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IMPLEMENTATION COMPLETION AND RESULTS REPORT  
(IBRD-77120)

ON A

LOAN

IN THE AMOUNT OF US\$100 MILLION

TO THE

PEOPLES'S REPUBLIC OF CHINA

FOR A

XINING FLOOD AND WATERSHED MANAGEMENT PROJECT

June 9, 2016

Water Global Practice  
China and Mongolia Country Management Unit  
East Asia and Pacific Region

CURRENCY EQUIVALENTS  
(Exchange Rate Effective April 12, 2016)  
Currency Unit = Renminbi (RMB)  
RMB 1.00 = US\$0.155  
US\$1.00 = RMB 6.468

FISCAL YEAR  
January 1 – December 31

#### ABBREVIATIONS AND ACRONYMS

AM	Aide Memoire
CAS	Country Assistance Strategy
CF	Counterpart Fund
CPS	Country Partnership Strategy
CWRAS	Country Water Resources Assistance Strategy
EMDP	Ethnic Minorities Development Plan
EIRR	Economic Internal Rate of Return
EMP	Environmental Management Plan
FM	Financial Management
GDP	Gross Domestic Product
GIS	Geographic Information System
IBRD	International Bank for Reconstruction and Development
ICR	Implementation Completion and Results Report
KPI	Key Performance Indicator
M&E	Monitoring and Evaluation
MIS	Management Information System
MWR	Ministry of Water Resources
O&M	Operation and Maintenance
OP	Operational Policy
PAD	Project Appraisal Document
PDO	Project Development Objective
PMO	Project Management Office
PMP	Pest Management Plan
RAP	Resettlement Action Plan
SA	Social Assessment
XPMO	Xining Project Management Office

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**CHINA**  
**XINING FLOOD AND WATERSHED MANAGEMENT PROJECT**

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<b>A. Basic Information</b>			
Country:	China	Project Name:	Xining Flood and Watershed Management
Project ID:	P101829	L/C/TF Number(s):	IBRD-77120
ICR Date:	05/25/2016	ICR Type:	Core ICR
Lending Instrument:	SIL	Borrower:	MINISTRY OF FINANCE, CHINA
Original Total Commitment:	US\$ 100.00 million	Disbursed Amount:	US\$100.00 million
Revised Amount:	US\$ 100.00 million		
<b>Environmental Category: A</b>			
<b>Implementing Agencies:</b> Xining Water Affairs Bureau Datong Water Affairs Bureau Huangyuan Water Affairs Bureau Huangzhong Water Affairs Bureau			
<b>Cofinanciers and Other External Partners:</b> not applicable			

<b>B. Key Dates</b>				
Process	Date	Process	Original Date	Revised / Actual Date(s)
Concept Review:	11/19/2007	Effectiveness:		11/05/2009
Appraisal:	01/15/2009	Restructuring(s):		05/27/2014
Approval:	06/02/2009	Mid-term Review:	06/30/2012	06/12/2012
		Closing:	12/31/2014	12/31/2015

<b>C. Ratings Summary</b>	
<b>C.1 Performance Rating by ICR</b>	
Outcomes:	Satisfactory
Risk to Development Outcome:	Moderate
Bank Performance:	Satisfactory
Borrower Performance:	Satisfactory

<b>C.2 Detailed Ratings of Bank and Borrower Performance (by ICR)</b>			
Bank	Ratings	Borrower	Ratings
Quality at Entry:	Satisfactory	Government:	Satisfactory
Quality of Supervision:	Satisfactory	Implementing Agency/Agencies:	Satisfactory
<b>Overall Bank Performance:</b>	Satisfactory	<b>Overall Borrower Performance:</b>	Satisfactory

**C.3 Quality at Entry and Implementation Performance Indicators**

Implementation Performance	Indicators	QAG Assessments (if any)	Rating
Potential Problem Project at any time (Yes/No):	No	Quality at Entry (QEA):	None
Problem Project at any time (Yes/No):	No	Quality of Supervision (QSA):	None
DO rating before Closing/Inactive status:	Satisfactory		

**D. Sector and Theme Codes**

	Original	Actual
<b>Sector Code (as % of total Bank financing)</b>		
Flood protection	60	65
Other social services	20	15
Public administration - Water, sanitation, and flood protection	12	10
Wastewater Collection and Transportation	8	10
<b>Theme Code (as % of total Bank financing)</b>		
City-wide Infrastructure and Service Delivery	47	50
Land administration and management	2	1
Natural disaster management	28	25
Participation and civic engagement	1	2
Water resource management	22	22

**E. Bank Staff**

Positions	At ICR	At Approval
Vice President:	Victoria Kwakwa	James W. Adams
Country Director:	Bert Hofman	David R. Dollar
Practice Manager /Sector Manager:	Ousmane Dione	Ede Jorge Ijjasz-Vasquez
Project Team Leader:	Ximing Zhang	Ximing Zhang
ICR Team Leader:	Ximing Zhang	
ICR Primary Author:	Yoro Sidibé	

## F. Results Framework Analysis

### Project Development Objectives (from Loan Agreement Document)

The development objective of the project is to improve the protection of property and safety of people from flood events and bring about sustainable utilization of land and water resources within Xining Municipality of Qinghai Province of the borrower.

### Revised Project Development Objectives (as approved by original approving authority)

There were no revisions of the project development objectives (PDOs) or to the key performance indicators. However, the target value of a few PDO and intermediate outcome indicators were increased to reflect the change in project scope at restructuring.<sup>1</sup>

#### (a) PDO Indicator(s)

Indicator	Baseline Value	Original Target Values (from approval documents)	Formally Revised Target Values	Actual Value Achieved at Completion or Target Years
<b>Indicator 1</b>	Population protected from flooding (persons, thousands)			
Value (quantitative or qualitative)	0	414.30	426.30	434.44
Date achieved	04/29/2009	05/27/2014	12/31/2015	12/31/2015
Comments (including % achievement)	Achieved <b>105%</b> of original target value and <b>102%</b> of revised target.			
<b>Indicator 2</b>	The annual reduction of urban wastewater directly discharged into rivers in Xining (tons, thousands)			
Value (quantitative or qualitative)	0	2,007.90	2,384.90	4,825.90
Date achieved	04/29/2009	05/27/2014	12/31/2015	12/31/2015
Comments (including % achievement)	Achieved <b>240%</b> of original target value and <b>202%</b> of revised target. This overachievement is a result of economic development of Xining beyond expectation leading to the production of more wastewater.			
<b>Indicator 3</b>	The annual reduction of soil erosion (tons, thousands)			
Value (quantitative or qualitative)	0	898.00	n.a.	1127.11
Date achieved	04/29/2009	12/31/2015	n.a.	12/31/2015
Comments (including % achievement)	Achieved <b>126%</b> of original target value. The target was not revised.			

<sup>1</sup> Target values that were not revised are indicated by a blank in the cell.

