of China. Setting the goals according to the needs of the Chinese side and achieving satisfactory results can be referred to as a good practice of securing dissemination of the project deliverable by prompt formalization.



Panjiakou Dam



Electronic billboard for warning at Lushui Dam



Warning system at Lushui Dam

Model Dams and the equipment provided by the project (photos provided by the Implementing Agency)