

People's Republic of China

Ex-Post Evaluation of Japanese ODA Loan

“Jiangxi Urban Flood Control Project”

External Evaluator: Tomoo Mochida, OPMAC Corporation

## **0. Summary**

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

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

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

## 1. Project Description



Project Location  
(Jiangxi Province)



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

### 1.1 Background

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

### 1.2 Project Outline

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

Loan Approved Amount/ Disbursed Amount	11,000 million Japanese yen / 8,926 million Japanese yen
Exchange of Notes Date/ Loan Agreement Signing Date	March 2000 / March 2000
Terms and Conditions	Interest Rate: 0.75% Repayment Period: (Grace Period) 40 years (10 years) Conditions for Procurement: Bilateral tied
Borrower / Executing Agency(ies)	Government of People's Republic of China / Jiangxi Provincial People's Government
Final Disbursement Date	March, 2011
Main contractor (Over 1 billion yen)	<ul style="list-style-type: none"> <li>• China Gezhouba Construction Group Corporation for Water Resources &amp; Hydropower (China)</li> <li>• 16th Engineering Bureau Group Ltd of China Railway (China)</li> <li>• Jiangxi Water Conservancy &amp; Hydropower General Corp. (China)</li> <li>• Jiujiang Water Conservancy &amp; Electric Power Building Co. (China)</li> </ul>
Feasibility Studies, etc.	Special Assistance for Project Formation (SAPROF) for Changjiang River Basin Urban Flood Control Project in the People's Republic of China (September 1999)
Related projects	<p>[Japanese ODA Loans]</p> <ul style="list-style-type: none"> <li>• Hubei Urban Flood Control Project (Loan Agreement signed in March 2000)</li> <li>• Hunan Urban Flood Control Project (Loan Agreement signed in March 2000)</li> </ul> <p>[Technical Cooperation]</p> <ul style="list-style-type: none"> <li>• Human Resource Development Project for Water Resources, P.R.C (July 2000 to June 2007)</li> </ul> <p>[Grant Aid]</p> <ul style="list-style-type: none"> <li>• Emergency Grant Aid for Flood Disasters (Exchange of Notes signed: not known)</li> <li>• The Project for Improvement of Dikes in Yangtze River (Exchange of Notes signed: March 1999)</li> </ul> <p>[Other Donors]The World Bank</p> <ul style="list-style-type: none"> <li>• Jiujiang Dikes Reinforcement Project</li> <li>• Poyang Lake Dikes Reinforcement Project</li> </ul>

## 2. Outline of the Evaluation Study

### 2.1 External Evaluator

Mochida Tomoo, OPMAC Corporation

### 2.2 Duration of Evaluation Study

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

Duration of the Field Study: November 11, 2013 – November 27, 2013,  
April 23, 2014 – April 30, 2014

### 2.3 Constraints during the Evaluation Study

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

## 3. Results of the Evaluation (Overall Rating: B<sup>1</sup>)

### 3.1 Relevance (Rating: ③<sup>2</sup>)

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

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

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

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

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

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

<sup>1</sup> A: Highly satisfactory, B: Satisfactory, C: Partially satisfactory, D: Unsatisfactory

<sup>2</sup> ③: High, ② Fair, ① Low

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

<sup>4</sup> These targets are used to mean “probability of return”, the probability that a flood exceeding a certain size will occur in any given year.

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

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

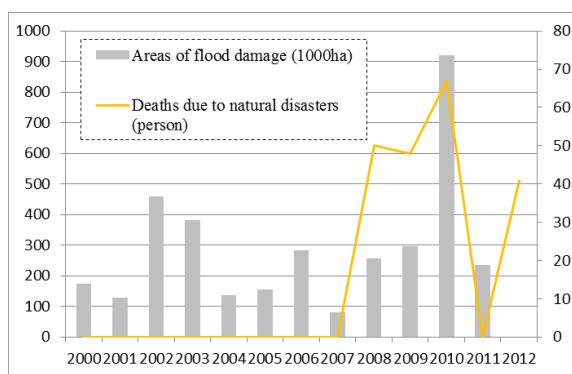
As seen above, measures to strengthen capacity of flood control and prevention continued to be identified as priority issues in the national as well as the Jiang Xi provincial plans at the time of the ex-post evaluation. Hence, the Project is found to be highly relevant to these plans.