**(b) Intermediate Outcome Indicator(s)**

Indicator	Baseline Value	Original Target Values (from approval documents)	Formally Revised Target Values	Actual Value Achieved at Completion or Target Years
<b>Indicator 1</b>	Length of dikes built or rehabilitated (km)			
Value (quantitative or qualitative)	0	53.73	61.19	61.96
Date achieved	04/29/2009	05/27/2014	12/31/2015	12/31/2015
Comments (including % achievement)	Achieved <b>115%</b> of original target value and <b>101%</b> of revised target value. This indicator is a proportion in the Project Appraisal Document (PAD).			
<b>Indicator 2</b>	Landscapes and green belts created (km <sup>2</sup> )			
Value (quantitative or qualitative)	0	278.6	n.a.	293.18
Date achieved	04/29/2009	12/31/2015	n.a.	12/31/2015
Comments (including % achievement)	Achieved <b>105%</b> of original target value. The target was not revised. This indicator is a proportion in the PAD.			
<b>Indicator 3</b>	Completion of the flood warning and forecasting system in Xining and three counties			
Value (quantitative or qualitative)	Not started	Completed	n.a.	Completed
Date achieved	04/29/2009	12/31/2015	n.a.	12/31/2015
Comments (including % achievement)				
<b>Indicator 4</b>	The area protected from flooding (km <sup>2</sup> )			
Value (quantitative or qualitative)	0	31.39	35.77	36.22
Date achieved	04/29/2009	05/27/2014	12/31/2015	12/31/2015
Comments (including % achievement)	Achieved <b>115%</b> of original target value and <b>101%</b> of revised target.			
<b>Indicator 5</b>	The total economic value of the areas protected from flooding (RMB, millions)			
Value (quantitative or qualitative)	0	5,340	5,710	5,782
Date achieved	04/29/2009	05/27/2014	12/31/2015	12/31/2015
Comments (including % achievement)	Achieved <b>108%</b> of original target value and <b>101%</b> of revised target.			

<b>Indicator 6</b>	Length of wastewater collection networks built or upgraded (km)			
Value (quantitative or qualitative)	0	72.30	86.10	87.11
Date achieved	04/29/2009	05/27/2014	12/31/2015	12/31/2015
Comments (including % achievement)	Achieved <b>120%</b> of original target value and <b>101%</b> of revised target value.			
<b>Indicator 7</b>	Percentage of wastewater collected by the network (%)			
Value (quantitative or qualitative)	0	100	n.a.	100
Date achieved	04/29/2009	12/31/2015	n.a.	12/31/2015
Comments (including % achievement)	Achieved <b>100%</b> of original target value. The target was not revised. The achievement is 4,825.90 tons.			
<b>Indicator 8</b>	Area applied soil erosion reduction and water conservation measures (ha)			
Value (quantitative or qualitative)	0	10034	n.a.	10233.29
Date achieved	04/29/2009	12/31/2015	n.a.	12/31/2015
Comments (including % achievement)	Achieved <b>102%</b> of original target value. The target was not revised. This indicator is a proportion in the PAD.			
<b>Indicator 9</b>	Project staff trained (persons)			
Value (quantitative or qualitative)	0	2,328	n.a.	3,330
Date achieved	04/29/2009	12/31/2015	n.a.	12/31/2015
Comments (including % achievement)	Achieved <b>143%</b> of original target value. The target was not revised.			
<b>Indicator 10</b>	Farmers who attend skills training organized by the project (persons)			
Value (quantitative or qualitative)	0	2,695	n.a.	16,061
Date achieved	04/29/2009	12/31/2015	n.a.	12/31/2015
Comments (including % achievement)	Achieved <b>596%</b> of original target value. The target was not revised. The participatory approach succeeded beyond expectations.			

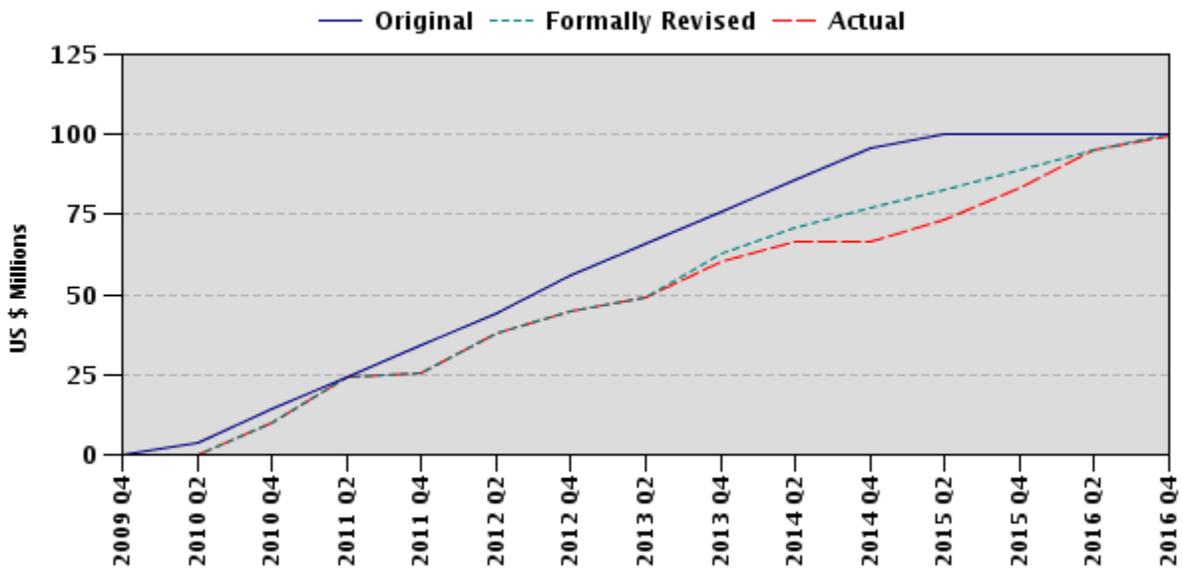
### G. Ratings of Project Performance in ISRs

No.	Date ISR Archived	DO	IP	Actual Disbursements (USD millions)
1	01/28/2010	Satisfactory	Satisfactory	0.00
2	10/03/2010	Satisfactory	Satisfactory	10.00
3	06/25/2011	Satisfactory	Satisfactory	25.45
4	12/04/2011	Satisfactory	Satisfactory	31.68
5	10/27/2012	Satisfactory	Satisfactory	48.88
6	12/25/2012	Satisfactory	Satisfactory	48.88
7	06/25/2013	Satisfactory	Satisfactory	60.03
8	12/19/2013	Satisfactory	Satisfactory	66.74
9	06/25/2014	Satisfactory	Satisfactory	66.74
10	11/02/2014	Satisfactory	Satisfactory	73.39
11	06/08/2015	Satisfactory	Satisfactory	76.61
12	11/05/2015	Highly Satisfactory	Satisfactory	86.86
13	12/03/2015	Satisfactory	Satisfactory	87.65

