

Country Name People's Republic of China	The Project for Development of the Capacity on Water Environmental Management in Heihejinpen Dam River Basin												
I. Project Outline													
Background	Heihe Source Protection Zone of Water Source located in Xi'an City in Shaanxi Province in the People's Republic of China (hereinafter referred to as "China") was the main source of drinking water for Xi'an City. Water quality of Heihe basin was relatively good. However, in the upstream area, pollution sources such as houses, agricultural land, mines etc. were scattered and waste dumping was increasing. In Xi'an City, Xi'an Environmental Protection Bureau was in charge of pollution countermeasures and unexpected water pollution accident in the upstream area, Xi'an Water Affairs Bureau was responsible for policy and institutional aspects of water quality management of water sources, and Xi'an Water Group Company Limited, a water supply company, was responsible for operation and management of Heihejinpen Dam, which was the major water intake, according to the relevant regulations such as "Ordinance on Conservation of Heihe Water Conveyance System in Xi'an City" (August 2008) etc. However, in terms of organizational, institutional and technical aspects, their capacity to implement water environmental management was not sufficient. In addition, information sharing among the related organizations was not sufficient.												
Objectives of the Project	<p>The project aims to establish and operate integrated¹ water environmental management system, aiming at securing safe and appropriate-quality raw water for drinking water, in Heihejinpen Dam River Basin, which provides a model² for others, through enhancement of daily water quality management system, enhancement of system and implementing capacity to respond to unexpected water pollution accidents, and introduction of models which can be shared with other river basins having similar challenges through seminars, thereby sharing of experiences of the project in China and initiating efforts towards water environmental conservation in other water source areas.</p> <ol style="list-style-type: none"> 1. Overall Goal: Experience of the project is shared in China and efforts towards water environmental conservation are initiated in other water source areas. 2. Project Purpose: Integrated water environmental management system, aiming at securing safe and appropriate-quality raw water for drinking water, is established and operated in Heihejinpen Dam River Basin, which provides a model for others. 												
Activities of the Project	<ol style="list-style-type: none"> 1. Project Site: Heihejinpen Dam River Basin in Xi'an City in Shaanxi Province. 2. Main Activities: <ol style="list-style-type: none"> 1) Training in Japan on water quality management; review and identification of issues on Japanese and Chinese laws, organizational structures, technologies and implementation status of water source management of dam lakes; review of existing studies on the project site; study on current status of water pollution and risk assessment of the project site; development of water quality improvement plan (organization and technical aspects) for the project site; implementation of priority countermeasures; and improvement of operation and management method of Heihejinpen Dam. 2) Training in Japan on unexpected water pollution countermeasures; review and identification of issues on Japanese and Chinese laws, organizational structures, technologies and implementation status of unexpected water pollution countermeasures; review of emergency forecasting and warning system in the project site and unexpected water pollution accidents in the river basin in the past; identification of potential accident sources on the map; identification of potential pollutants; damage assumption of serious accidents; development of countermeasure plans (organization and technical aspects); implementation of priority countermeasures; and preparation of draft revision of the relevant manuals. 3) Organization of Japan-China water quality management technology seminar; identification of issues in other river basins; extraction of models from 1) and 2) above, implementation of seminar for the organizations in charge of other river basins with similar problems and sharing of the models. 3. Inputs (to carry out above activities) <table border="0" data-bbox="320 1621 1556 1935"> <tr> <td data-bbox="320 1621 938 1653">Japanese Side (at the time of project completion)</td> <td data-bbox="943 1621 1556 1682">Chinese Side (at the time of terminal evaluation in August 2014)</td> </tr> <tr> <td data-bbox="320 1653 938 1684">1) Experts: 8 persons</td> <td data-bbox="943 1682 1556 1809">1) Staff Allocated: 67 persons (Xi'an Science and Technology Bureau, Xi'an Environmental Protection Bureau, Xi'an Water Affairs Bureau, and Xi'an Water Group Company Limited, etc)</td> </tr> <tr> <td data-bbox="320 1684 938 1715">2) Training Received: 42 persons</td> <td data-bbox="943 1809 1556 1841">2) Land and Facilities: project office, etc.</td> </tr> <tr> <td data-bbox="320 1715 938 1776">3) Equipment: vehicles, a toxic sensor, a boom, a ship gate</td> <td data-bbox="943 1841 1556 1935">3) Local Cost: surveillance cameras, toxicity measurement equipment, design and installation costs of boom etc.</td> </tr> <tr> <td data-bbox="320 1776 938 1807">4) Local Cost</td> <td></td> </tr> </table> 			Japanese Side (at the time of project completion)	Chinese Side (at the time of terminal evaluation in August 2014)	1) Experts: 8 persons	1) Staff Allocated: 67 persons (Xi'an Science and Technology Bureau, Xi'an Environmental Protection Bureau, Xi'an Water Affairs Bureau, and Xi'an Water Group Company Limited, etc)	2) Training Received: 42 persons	2) Land and Facilities: project office, etc.	3) Equipment: vehicles, a toxic sensor, a boom, a ship gate	3) Local Cost: surveillance cameras, toxicity measurement equipment, design and installation costs of boom etc.	4) Local Cost	
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Project Period	March 2012 - March 2015	Project Cost	(ex-ante) 300 million yen, (actual) 267 million yen.										