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

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

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

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



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

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

### 3.1.3 Relevance to Japan's ODA Policy

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

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

### 3.2 Effectiveness<sup>5</sup> (Rating: ③)

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

#### 3.2.1 Quantitative Effects (Operation and Effect Indicators)

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

##### 3.2.1.1 Operation Indicators

- 1) Comparison between the discharge capacity<sup>6</sup> and the annual maximum flow at the reference point

Comparison is made of the discharge capacity at the reference point between the times of the appraisal in 1999 and the ex-post evaluation in 2011. As shown in Table 1, the total discharge capacity of the five cities increased by 33%, showing an improvement in the discharge capacity. If the annual maximum flow (m<sup>3</sup>) at the reference point is less than the discharge capacity, it means that floodwater flows

Table 1: Comparison of discharge capacities at the reference point

Unit: m<sup>3</sup>/S

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

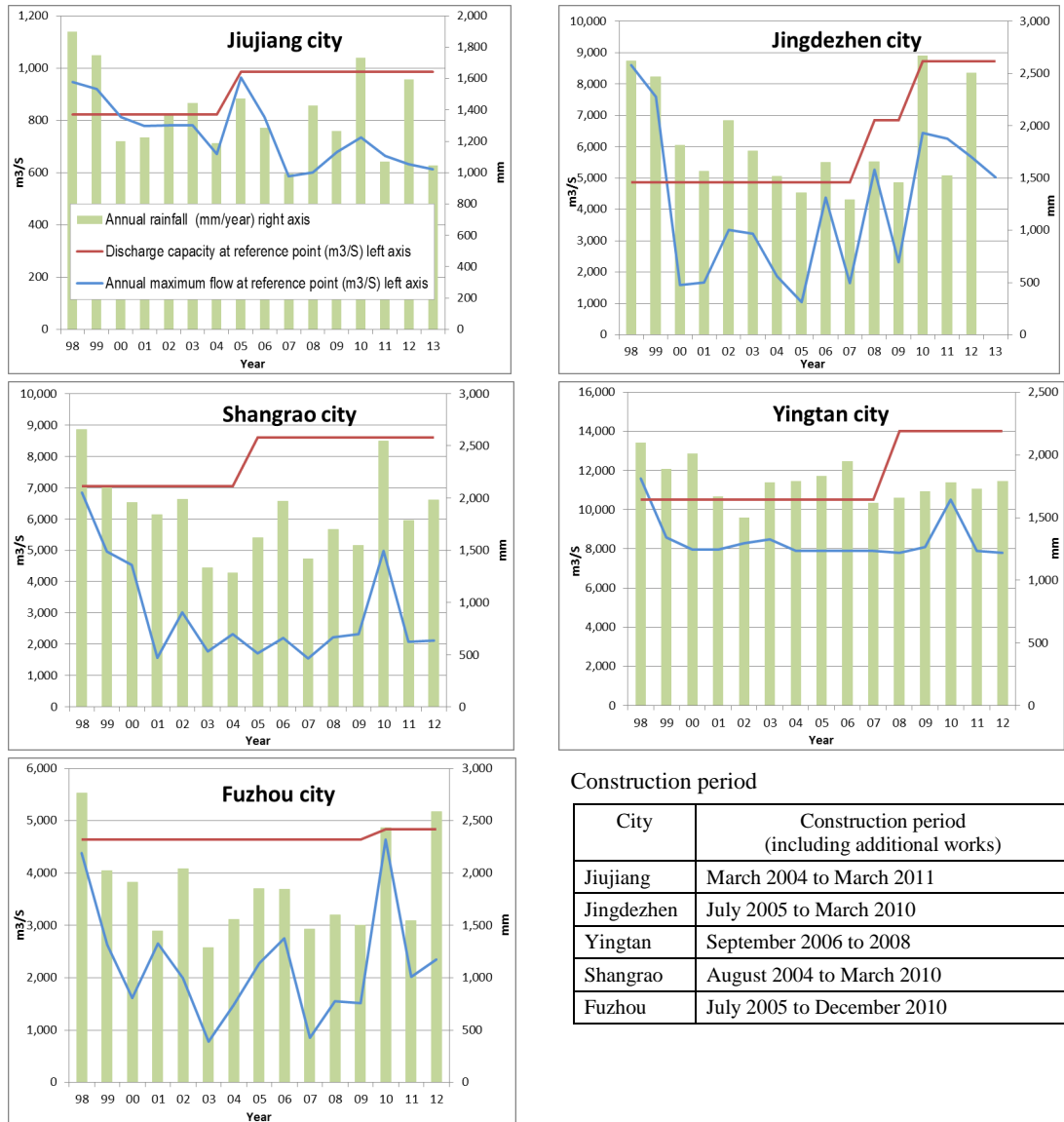
Source: Bureaus of Water Resources at respective cities