### H. Restructuring

Restructuring Date(s)	Board Approved PDO Change	ISR Ratings at Restructuring		Amount Disbursed at Restructuring in USD, millions	Reason for Restructuring and Key Changes Made
		DO	IP		
05/27/2014	None	Satisfactory	Satisfactory	66.74	<p>Revised indicator target values: the original target values were revised to reflect the extension of the project scope as a result of project restructuring.</p> <p>Change to activities: One-year extension. The project implementation period was extended by one year to ensure the completion of new activities that were identified at restructuring.</p>

## I. Disbursement Profile



## 1. Project Context, Development Objectives, and Design

### 1.1 Context at Appraisal

1. **At project appraisal despite impressive economic performance, China was still facing tremendous social and environmental challenges.** The gross domestic product (GDP) growth rate culminated to around 10 percent and fueled a remarkable increase in per capita income. However, income disparities became widespread as illustrated by the widening differences in living standards between urban and rural areas. Significant pockets of poverty and social deprivation persisted in rural areas, primarily affecting ethnic minorities. Furthermore, rapid urbanization and vibrant economic growth over the past decades brought dramatic environmental impacts, undermining both lives and properties.

2. **Environmental degradation was a critical constraint to China's sustainable development.** Affecting about 38 percent of the national territory, land degradation and erosion caused by unsustainable land use practices were threatening the livelihood of millions of mainly poor people in rural China. Natural and human pressure on ecosystems and land resources continued to drive severe environmental consequences including landslides and loss of vegetation and soil fertility, jeopardizing agricultural sustainability for both crops and livestock systems. In China, the social burden of accelerating environmental degradation is mainly borne by the poorest population because they directly rely on ecosystem services for their livelihood.

3. **Qinghai-Tibetan Plateau, one of the poorest provinces in China, located in the Huangshui River Basin, was heavily affected by erosion.** Because of intense summer rainfall, the watershed experienced periodic and devastating flooding, leaving the basin highly exposed to erosion. Destructive and continuous erosion led to the proliferation of gullies all over the watershed, limiting land use, threatening infrastructure, and exacerbating the consequences of flooding. This vicious circle of environmental degradation was maintained and catalyzed by inappropriate soil and water management practices. As a result, more than 61 percent of the watershed area was considered vulnerable to soil erosion.

4. **China has developed innovative governance tools to address environmental degradation at all levels.** The Eleventh Five-year Plan on Social and Economic Development (2006–2010), the Tenth Five-year Plan on Water Resources Development (2001–2005), and the Eleventh Five-year Environmental Protection Plan (2006–2010) prominently addressed water-related issues. These planning and strategy documents identified prevention and control of pollution and reversing of environmental degradation through infrastructure development and natural rehabilitation as top priorities. Recognizing the far-reaching disaster of floods, Xining Municipality prepared a Flood Control Plan in 2004 as part of the Municipal Master plan. Together with the Flood Control Plan, the Eleventh Five-year Plan for Water Resources Development in Xining Municipality recommends the integration of structural and nonstructural measures for effective flood management at the watershed level.

5. **The rationale for World Bank intervention was twofold.** First, the Bank was in the unique position to infuse lessons and experiences into watershed management in the province. Together with financial resources, the Bank was well positioned to transfer international expertise in participatory approaches to watershed management. In fact, the project design incorporated

lessons drawn from similar Bank-financed projects.<sup>2</sup> Bank intervention would ensure that adequate attention would be given to the sustainability of outcomes including operation and maintenance (O&M) arrangements during preparation and design. Bank safeguards policies would ensure that social and environmental aspects, especially ethnic minorities and resettlement issues, are addressed appropriately.

6. **Second, the key objectives were fully aligned with the central themes of the 2002 Country Water Resources Assistance Strategy (CWRAS) including flood protection and land and water management.** The project contributed to higher-level objectives of promoting flood protection, environmental sustainability, and poverty reduction identified in the World Bank Group's 2006 Country Partnership Strategy (CPS) for China (CPS 35435-CN, May 23, 2006) and the 2002 Country Water Resources Assistance Strategy (CWRAS-2002). The three counties targeted by the project were classified as national poverty counties or provincial poverty counties. The project was also fully consistent with the Eleventh Five-year Plan of Qinghai Province (2006–2010) and the Xining Municipal Flood Control Plan of 2004 that identifies nonstructural measures as essential to ensure integrated flood control and management.

### **1.2 Original Project Development Objective (PDO) and Key Indicators**

7. The PDO of the project as in the Loan Agreement is to improve the protection of property and safety of people from flood events and bring about sustainable utilization of land and water resources within Xining Municipality. The PDO in the Loan Agreement is identical to the PDO in the Project Appraisal Document (PAD). Key performance indicators (KPIs) were (a) the population protected from flooding reaches 414,300 by the end of project completion (protection of property and safety of people from flood events); (b) the annual reduction of urban wastewater directly discharged into rivers in Xining totals 2 million tons by the end of project completion (sustainable utilization of water resources); and (c) the annual reduction of soil erosion amounts to 898,000 tons by the end of project completion (sustainable utilization of land resources).

### **1.3 Revised PDO (as approved by original approving authority) and Key Indicators, and reasons/justification**

8. The PDO remained unchanged throughout implementation. The target values of a few indicators were revised during project restructuring to reflect the change in the project scope. At restructuring, a few activities were dropped from the project and new activities identified were added.

### **1.4 Main Beneficiaries**

9. The primary (target) project beneficiaries were the population of the 17 watersheds within Xining Municipality, in Xining Downtown area, Huangyuan County, Huangzhong County, and Datong County (414,300 people).

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<sup>2</sup> Global Environment Facility's Hai Basin Integrated Water and Environment Management Project (grant number TF-053183, P075035), Loess Plateau Watershed Rehabilitation Project (credit number 26160, P003540), and Changjiang and Pearl River Watershed Rehabilitation Project (loan number 48320, P081255)

## 1.5 Original Components (as approved)

10. **Component 1: Flood Control and Management (US\$105.02 million).** This component would include both structural and nonstructural activities including dikes strengthening, access roads across dike structures, water-level control structures, an integrated flood warning system, and riverbank landscaping works. This component would invest in three subcomponents in flood control works that would improve the level of flood protection in selected areas of Xining Municipality and in a comprehensive flood warning system.

11. **Component 2: Wastewater Collection (US\$10.13 million).** This component would support the construction of about 72.5 km of both wastewater and urban storm water collection pipelines to intercept an estimated 33 million tons of wastewater and storm water drainage, which at present flows freely to the river systems in the municipality, to deliver to existing or proposed wastewater treatment facilities. This component includes Xining Wastewater Collection Main Pipe construction, Xiaoqiao Rainstorm Collection Improvement, Rainwater Drainage Trunk Improvement in Huangzhong County, and Water Supply and Drainage Main Pipe Network Improvement in Qiaotou Town of Datong County. The four existing/planned wastewater treatment plants to be connected to receive the collected wastewater are (a) Chengnan Wastewater Treatment Plant, in Xining City; (b) the Second Wastewater Treatment Plant, in Xining City; (c) the Third Wastewater Treatment Plant, in Xining City; and (d) the Datong Wastewater Treatment Plant, in Datong County.