¹ "Integrated" means a state in which information concerning Heihejinpen Dam River Basin is shared and cooperation mechanism is established among the related agencies.

² "Model" means mechanism, countermeasure technologies and dam operation and management method centering on water quality, which are applicable to other river basins with similar problems.

Implementing Agency	Xi'an Municipal People's Government (Major related agencies ³ : Xi'an Science and Technology Bureau, Xi'an Environmental Protection Bureau, Xi'an Water Affairs Bureau, and Xi'an Water Group Company Limited)
Cooperation Agency in Japan	CTI Engineering International Co., Ltd.; Incorporated Administrative Agency Japan Water Agency

II. Result of the Evaluation

<Constraints on Evaluation>

·As for Indicator 3 for the Overall Goal (“Experience of the project is referenced at dams in other river basins”), achievement status could not be sufficiently confirmed because, due to human resource and time constraints and restriction on foreigners' entry, the data could not be collected directly from the stakeholders in other river basins, including those who had participated in the model sharing seminar implemented in the project and those who had made site visits to observe the project achievements.

<Special Perspective Considered in the Ex-Post Evaluation>

· The Project Design Matrix (PDM) does not state the timing of achieving the Overall Goal. In this ex-post evaluation, it shall be defined to be March 2018 since the timing of ex-post evaluation is set to be in 3 years after the project completion in the ex-ante evaluation sheet.

·For all of three Indicators for Overall Goal, expected level to be achieved and its criteria for judgement are not clearly stated so that the exact level of achievement cannot be confirmed. Therefore, in this ex-post evaluation, whether the actual result is sufficient in light of description of the Overall Goal shall be confirmed.

1 Relevance

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

At the time of ex-ante evaluation and project completion, the project was consistent with China's development policy of enhancement of protection of drinking water sources as set forth in “National Plan for Environment Protection of Urban Drinking Water Source” (2008-2020) and “Regulation on Pollution Control and Management for Drinking Water Protected Area” (2010 revision).

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

At the time of ex-ante evaluation and project completion. Heihejinpen Dam Lake was an important source of water in Xi'an City, and the project, which aimed to establish and operate integrated water environmental management system for securing safe and high-quality raw water for drinking water in Heihejinpen Dam River Basin, was consistent with the local needs.