down safely. Figure 2 compares the discharge capacity and the annual maximum flow (m<sup>3</sup>) at the reference point. At the reference points of all the five cities, the annual maximum flow is less than the discharge capacity, implying that floodwater flows down safely. In particular, during the period from 2010 to 2013, Jingdezhen city experienced the same level of annual

<sup>5</sup> Sub-rating for Effectiveness is to be put with consideration of Impact.

<sup>6</sup> The discharge capacity (m<sup>3</sup>/s) at the reference point is the maximum volume of water that can be carried safely by a river at the reference point. If the annual maximum flow is less than the discharge capacity, it means that floodwater flows down safely.

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



**Construction period**

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

Source: Bureaus of Water Resources at respective cities

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

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

2) Comparison between the planned highest safe water level and the annual highest water level<sup>7</sup> at the reference points

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

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

Unit: m (above sea level)

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

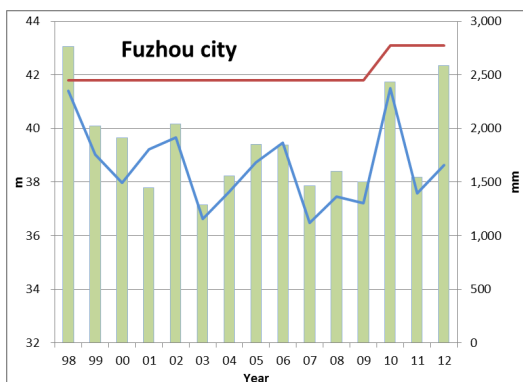
Source: Bureaus of Water Resources at respective cities

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



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





Source: Bureaus of Water Resources at respective cities

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

### 3.2.1.2 Effect Indicators

#### 1) Upgrading of flood control standards

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

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

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

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

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

Source: Bureaus of Water Resources at respective cities

2) Expansion of protected areas through implementation of the Project

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

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

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

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

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

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

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

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

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

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

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

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

Source: Bureaus of Water Resources at respective cities

### 3.2.2 Qualitative Effects

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

## 3.3 Impacts

### 3.3.1 Intended Impacts

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

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

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

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

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

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

---

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

<sup>12</sup> Out of these, one respondent experienced inundations even after completion of the Project.

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

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

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



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



Jiujiang city



Yingtang city



Fuzhou city

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

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

### 3.3.1.2 Development of the Local Economy in the Project Areas

#### 1) Stability of economic conditions

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

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

#### 2) Development of the local economy

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

### 3.3.2 Other Impacts

#### 3.3.2.1 Impacts on the Natural Environment

##### 1) Monitoring of the environmental aspect

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

2) Results of the interview surveys on the environmental aspects

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

3.3.2.2 Land Acquisition and Resettlement

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

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

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

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

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

Source: Water Bureaus at respective cities

Note 1: “Mu” is a measurement unit for land in PRC. One Mu is about 667m<sup>3</sup>.

Note 2: The above actual data includes resettlement and land acquisition required for the construction of new dike sections (a length of 8 km) carried out with the funds of Fuzhou city. The actual number of families resettled decreases from 33 to -4 in the above table if the section constructed with the funds of Fuzhou city is excluded.

## 2) Implementing bodies for resettlement

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

## 3) Measures taken for minimization of resettlement

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

## 4) Areas for resettlement and procedures/schedule

Resettlement was carried out in accordance with laws and ordinances. When substitute houses were provided, due care was taken in order to identify resettlement areas close to the original sites. However, it took more than one year for resettlement. The standards for compensation differed from city to city.

For example, in the case of compensation for houses at Shangrao city, excluding those who wished to receive cash compensation, substitute houses were provided to residents together with transport expenses (relocation costs) of 5 yuan per m<sup>2</sup>, and expenses for temporary resettlement (expenses incurred during a temporary resettlement period) of 5 yuan per m<sup>2</sup> per month over 18 months. The actual period at temporary resettlement sites was prolonged to 16 to 18 months. The reason why resettlement took such a long time was due to the construction periods required for substitute houses and also due to the fact that the resettlement was carried out, based on the overall resettlement plans of urban development projects<sup>13</sup>. Meanwhile, compensation was paid out of



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

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

---

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



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

5) Employment of labor during the construction period

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

3.3.2.3 Unintended Positive/Negative Impact

Impacts other than those described above have not been observed.