12. **Component 3: Participatory Watershed Management (US\$19.49 million).** This component would involve three integrated sets of sub-activities to allow communities to respond to varying soil and water conservation, land use, and socioeconomic conditions in the 17 individual highest priority sub-watersheds within the municipality. These activities would be packaged into an integrated set of interventions for each sub-watershed.

13. **Component 4: Institutional Strengthening and Capacity Building (US\$11.12 million).** This component would support construction of a flood warning center, provision of office equipment, consulting services, technical study and research, training, and study tours.

14. **Component 5: Resettlement and Environmental Management (US\$35.00 million).** This component would support resettlement and rehabilitation of displaced persons in connection with the implementation of the project and managing the adverse environmental impacts resulting from the implementation of the project through establishment and operation of environmental management offices, provision of consulting services, and carrying out monitoring and supervision.

15. **Component 6: Project Management (US\$18.11 million).** This component would support development and operation of a management information system (MIS) and strengthening the capacity of Xining Municipality to carry out procurement, construction supervision, quality control, financial management (FM), and monitoring and evaluation (M&E) with respect to the project.

16. Component 1 directly contributed to improving the protection of property and safety of people from flood events. Component 2 contributed to the sustainable utilization of water resources. Component 3 contributed in various ways to improve the protection of property and

safety of people from flood events to the sustainable utilization of land and water resources. Components 4, 5, and 6 indirectly supported the successful implementation of other components.

## **1.6 Revised Components**

17. There were no changes to project components.

## **1.7 Other Significant Changes**

18. As specified in the project restructuring paper of May, 2014, a number of subprojects were dropped from the project, including

- (a) construction of 4.6 km of dike improvement and wastewater collection pipes from Chaoyang Power Station to Railway Bridge;
- (b) construction of Nanchuan wetland, upstream of Haishan Bridge; and Beichuan wetland, downstream of Chaoyang intake pumping station in Xining City; and
- (c) improvements in Maojia Valley in Datong County and Quaner Valley in Huangyuan County.

19. As a result, the loan savings were used to support new identified subprojects, which are mostly extensions of current subprojects, including

- (a) about 15 km extension of the improvement works along Nanchuan River from Da'nanchuan Dam to Xiejiazai Bridge;
- (b) about 3.5 km of dike strengthening works along Beichuan River from Kangjia Bridge to Chaoyang Hydropower Plant Outlet;
- (c) about 1 km extension of dike works from Menyuan Bridge to the river inlet; and
- (d) about 1 km of gully management works upstream of Dujia Gully.

20. The loan closing date was extended by one year from December 31, 2014, to December 31, 2015, to enable the completion of the proposed new activities.

## **2. Key Factors Affecting Implementation and Outcomes**

### **2.1 Project Preparation, Design, and Quality at Entry**

21. **Project design built on the strategic directions outlined in the 2002 Country Assistance Strategy (CAS).** The design integrated all key themes of the 2002 CAS. By enhancing traditional structural measures (dikes and check dams) with innovative nonstructural solutions (flood forecasting and early warning system), the project's overall approach streamlined sustainable ecological protection at the watershed level. The design emphasized a shift from solely flood control to more integrated flood management. A dynamic and iterative participatory process with special attention paid to the concerns of poor and vulnerable groups, especially ethnic

minorities, ensured strong support and ownership at the grassroots level. At the same time, well-built institutional arrangements guaranteed the involvement and support of political leaders at township, county, municipal, and provincial levels. To ensure project sustainability, the design incorporated a robust O&M plan, defining institutional arrangements, technical standards and methods, as well as financial sources. By mobilizing international knowledge, successful integrated water resources management principles were soundly infused into project design.

22. **The background analysis incorporated relevant lessons from previous projects.** Experiences from the Loess Plateau Watershed Rehabilitation Project (credit number 26160, P003540) and the Changjiang and Pearl River Watershed Rehabilitation (loan number 48320, P081255) were central to the project preparation and design. For example, active involvement of farmers at all stages was fostered by a two-way consultation process enabling them to fully understand the justification of the operation. The introduction of inclusive mechanisms for close consultations at the lowest levels through an adequate combination of both ‘top-down’ and ‘bottom-up’ approaches coupled with a demand-driven approach to the selection of alternative livelihood improvement solutions incentivized buy-in from direct beneficiaries. Success factors identified were properly reflected in the design. In particular, the commitment of counterpart funds (CFs) was ensured before the start of the project while minimizing CFs from poor counties.

23. **The design of the participatory process was appropriate.** Guidance from the participatory watershed management planning manual for the Bank’s Changjiang/Zhujiang River Watershed Rehabilitation Project informed the participatory design. A bottom-up community-driven participatory approach based on a partnership between local governments and rural communities was adopted. Rural communities would be fully involved in the implementation of sustainable watershed management plans through community associations to be established under the project. The project promoted an approach based on pilot watersheds.

24. **Assessment of project design and preparation.** The PDO was clearly stated and realistic. The different project components contributed directly to the achievement of the PDO through a sound Results Framework. The project activities were fully aligned with the PDO including a set of structural measures that harmoniously complemented nonstructural measures. At each stage of project preparation, a multidisciplinary Bank team provided comprehensive support to Chinese counterparts, including environmental, social, fiduciary, and economic assistance. Attention was paid to match project features with local conditions. Regular field visits by the Bank team to identified project sites facilitated the refinement of intervention options. Ad hoc capacity-building events, including overseas and domestic trainings and study tours, were organized to enhance the understanding of the integrated watershed management and acquaint the then unexperienced Project Management Office (PMO) with Bank procedures.

25. **Institutional and managerial arrangements were appropriate.** Vertically and horizontally structured institutional setup was planned earlier on to ensure that all relevant agencies supported the project. The institutional structure was built on a Project Leading and Coordination Group with the high-level overall responsibility for project preparation and implementation and a Central PMO with the responsibility for day-to-day project management. The same structure was replicated at the county level, complemented by community groups. Expert panels were established at city and county levels to provide technical assistance on design, engineering, procurement, financial, economic, social, and environmental issues. This arrangement, though

complex, ensured that management and coordination were functional at municipal, county, and community levels.