<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 time of project completion. From May 2014, Heihe Water Source Protection Meeting, consisting of Heihejinpen Dam Management Corporation (formerly Jinpen Management Center), Heihe Water Source Environment Protection and Management General Station (Heihe General Station), and Heihe Police Station, was organized regularly and information on hydrology and water quality of dam lake and river basin was shared to ensure integrated management of Heihejinpen Dam River Basin constantly (Indicator).

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

Achievement status of the Project Purpose has been continued at the time of ex-post evaluation. Heihe Water Source Protection Meeting has been organized regularly (around 4 or 5 times a year) and information on water quality and security of dam lake and river basin has been shared. In addition, the pumped aeration equipment⁴ improved in the project has been continuously operated as a daily water quality protection measure, and a toxic sensor introduced as a measure against an unexpected water pollution accident has been continuously operated⁵. Furthermore, the technical manual for operation of Heihejinpen Dam developed in the project has been continuously utilized in dam operation, including pumped aeration equipment, etc.

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

The Overall Goal has been partially achieved by the time of ex-post evaluation. Experience of the project has been shared with the relevant bureaus of other cities through WSB and Xi'an Environmental Protection Bureau and with the relevant departments of the central government (Ministry of Science and Technology and Ministry of Water Resources) through Xi'an Science and Technology Bureau and Xi'an Water Affairs Bureau. However, the experience has not been disseminated further through the central government. According to the implementing agencies, it is attributable to the fact that it is not common in China's administration to share information and make requests from the local level to the central level (Indicator 1). Total of 6 organizations in other river basins (of which 4 from outside Xi'an City) have made field visits to observe the project achievements (3 during the project implementation and the other 3 after the project completion). According to the implementing agencies, the number of visits is limited after the project because it has become difficult to conduct field observations and exchange among provinces/cities due to strict budget management in the recent years (Indicator 2). According to the

³ Under Xi'an Science and Technology Bureau, Xi'an Regional Science and Technology Exchange Centre was mainly in charge of the project. Field activities in Heihejinpen Dam River Basin was conducted by Heihe Water Source Environment Protection and Management General Station under Xi'an Water Affairs Bureau as well as Heihejinpen Dam Management Corporation (formerly Jinpen Management Center) under Xi'an Water Group Company Limited.

⁴ Equipment to take in water mass with low dissolved oxygen (DO) concentration in the lower part, to improve the DO concentration by aerating it, and to send it back to the lower part.

⁵ As for the boom and the ship gate installed in the project in order to prevent waste disposal, they have been temporarily removed since the end of 2017 because the effect of the boom was not exerted as expected for the damming of the drifting in water rising period due to extremely strong wind blowing over Heihejinpen Dam Lake in the recent years. It is noted that, at the time of ex-post evaluation, the drifting objects are removed by manpower and operation of the dam is not disturbed.

implementing agencies, the experiences of the project have been referred to at 2 dams in other river basins in Xi'an City, which participated in the model sharing seminar and the field observation organized by the project (Integrated management has been implemented at Lijiahe Reservoir based on the experiences of the project, and pumped aeration equipment has been introduced to Lijiahe Reservoir and Shibianyu Reservoir). Information on dams in other river basins outside Xi'an City could not be confirmed at the implementing agencies (Indicator 3).

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

According to the implementing agencies, since the project completion, the results of all water quality monitoring items in Heihejinpen Dam River Basin have continuously met the standards set by the Central Government, and an accident such as inflow of contaminant into Heihejinpen Dam Lake has not occurred. In addition, it is confirmed that the quality of water has improved at Lijiahe Reservoir and Shibianyu Reservoir, which have installed pumped aeration equipment with reference to the experience of the project. Also, knowledge and experience of the stakeholders of the project was referred when revising local laws and regulations such as the “Ordinance on Pollution Control and Management for Urban Drinking Water Source in Xi'an City” (2014 revision). Meanwhile, negative impact of the project has not occurred.

<Evaluation Result>

Therefore, the effectiveness/impact of the project is fair.