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

3.4 Efficiency (Rating: ①)

3.4.1 Project Outputs

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

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

Table 7: Changes in the Outputs

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

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

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

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

Table 8: Comparison of Plan and Actual Outputs

(1) Plan of the flood control project

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

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

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

Source: JICA appraisal documents, Bureaus of Water Resources at the respective cities

Note 1: City funds were utilized for 2.5 km out of 16.7km.

Note 2: By use of city funds (4 sites)

Note 3: City funds were used for 8.0km out of 10.9km. Table 9 below (comparison of the Project costs) shows one case where the Project cost includes costs for the civil works of new sections, land acquisition and compensation using city funds and another case where the Project cost does not include these, as explained in Note 3 of the table.

### 3.4.2 Project Inputs

#### 3.4.2.1 Project Cost

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

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

Table 9: Comparison of the Project Costs

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

Source: Water Resource Department of Jiangxi province and Bureaus of Water Resources at the respective cities

Note 1: Actual foreign exchange rate: 13.944 JPY/yuan (an average of the annual averages from 2000 to 2011) from the International Financial Statistics, IMF.

Note 2: The numbers may not necessarily sum up due to rounding.

Note 3: The actual amounts in the brackets for local currency include the costs required for civil works, land acquisition and compensation, which were born by Fuzhou city.

Note 4: The actual amount of the interest during construction, which was born by the respective cities, is the accumulated amount of interest paid as of August 2010.

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

Table10: Land acquisition and compensation costs

Unit: 10,000 yuan

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

Source: Bureaus of Water Resources at the respective cities

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

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

### 3.4.2.2 Project Period

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

Table 11: Project period: Planned and Actual

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

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

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

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

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

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

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

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

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

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

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

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

## 3.5 Sustainability (Rating: ③)

### 3.5.1 Institutional Aspects of Operation and Maintenance

#### (1) Operation during the Project implementation period

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

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

## (2) Operation and maintenance after completion of the Project

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

---

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

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

City Government	O&M organization	Operation and maintenance system	Implementation of routine and periodic inspections
Jiujiang	<ul style="list-style-type: none"> <li>- Department of River and Lake Management, Bureau of Water Resources at Jiujiang city</li> <li>- Jiujiang Urban Pumping Station Management Office</li> </ul>	The number of staff working at the Bureau of Water Resources totals more than 200, out of which 144 are engaged in maintenance works. Out of 144, 30% are engineers. Among the engineers, there are six senior engineers.	<p>With regard to dikes, a riverbank patrol inspection system and a routine patrol system are adopted. Cleaning works, including garbage collection, are carried out every day, weeding is once a month, and repair works are periodically conducted (through outsourcing).</p> <p>Routine inspection at pumping stations is carried out on a daily basis. Periodic inspections are carried out from October to March (the rainy season lasts from April to October. In particular, heavy rains are concentrated in the period from May to July).</p>
Jingdezhen	<ul style="list-style-type: none"> <li>- Department of River and Riverbank Management, Bureau of Water Resources at Jingdezhen city</li> </ul>	The number of staff working at the Bureau of Water Resources totals 150, out of which 70 work for the operation and maintenance division (15 are administrative staff and 55 are technical personnel (out of which, 28 are engineers and 27 are general technicians)). A qualification system exists for pump operations.	<p>Routine inspections are carried out over all the dikes once every 10 days. During the rainy season (from April to August), daily patrols are conducted.</p> <p>Periodic inspections at pumping stations are conducted from January to March. All the test runs are carried out.</p> <p>Plant management is carried out by the Landscaping and Greening Management Bureau of the city, and garbage collection and weeding are outsourced.</p>
Yingtian	<ul style="list-style-type: none"> <li>- Department of Flood Control Construction Work Management, Bureau of Water Resources at Yingtian city</li> </ul>	The number of staff at the Bureau of Water Resources totals 100. Out of these, 15 are assigned for the operation and maintenance of dikes and pumping stations (assigned concurrently). Out of the total 100, 20 are administration staff, 20 are general staff (such as drivers), 60 are technical personnel (out of which, 30 are engineers and another 30 are general technicians). A qualification system is applied to the operation of pumps.	Routine inspection of dikes is carried out every day during the rainy season (from April to September) and once every half a month during the dry season. Inspection of pumping stations is conducted every day during the rainy season and periodic inspection is carried out twice a year (during the dry season). Plant management is carried out by the Landscaping and Greening Management Bureau of Yingtian city together with management of parks. Garbage collection and weeding are carried out by the Department of Environment and Sanitation Management at Yingtian city.
Shangrao	<ul style="list-style-type: none"> <li>- Department of Urban Flood Control Construction Work Management, Bureau of Water Resources at Shangrao city</li> </ul>	The total number of staff at the Bureau of Water Resources is 300. Out of these, 49 are in charge of the operation and maintenance of facilities and equipment. Out of these 49, 16 are working on dikes, drainage gates and water channels and 21 are for pumping stations. These 49 staff members include 12 administrative/general staff members, 37 technical personnel (out of which 7 are engineers and 30 are general technicians). There are 30 qualified personnel for pump operations.	<p>Routine inspection of dikes is carried out once a day. During the rainy season from April to August, the frequency of the patrol is increased.</p> <p>Pumping stations are operated for 24 hours in three shifts and daily operating conditions are recorded. Periodic inspection is carried out three times a year in total: before, during and after the rainy season.</p> <p>Management of plants is carried out by the Landscaping and Greening Management Bureau of Shangrao city. Garbage collection and weeding are carried out by the Department of Environment and Sanitation Management of Yingtian city.</p>