26. **From the very beginning, the project benefited from a high level of commitment from local institutions.** The watershed approach was already largely accepted in the Xining catchment from a number of previous projects. Participatory design, with an emphasis on farmers' participation including compensation schemes and alternative livelihoods, contributed to farmers' commitment and adherence to the project. Strong engagement was demonstrated by the advanced provincial and municipal preparedness even before the first Bank exploratory mission and by the allocation of counterpart financial resources. The Feasibility Study Report and Environment Impact Assessment were already being prepared during the Bank's first exploratory mission. Prompt actions by provincial and municipal representatives to implement the recommendations after each Bank mission reflected their commitment to the project design and to Bank's requirements.

27. **Critical risks were identified and corresponding mitigation measures built in project design.** The overall risk was rated Moderate after mitigation measures. Mitigation measures were adopted for risks that were rated Substantial. The risks regarding timely allocation of CFs at the county level would be tackled by including a line item for CFs in the annual county budgets, and the risk related to the financial sustainability of river works, wastewater collection, and watershed management would be mitigated by implementing a well-articulated O&M plan. Exchange rate and inflation risks were not under the direct control of the project.

## 2.2 Implementation

28. **Motivated PMO staff and strong political leadership at provincial, municipal, and county levels as well as close Bank supervision were critical ingredients for successful project implementation.** The Bank provided quality supervision and specialized technical implementation assistance, especially on innovative topics. Examples include advising on the use of environment-friendly concrete and seeking the views of the population on sizing local infrastructure. The strong commitment of local governments and leaders had a positive bearing on overall project implementation. PMO staff developed a good and lasting relationship with the local population. The resulting mutual trust created an enabling environment for smooth project implementation at the watershed level.

29. **Initial implementation delays.** The project had the usual start-up delays despite the efforts made during project preparation and appraisal to ensure smooth start. Xining City and Huangzhong County made rapid progress on participatory livelihood improvement activities. However, progress in Huangyuan and Datong Counties was behind schedule. Delays were caused by lack of familiarity with Bank procurement and FM procedures. In addition, CFs were not fully allocated as planned. Construction of the flood warning center experienced start-up delays due to the rapid increase in land value in the originally planned location. Also, changes in the needs of the local population necessitated frequent revisions to livelihood improvement activities. These delays were addressed promptly through discussions between the project agencies and the Bank, and project implementation was back on schedule.

30. **Midterm review and restructuring.** The project midterm review (MTR) was conducted in June 2012, as originally planned. The review found that new domestic plans and programs that were adopted during project implementation updated and expanded the overall flood control plan used for project background analysis at appraisal. Some activities included in the project had already been executed with the borrower's own funds. These changes pertained to the Xining Twelfth Five-year Plan (2011–2015), the Huangshui River Basin Integrated Management Plan, and the Master Plan for the National Nanchuan Industrial Park. These new strategic documents expanded the urban flood control and watershed management area and promoted the adoption of higher flood control standards (protection from 50-year floods to 100 year floods). At the MTR, the Xining Project Management Office (XPMO) consequently proposed the cancelation of selected project activities and the additions of others. The proposed new activities were reviewed by the Bank from the technical, economic, environmental, and social points of view.

31. The MTR recommended a project restructuring to formalize the changes in activities. The restructuring took place in May 2014. Long domestic review and approval procedures delayed the submission of an official restructuring application to the Bank. As a result, the completion of the project required a one-year project extension beyond the original closing date. It integrated new activities similar to the ones under the original project. It flexibly reoriented project outputs to better satisfy the changing needs of project beneficiaries.

### **2.3 Monitoring and Evaluation (M&E) Design, Implementation, and Utilization**

32. **M&E design.** The project included a sound M&E framework with a set of key indicators to measure both outputs and outcomes. The Results Framework included three outcome indicators to measure achievement of the PDO. Intermediate outcome indicators were aligned with intermediate outcomes and component outputs. At appraisal, the indicators were well defined and methods to track them were established. At the MTR, M&E targets were raised to fit the revised scope of the project. A MIS was also designed to support information-based decision making.

33. **M&E implementation.** Project management staff benefitted from intensive capacity building in M&E implementation. The overall M&E implementation was the responsibility of the XPMO. The XPMO M&E team liaised with other M&E teams at county levels to ensure quality reporting. The XPMO provided, through an independent external monitoring agency, regular detailed reports every six months. These reports maintained data consistency and integrity throughout implementation. The project adopted a participatory approach to the M&E (especially for soil and water conservation activities); each village project management group had designated staff exclusively responsible for M&E activities.

34. **M&E utilization.** M&E reports were utilized to track project progress during the implementation and used to ensure compliance with safeguard requirements, in particular payment of full compensation to affected persons before commencement of works. During project restructuring, M&E reports were used to determine the additional time needed to complete the project activities. At Implementation Completion and Results Report (ICR) preparation, M&E data provided vital information to assess project outcomes and impact on beneficiaries.

## 2.4 Safeguard and Fiduciary Compliance

35. The safeguard policies triggered under the project included Environmental Assessment (OP 4.01), Involuntary Resettlement (OP 4.12), Indigenous Peoples (OP 4.10), Safety of Dams (OP 4.37), and Pest Management (OP 4.09). The Bank safeguards policies were properly implemented.

36. **Environmental Assessment (OP 4.01).** A full-size Environmental Assessment report and an Environmental Management Plan (EMP) were prepared for the project, and a supplemental EMP was prepared at restructuring for newly added activities. The restructuring did not change the original environmental categorization (Category A) or trigger new safeguards policies. Mitigation measures specified in the EMPs have been satisfactorily implemented. Progress reports on EMP implementation were submitted to the Bank regularly, confirming the compliance of the agreed EMPs.

37. **Involuntary Resettlement (OP 4.12).** In compliance with the Bank's policy on Involuntary Resettlement (OP 4.12), a resettlement action plan (RAP) was developed for the project. Resettlement was limited to Xining downtown areas and Hangyuan County. It involved the acquisition of 1,635.1 mu (108.7 ha) of rural collective land in 39 villages affecting 888 households comprising 3,549 people. Urban riverway management activities involved house demolition and affected 132 households (538 people). Twenty-two enterprises or businesses located along the banks of Nanchuan and Huangshui Rivers were affected. The project RAP and supplementary RAP were implemented in a satisfactory manner. Resettlement related to the project had been effective, and livelihoods of the affected people have been restored. Interviews showed that farmers were highly satisfied with the compensations provided. At project restructuring, a supplementary RAP was prepared for the newly added activities in compliance with applicable Chinese regulations and standards, as well as OP 4.12.

38. **Indigenous Peoples (OP 4.10).** An Ethnic Minorities Development Plan (EMDP) was developed in accordance with the Bank's policy on Indigenous Peoples (OP 4.10) for ethnic minorities in Datong, Huangyuan, and Huangzhong Counties, including 21 ethnic minority communities and 8 ethnic-minority-predominant communities. Two types of project activities were carried out to benefit the eight affected ethnic minority communities: (a) soil and water conservation activities, including tree planting and reforestation, vegetation recovery, check dam construction, slope protection, gully head protection, dike strengthening, and terracing of sloped land and (b) livelihood improvement and infrastructure construction, including construction of animal sheds, animal farming (cattle and goat), construction of biogas digesters, installation of solar stoves, and rural road improvement. The project fully complied with OP 4.10.