Achievement of Project Purpose and Overall Goal

Aim	Indicators	Results									
(Project Purpose) Integrated water environmental management system, aiming at securing safe and appropriate-quality raw water for drinking water, is established and operated in Heihejinpen Dam River Basin, which provides a model for others.	(Indicator) Heihe Water Source Protection Meeting, consisting of Jinpen Management Center, Heihe General Station and Heihe Police Station, is organized regularly and information on hydrology and water quality of dam lake and river basin is shared to ensure integrated management constantly.	Status of the Achievement: achieved (continued) (Project Completion) -From May 2014, Heihe Water Source Protection Meeting was conducted regularly in odd month and information was shared. (Ex-post evaluation) -Heihe Water Source Protection Meeting is conducted regularly (about 4-5 times a year) and information is shared.									
(Overall Goal) Experience of the project are shared in China and efforts towards water environment conservation are initiated in other water source areas.	(Indicator 1) Experience of the project is shared with relevant departments/bureaus of other cities, other provinces, and the central government.	(Ex-post Evaluation) partially achieved -Experience of the project has been shared with the relevant bureaus of other cities through Xi'an Water Affairs Bureau and Xi'an Environmental Protection Bureau and with the relevant departments of the central government (Ministry of Science and Technology and Ministry of Water Resources) through Xi'an Science and Technology Bureau and Xi'an Water Affairs Bureau. However, the experience has not been disseminated further through the relevant departments of the central government.									
	(Indicator 2) Stakeholders in other river basins conduct site visits to observe project achievements.	(Ex-post Evaluation) partially achieved <Organizations in other river basins which observed project achievements through Heihe General Station and Xi'an Water Group Company Limited > (as of March 2018)									
		<table border="1"> <thead> <tr> <th></th> <th>Organizations in other basins</th> <th>Major achievements observed.</th> </tr> </thead> <tbody> <tr> <td>During the project</td> <td>3 organizations (2 from Xi'an City and 1 from another city in Shaanxi Province)</td> <td>Upstream area management system, boom and ship gate, pumped aeration equipment</td> </tr> <tr> <td>After the project</td> <td>3 organizations (from Hubei Province, Qinghai Province, and Yanan City)</td> <td>Structure and management of pumped aeration equipment and toxic sensor, water source management, operation and management of Heihejinpen Dam.</td> </tr> </tbody> </table>		Organizations in other basins	Major achievements observed.	During the project	3 organizations (2 from Xi'an City and 1 from another city in Shaanxi Province)	Upstream area management system, boom and ship gate, pumped aeration equipment	After the project	3 organizations (from Hubei Province, Qinghai Province, and Yanan City)	Structure and management of pumped aeration equipment and toxic sensor, water source management, operation and management of Heihejinpen Dam.
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(Indicator 3) Experience of the project is referenced at dams in other river basins.	(Ex-post Evaluation) partially achieved - In Xi'an City, integrated management based on the experience of the project has been carried out at Lijiahe Reservoir and pumped aeration equipment has been introduced at Lijiahe Reservoir and Shibianyu Reservoir.										

Source: Terminal Evaluation Report, Project Completion Report, questionnaire survey and interview to Xi'an Environmental Protection Bureau and Heihe General Station, Xi'an Science and Technology Bureau and Xi'an Regional Science and Technology Exchange Centre, Xi'an Water Affairs Bureau, Xi'an Water Group Company Limited, and Heihejinpen Dam Management Corporation.

3 Efficiency

Both project cost and project period were within the plan (ratio against the plan: 89%, 100%). The Outputs of the project were produced as planned. Therefore, the efficiency of the project is high.