City Government	O&M organization	Operation and maintenance system	Implementation of routine and periodic inspections
Fuzhou (Linchuan)	<ul style="list-style-type: none"> <li>- Department of Urban Flood Control Construction Work Management, Bureau of Water Resources at Fuzhou city</li> <li>- Office of Shangdundu Riverbank Management at Linchuan District, Bureau of Water Resources at Fuzhou city</li> </ul>	The total number of staff at the Bureau of Water Resources is 60. Out of these, 25 personnel are working at the Department of Urban Flood Control Construction Work Management (12 persons) and the Office of Shangdundu Riverbank Management at Linchuan District (13 persons). Out of these 25 persons, 13 are in charge of the operation and maintenance of dikes (maintenance of gates and water channels) and 4 are in charge of pumping stations (4 persons work on a full time basis. At the pumping station visited by the external evaluator, 6 persons, including part-time workers, were working in three shifts), and 8 are in charge of administration. Out of the 17 persons who are in charge of the operation and maintenance of dikes and pumping stations, 12 are engineers and 5 are general technicians. There are four qualified personnel for pump operations.	Routine inspection of dikes is carried out twice a week during the flooding season (from April to June) and once a week in the rest of the time. Routine inspection of pumping stations is undertaken every day during the major flooding period (in June). The Landscaping and Greening Management Bureau of the city is in charge of construction and management of public parks including plant management, garbage collection and weeding.

Source: Bureaus of Water Resources at the respective cities

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

The facilities subject to operation and maintenance vary depending upon the cities. There are large differences in terms of the number of staff members and maintenance budgets, as described later. Some Bureaus of Water Resources commented that they found it difficult to

carry out maintenance because they were responsible for the operation and maintenance of wider areas of dikes while others set up monitoring cameras at pumping stations in order to monitor water levels, making up for shortage of human resources. Bureaus of Water Resources at the respective cities have been taking counter-measures against such issues as shortages of human resources and have been carrying out the operation and maintenance works of facilities and equipment developed under the Project, keeping them out of major trouble.

### 3.5.2 Technical Aspects of Operation and Maintenance

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

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

Unit: Persons

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

Source: Bureaus of Water Resources at the respective cities



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

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

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

### 3.5.3 Financial Aspects of Operation and Maintenance

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

### 3.5.4 Current Status of Operation and Maintenance

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

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

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

## **4. Conclusion, Lessons Learned and Recommendations**

### 4.1 Conclusion

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

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

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

### 4.2 Recommendation

#### 4.2.1 Recommendation to the Executing Agency

None.

#### 4.2.2 Recommendation to JICA

None.

### 4.3 Lessons Learned

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

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

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

(2) Alignments with Other JICA Schemes

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

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

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

Comparison of the Original and Actual Scope of the Project

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