39. **Safety of Dams (OP 4.37).** Project sites are located downstream of 10 dams higher than 15 m, 4 in Datong County and 6 in Huangyuan County. The project engaged a panel of dam safety experts to assist the municipal PMO and the Bank in monitoring and evaluating dam-safety-related issues and preparing a dam safety review report. The project implemented an effective dam safety plan. Additionally, it has developed an emergency preparedness plan for each of the large and medium-sized dams in compliance with Bank policy.

40. **Pest Management (OP 4.09).** No pesticides were to be procured under the project; however, it was anticipated that reforestation/revegetation activities and greenhouse operation would result in an increase in the use of pesticides locally. A pest management plan (PMP) was therefore developed and integrated into the EMP to ensure compliance with this policy. The measures proposed in the PMP were implemented in a satisfactory manner.

41. **Financial management.** Bank supervision missions reviewed project FM, including its compliance with Bank policies, on a regular basis. Audit reports were submitted on time, and there were no qualified audit reports. Initial lack of experience in Bank FM procedures was rapidly overcome thanks to trainings. The XPMO and the county-level PMOs played an active role in coordinating with local provincial and local finance bureaus. The smooth communication between the finance and engineering departments of the PMOs ensured consistent project disbursement.

42. **Procurement.** Initially, implementation agencies were unfamiliar with the details of the Bank procurement procedures. Also, at the beginning of the project, the large number of contracts to be processed overwhelmed procurement units. However, they quickly learned how to successfully implement good contract management practices. The PMOs submitted regular updated procurement plans to the Bank. No misprocurement was declared in the project, and no integrity, corruption, or complaint case was reported.

## **2.5 Post-completion Operation/Next Phase**

43. **Post-completion arrangements.** O&M arrangements for project-created assets are adequate to ensure its post-completion sustainability (section 1.1 and section 2.1). O&M plans prepared for the project are consistent with the O&M reforms proposed by the Ministry of Water Resources (MWR) and the policies of the Provincial Water Resource Bureau. Nonstructural measures under the project focused on improving O&M of the flood control assets through capacity building and training (especially training on the flood warning system) and the adoption of a realistic and effective O&M plan that encompasses institutional, technical, and financial arrangements. The plan extends to all relevant project components, including flood control and management, wastewater collection pipelines, and watershed management in Xining Municipality and the three counties. O&M procedures are in place at government and community levels to ensure adequate funding for post-project operation. Successful lessons learned under the project are being continually scaled up and integrated in the design of the Qinghai Xining Water Environment Management Project, in particular, the demand-driven participatory approach.

## **3. Assessment of Outcomes**

### **3.1 Relevance of Objectives, Design, and Implementation**

44. **Relevance of objectives (Rating: High).** The PDOs remained pertinently aligned with the CPS for FY2013–FY2016. The PDO was well aligned with the CAS at appraisal (section 1.1) and continues to be aligned with the current CPS for FY2013–FY2016. Specifically, the PDO directly supports Outcome 1.4: Promoting Sustainable Agriculture Practices and Outcome 1.5: Demonstrating Sustainable Natural Resource Management Approaches under Strategic Theme One: Supporting Greener Growth, by implementing approaches of integrated water resources management at the river basin level, addressing flooding and bringing about sustainable utilization

of land and water resources within Xining Municipality (section 2.1). It also directly supports Strategic Theme Two: Promoting More Inclusive Development, Outcome 2.3: Enhancing Opportunities in Rural Areas and Small Towns as the project areas included rural villages with ethnic minorities and the surrounding small towns. The creation of livelihood activities has contributed substantially to enhanced opportunities (section 2.1 and section 3.2).

45. **The PDO is also aligned with the Bank’s sector strategy.** The Bank’s current Country Water Resources Partnership Strategy for China (2013–2020) explicitly identifies flood protection and drainage as one of the critical areas for Bank support through both structural (infrastructure construction) and nonstructural measures (institutional capacity building, river basin management, flood warning and disaster assessment systems, participatory approach, and strengthening O&M). Strategy documents explicitly mention integrated water resources management at the river basin level and addressing multiple uses, for example, flooding and pollution, as a key partnership area. The PDO directly supports these strategic orientations by addressing flood, land, water, and wastewater management, in an integrated water resources management framework.

46. **The objectives and design of the project continue to remain highly relevant.** The project was developed in the context of the MWR’s Yellow River Basin Water Resources Master Plan. Qinghai Province contributed to the finalization of the MWR’s plan. The project supports the plan’s key overarching goal of promoting the efficient and sustainable use of both land and water resources within the project area and aims to reverse long-standing unsustainable resource management practices for flood control and management, as well as watershed management.

47. The level of ambition of the PDO was appropriate with respect to the institutional and political context of Xining Municipality. Political commitment to water resources management through integrated water management was strong as demonstrated by numerous similar projects in the country (section 2.1). China and Xining Municipality were fully aware of the extent of environmental challenges and consequently provided counterpart funding higher than the Bank loan.

48. **Relevance of design and implementation (Rating: Substantial).** Project design aligns project components and activities with the PDO and includes a sound Results Framework. The PDO “to improve the protection of property and safety of people from flood events” was directly supported by Component 1: Flood Control and Management; the PDO “bring about sustainable utilization of land and water resources within Xining Municipality” was directly supported by Component 2: Wastewater Collection and Component 3: Participatory Watershed Management through engineering, afforestation, and livelihood improvement that ensured the sustainability of the assets. Components 4 and 5 indirectly contributed to the PDO by strengthening and building institutions and capacities, conducive to swift project implementation, while adequately tackling social and environmental issues. Component 6 ensured overall project implementation (section 2.2).

49. The Results Framework includes a good mix of intermediate and project outcome indicators. Intermediate outcomes were clearly stated and a causal chain to objectives is well established, as indicated in the PAD (see also table 1 in section 3.2.). For example, construction of protective dikes, the establishment of flood warning systems, and afforestation of areas surrounding main streams directly contribute to flood protection. Project design, however, did not

adequately take into account the capacity of the implementing agencies in assigning less than six years for project implementation.

50. The relevance of objectives is high and the relevance of design and implementation is substantial. The Relevance of Objectives, Design, and Implementation is consequently rated Substantial.

### 3.2 Achievement of Project Development Objectives

51. The project achieved or exceeded all PDO indicators and all intermediate indicators as discussed in the following paragraphs (and presented in the Results Framework analysis in the data sheet). The achievement of the PDO is consequently rated Substantial.