4 Sustainability

<Policy Aspect>

Importance of protecting drinking water sources is set forth in such policy documents as “National Plan for Environment Protection of Urban Drinking Water Source” (2008-2020), “Regulation on Pollution Control and Management for Drinking Water Protected Area” (2010 revision), and “Action Plan for Prevention and Control of Water Pollution” (2015) at the national level, and “Plan for Environmental Protection of Drinking Water Source in Xi'an City” (2010-2020), “Ordinance on Pollution Control and Management for Urban Drinking Water Source in Xi'an City” (2014 revision) at the level of Xi'an City. In addition, “Implementation Plan for Water Quality Improvement Measures for Heihe Water Source” (2013), formulated utilizing the knowledge acquired in training in Japan under this project is

continuously effective. According to the implementing agencies, major changes are not expected in these policies in the future.

<Institutional Aspect>

Since the project completion, there has been no change in the organizational structure and roles of each implementing agency for daily water quality management and response to unexpected water pollution accidents in Heihejinpen Dam River Basin. The implementing agencies have carried out their work and have cooperated with each other according to the above-mentioned “Implementation Plan for Water Quality Improvement Measures for Heihe Water Source”. As for the implementing agencies at the central level, the number of the staff at the relevant departments is 3 in Xi'an Environmental Protection Bureau, 4 in Xi'an Water Affairs Bureau, and 2 in Xi'an Water Group Company Limited, all of which is less than the quota. However, these implementing agencies consider that the necessary number of people is allocated because their duties have been accomplished without a problem. At the field level, the number of the staff is 110 in Heihe General Station and it is according to the quota. In Heihejinpen Dam Management Corporation, 17 regular staff members are allocated, and additional 25 contract staff members have been employed since 2018 because the regular staff members used to concurrently serve more than one task. Cooperation between the related agencies has been strengthened through Heihe Water Source Protection Meeting convened 4 to 5 times a year and an annual joint training for unexpected pollution accidents. According to the implementing agencies, the above-mentioned organizational structure is expected to continue in the future.

<Technical Aspect>

At the implementing agencies, there has been no massive turnover since the project completion. The C/Ps leaving their office as part of routine rotation have transferred the matters related to the project to their successors, and the knowledge and skills obtained in the project as well as the reports and technical manuals developed in the project have been utilized in day-to-day work. It is considered that technical level necessary to sustain the project effect is maintained at each implementing agency because the result of water quality monitoring has been continuously meeting the standard in Heihejinpen Dam River Basin and no serious accident such as influx of pollutants in Heihejinpen Dam Lake has occurred. At Heihejinpen Dam Management Corporation, the relevant training and learning activities have been continued to maintain and further enhance the capacity improved through the project. Regarding the provided equipment, from the interview to the implementing agencies and the field observation, it was confirmed that a person in charge of maintenance and patrol inspection has been assigned for the toxic sensor, which has been properly maintained and continuously utilized, while the boom and the ship gate have been temporarily removed in response to change in the local natural environment (see footnote 4).

<Financial Aspect>

According to the implementing agencies, necessary budget has been secured because their work related to day-to-day water quality management and response to unexpected water pollution accidents in water sources, including Heihejinpen Dam River Basin, has not been disturbed seriously due to budget constraint. It is unlikely that there will be changes in budget allocation so that necessary budget is expected to be secured for the future.

<Budget and expenditure related to day-to-day water quality management and response to unexpected water pollution accidents>
(Unit: ten thousand yuan)

	Xi'an Environmental Protection Bureau		Xi'an Water Affairs Bureau		Xi'an Water Group Company Limited		Heihejinpen Dam Management Corporation		Heihe General Station	
	Budget	Expenditure	Budget	Expenditure	Budget	Expenditure	Budget	Expenditure	Budget	Expenditure
2015	N/A	602.02	N/A	241.32	199.6	146.79	82.9	82.9	N/A	306.78
2016	N/A	297.65	N/A	885.61	111.0	100.49	75.99	66.99	N/A	406.61
2017	N/A	245.56	N/A	186.7	116.0	108.09	88.68	83.68	N/A	400.69

Source: questionnaire and interview surveys to each implementing agency

<Evaluation Result>

Therefore, the sustainability of the effects through the project is high.