52. There are clear causal links between project outputs, intermediate outcomes, and PDO-level indicators and outcomes: (a) specific infrastructure and management improvements have directly contributed to the protection of life and property from flood events; (b) improved wastewater collection has contributed directly to sustainable water resources management; and (c) improved soil and water conservation of catchments has supported sustainable land resources conservation. The project had achieved all PDO dimensions, namely, flood control, pollution reduction, and soil erosion reduction. Table 1 shows the achievement of key outputs and their logical link to intermediate and PDO-level outcomes. Detailed outputs are presented in annex 2.

**Table 1. Causal Chain between Output Indicators (Key Intermediate Indicators), PDO-level Indicators, and PDO-level Objectives**

<b>PDO-level Objectives</b>	<b>PDO-level Indicators (Actual Value Achieved)</b>	<b>Key Intermediate Indicators</b>
Protection of property and safety of people from flood events	Population protected from flooding (434,440 people).	Proportion of dikes constructed or rehabilitated (102% of revised target)  Proportion of landscapes and green belts created (105% of revised target)  Flood warning and forecasting system completed in Xining and three counties  The area protected from flooding (36.22 km <sup>2</sup> )
Sustainable utilization of water resources	Reduction of urban wastewater directly discharged into the rivers in Xining (4,825,900 tons/year)	Length of wastewater collection networks built or upgraded (87.11 km)  Percentage of wastewater collected by the network (100%)
Sustainable utilization of land resources	Annual reduction of soil erosion (1,127,110 tons/year)	Proportion of the area applied soil erosion reduction and water conservation measures (102%)

53. **Protection of property and safety of people from flood events (Rating: High).** The project achieved or exceeded all intermediate targets (table 1). At project closure, the project contributed directly to protecting 434,440 people from flooding (102 percent of the revised target value of 426,300). These results were achieved by adopting watershed-wide flood management combining structural and nonstructural measures. Structural measures were identified by the municipal plan. For example, silt retention and water/erosion check and control structures were designed to slow the flow of flood water in tributary gullies. Nonstructural measures based on environment-friendly solutions addressed the primary causes of floods, for example, soil erosion. By reducing sediment flows into the Huangshui River system, vegetation cover regulates surface runoff intensity, stores floodwater, shifts and retards the passage of peak flood, and controls and decreases the frequency of flash floods. Implementation of nonstructural measures was facilitated by ownership created through the participatory process. The flood warning and forecasting system will significantly contribute to flood management by providing accurate evidence-based flood predictions that will be used to support reliable decision making, for example, by activating flood dispatch commands. It will therefore protect the lives and properties of thousands of people by anticipating torrential and flash floods.

54. **Sustainable utilization of water resources (Rating: Substantial).** The project contributed substantially to sustainable utilization of water resources by considerably improving wastewater collection systems. Annual reduction in urban wastewater discharged directly into rivers in Xining totaled nearly 5 million tons, largely doubling the revised target of 2.4 million tons per year. This result was achieved by investing in a system of strategic infrastructure capable of creating maximum impact on urban wastewater management. The system included the Xining Wastewater Collection Main Pipe construction, Xiaoqiao Rainstorm Collection Improvement, Rainwater Drainage Trunk Improvement in Huangzhong County, and Water Supply and Drainage Main Pipe Network Improvement in Qiaotou Town of Datong County. The revised target was exceeded due to the increased generation of wastewater, mainly because of economic development, and the conveyance of this wastewater through the World Bank financed collection system. Other ad hoc and demand-driven activities, including the rehabilitation of gullies to enable water storage or facilitate drainage, contributed substantially to sustainable utilization of water resources.

55. **Sustainable utilization of land resources (Rating: Substantial).** The project contributed substantially to sustainable utilization of land resources by considerably reducing soil erosion, building terraces, and planting selected species of trees and shrubs. The annual reduction of soil erosion amounted to over 1 million tons as a result of good land use practices. The area where soil erosion reduction and water conservation measures are applied reached over 100,000 ha, representing 102 percent of the revised and original target value.<sup>3</sup> Full community participation was instrumental in the optimization of the engineering design of major infrastructure, for example, check dams. All engineering activities, including construction of small check dams (222), bank strengthening, and terrace building (407.07 ha), were satisfactorily completed at high quality. Afforestation of degraded land (944.96 ha) through both arbor trees and shrubs and vegetation recovery (1848.6 ha) resulted in a visible replenishment of the mountainous landscapes and drastically reduced erosion.

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<sup>3</sup> This indicator was not revised and hence original and revised target values are identical.

56. Livelihood support activities were essential accompanying measures to provide alternative livelihood options to the local population and thereby encourage the adoption of sustainable land and water use practices. The participatory approach allowed livelihood activities to be adjusted to the specific needs of each local community/village. Livelihood improvements were achieved through road construction (11.2 km of village roads), animal farming development, and animal shelter construction. Farmers are already benefiting from additional agricultural land (407 ha) on terraced crop land and livestock investments, while newly constructed field tracks and village roads are further easing farm work, saving labor time, and reducing the hardship of traveling during rainy season. For example, the improved 12 km road linking Yangjuan Village and the neighboring industrial area will enable 300 farmers in the village to access the industrial area and earn RMB 80–100 daily for up to six months a year. Solar water heaters installed will allow saving of RMB 60 per month, because of reduced quantity of coal/fuelwood bought or collected, free up more time for attending to other businesses, and at the same time safeguard ecosystems and enhance the quality of life of farmers.

57. **Institutional strengthening and capacity building in Xining Municipality.** Institutional strengthening and capacity building were instrumental to the success of other project components. The total number of staff trained reached 3,330 (143 percent of the target value) in 2015. Staff were trained in procurement and project and contract management. By the end of the project, the number of farmers who attended skills training organized by the project was almost six times the number planned, demonstrating the success of the participatory process.

58. Educational campaigns conducted by the project enhanced farmers' awareness of good soil and water conservation practices. Improved understanding of the long-term benefits of tree planting and reforestation for future increase in household income from forest products motivated beneficiaries to support measures like restrictions on animal grazing in the sub-watersheds and adjacent slopes.

### 3.3 Efficiency

59. The methodology for economic analysis closely follows the approach developed at appraisal, using updated prices and project costs at completion. Major benefits of the project are derived from avoided flood damage, increased land values, water quality and health improvements, increased agricultural production, and ecological upgrading and soil erosion reduction in watersheds. A cost-benefit analysis was employed to examine the economic viability of the project. The economic internal rate of return (EIRR) of the combined flood control and wastewater collection investments is 29.4 percent at completion (22.1 percent at appraisal) and that of the sustainable watershed management component at completion is 15.1 percent (13.8 percent at appraisal). The project EIRR at completion is 26.9 percent (21.4 percent at appraisal), calculated on the basis of the aggregated economic cash flows of the three components.<sup>4</sup> The project therefore remains economically viable at completion as a whole and by component. Table 2 provides a comparison of the EIRRs at appraisal and at completion.

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<sup>4</sup> Components 1, 2, and 3 together represent US\$160.11 million; 74 percent of total project costs.