5 Summary of the Evaluation

The project achieved the Project Purpose (“Integrated water environmental management system, aiming at securing safe and appropriate-quality raw water for drinking water, is established and operated in Heihejinpen Dam River Basin, which provides a model for others”). The effect of the project has been continued, and the Overall Goal (“Experience of the project is shared in China and efforts towards water environmental conservation are initiated in other water source areas”) has been partially achieved. Regarding the sustainability, no problem has been observed in terms of the policy, institutional, technical, and financial aspects. Considering all of the above points, this project is evaluated to be highly satisfactory.

III. Recommendations & Lessons Learned

Recommendations for Implementing Agency:

· The Overall Goal of the project states that the experience of the project shall be shared with other river basins. The experience has been shared in some basins, but the number of such cases has been limited; therefore, further promotion of sharing is desirable. A major achievement of the project is the enhanced coordination of the related agencies that manage Heihejinpen Dam River Basin in addition to introduction of technologies such as pumped aeration equipment and toxic sensor. For example, coordination has been strengthened through organization of Heihe Water Source Protection Meeting, consisting of the related agencies, and joint training for unexpected water pollution accidents as well as division of roles and coordination according to “Implementation Plan for Water Quality Improvement Measures for Heihe Water Source”, etc. Such system for coordination among the related organizations would be useful enough in other river basins. It is desirable that the implementing agencies of the project (Xi'an Environmental Protection Bureau, Heihe General Station, Xi'an Water Affairs Bureau, Xi'an Water Group Company Limited, and Heihejinpen Dam Management Corporation) continuously share the experience of the project and coordination among the related agencies to the relevant organizations in other river basins. For example, it is an idea to invite the relevant organizations in other river basins to Heihe Water Source Protection Meeting and joint training for unexpected water pollution accidents.

Lessons Learned for JICA:

· The effect of the project is sustained in the project site. One of the important factors is the policy on protection of drinking water sources, which has been continuing over the long term. At the time of formulation of the project, detailed study was conducted on the plans, ordinances, regulations, etc. of the central government and local government in the project site regarding protection of drinking water sources. Among them was “National Plan for Environment Protection of Urban Drinking Water Source” (2008-2020), which was planned to continue even after the project completion (i.e. March 2015) and could provide policy support for the activities of the in sustainable way. In view of the above, sustainability of a project of JICA after the project completion is considered to be further enhanced by studying the policies of the country as much as possible from a long-term perspective, looking ahead to post-project period, and by examining the project period, activities, inputs, etc. in considering of such policies at the time of project formulation.

· In the administration of China, information and instructions are sent from the central level to the local level, and information sharing and requests from the local level to the central level are not common. In the case of this project, information sharing to the central level after the project completion has not been promoted so much and information sharing through the central-level organizations has not been done. When dissemination of the project experience, involving the central-level organizations, is expected in the post-project period, it is necessary to thoroughly examine the measures to be taken at the time of project completion, taking into account of the above-mentioned Chinese administration system. It would be necessary for JICA to provide support because the local-level implementing agencies have a limitation in promotion of information sharing through the central-level organizations due to their organizational relationship. For example, the following measures are considered important: JICA, in response to the request from the implementing agencies, would accompany them on their visits to the central-level organizations for information sharing; and, after the information sharing, JICA would monitor the status of sharing of the project experience via the central-level organizations and provide further support as appropriate.

- The level of achievement of the Overall Goal of this project could not be confirmed in the ex-post evaluation because criteria for judging the achievement level of the Indicators were not clearly stated. Therefore, it is important to clearly set the criteria for judging achievement level of the Indicators at the planning stage of technical cooperation projects.



Heihejinpen Dam Lake. Good quality of water is maintained.



The toxic sensor installed in the upper stream area of Heihejinpen Dam Lake.
No failure occurred since installment.