60. The main reason for the noticeably higher EIRR at completion is that the values of residential and commercial lands along the rehabilitated riverbanks increased more than anticipated at appraisal. This achievement was also made possible by the optimization of infrastructure size with the participation of the local population. The project also benefited from regular field visits by the Bank to provide guidance on key engineering aspects. The necessity of extending the project implementation period by a year detracts a bit from the otherwise high efficiency of the project.

61. The fiscal sustainability and debt repayment obligations of the local governments have been analyzed, taking into account the trends of economic growth and total revenues and expenditures. The analysis suggests that Xining Municipality as well as the three project counties are all in a reliable fiscal position to repay the Bank's loan and cover O&M costs for the infrastructure works. The project efficiency is rated substantial. A detailed analysis is provided in annex 3.

**Table 2. Comparison of EIRRs**

<b>Project Component</b>	<b>EIRR Estimate at Appraisal (%)</b>	<b>EIRR Estimate at ICR (%)</b>
Component 1: Flood Control and Management and Component 2: Wastewater Collection	22.1	29.4
Component 3: Participatory Watershed Management	13.8	15.1
Combination of Component 1, 2, and 3	21.4	26.9

### **3.4 Justification of Overall Outcome Rating**

62. The objectives of the project continue to be highly relevant to the current need for flood and wastewater management as well as soil and water conservation in an integrated watershed framework. At completion, the project had fully achieved or exceeded all PDO and intermediate indicators. Further, it produced several outcomes beyond the PDO-level objectives. Finally, the estimated EIRRs exceeded appraisal estimates. As a result, the overall outcome is rated Satisfactory.

### **3.5 Overarching Themes, Other Outcomes and Impacts**

#### **(a) Poverty Impacts, Gender Aspects, and Social Development**

63. **Impact on poverty and gender.** Project impacts on poverty are far-reaching and are likely to be sustained. The project's livelihood improvement activities primarily targeted poor and middle-income households by providing job opportunities (section 3.2). Through a participatory approach, poverty-grouping criteria were developed by villagers, and farmer households were grouped as rich households, middle-income households, and poor households. Poor households received the largest part of project subsidies (up to 50 percent). Middle-income households received a more moderate part of the subsidies (25 percent) while rich households were not subsidized. Solar water heaters had direct positive impacts on women and the elderly. The use of solar water heaters has reduced the use of firewood by women for heating and boiling water. Surveys by the PMO indicated that the average household saves RMB 80 to RMB 120 a month on electricity and firewood costs by using solar water heaters. Further, firewood was associated with

respiratory diseases in women. The easy availability of hot water has improved the living condition of the elderly, especially in winter. Each community project management group and community planning group had at least one woman representative. Women's participation was central to the whole decision-making process.

64. **Impact on ethnic minorities.** Implementation of the project has both positive and negative impacts on the Hui and Tibetan ethnic minority groups. Check dams, silt retention dams, retaining walls, and slope land terracing and other engineering measures generated positive impacts on ethnic minority communities, such as reduced soil erosion and eliminated or reduced the threats of flash floods. Key negative impacts addressed in the EMDP include reduced grazing activities by minority communities as it takes about three years for seedlings to grow. However, in the long term, the afforested areas will serve ethnic minorities better. Positive aspects largely offset negative ones (section 2.4).

65. The involvement of the Ethnic and Religious Affairs Bureau in the PMO helped promote the development of ethnic minorities and mainstream their concerns during project implementation. The project promoted the visibility of ethnic minorities as part of the participatory approach. In the selection of members of the community planning group, special attention was paid to the participation of ethnic minority representatives. Ethnic minority communities proposed several activities under the project, such as animal shed construction/improvement, development of animal farming, and rural road improvement based on their experience and local habits. The proposed activities effectively mitigated the project's negative impacts and improved production and living conditions of local communities and residents.

#### **(b) Institutional Change/Strengthening**

66. Institutional strengthening and capacity building (Component 4) were an integral part of the project. From design to completion, every project stage provided a balanced mix of training activities that will have a lasting impact by building a reservoir of trained staff.

67. Specific long-term institutional outcomes include the following:

- Construction of a flood warning center that will provide facilities to train practitioners to protect lives and property from floods
- Training in watershed management
- Experience in the management of a multicomponent project
- Introduction of more effective O&M practices
- Improved environmental capacity through the adoption of modern processes and procedures, especially for dam safety
- Adoption of modern flood forecasting and warning techniques based on remote sensing, a geographic information system (GIS), and a global positioning system

- Experience in implementation of the Bank's fiduciary and safeguard policies with possible application to other similar projects.

**(c) Other Unintended Outcomes and Impacts (positive or negative)**

68. The project led to a significant change of mindsets and outlooks of local communities. As a result of the intensive awareness campaign, training, and demonstrations, the population does not view environmental problems as inevitable anymore. An increased awareness of environmental problems and their causes and consequences has contributed to a willingness to take necessary steps to build and restore a more resilient local environment.

**3.6 Summary of Findings of Beneficiary Survey and/or Stakeholder Workshops**

69. A Beneficiary Survey was conducted by the XPMO to investigate the level of satisfaction of project beneficiaries. A questionnaire was developed and administered to a selected sample of beneficiary households in Xining and in the three counties. About 97 percent of the respondents declared that they are highly satisfied with the project results while 3 percent of them indicated that they are satisfied with the project results. All the respondents declared that the quality of life for their households has improved with the project. This survey indicates that the project has substantial positive impacts on the livelihoods of the population.

**4. Assessment of Risk to Development Outcome**

Rating: Moderate

70. The following discussion on risk is appropriate for all three dimensions of the PDO. Based on the following discussion, the overall risk to development outcome is rated Moderate.

71. **Political support and a rich enabling policy environment.** The project objectives continued to enjoy strong political support and the structural and nonstructural measures implemented under the project are expected to be sustained. Institutional risks are Low.

72. **The project design was built on state-of-the-art international standards and good practices.** Environment-friendly concrete, with limited impact on water infiltration and vegetation growth, was used for riverbank protection. The early flood warning system relies on a combination of GIS and remote sensing technologies that are cost effective, time saving, and easy to operate by trained staff. Technical risks to project outcomes are Moderate.

73. **The project O&M arrangement are adequate to ensure sustainability.** A multipronged O&M system, including institutional, technical, and financial arrangements, was implemented during the project and is still functioning.

74. **The approach to livelihood improvement adopted is conducive to ensuring sustainability of watershed outcomes.** The active participation of beneficiary farmers in the design, implementation, and post-completion phases has created a strong sense of ownership of the project local assets. Livelihood solutions adopted by the local population will likely provide genuine incentives to farmers to drastically reduce the pressure on natural resources. Solar heaters provided under the project promote the conservation of afforested areas. Risks to sustainability of watershed outcomes are rated Low.

## 5. Assessment of Bank and Borrower Performance

### 5.1 Bank Performance

#### (a) Bank Performance in Ensuring Quality at Entry

Rating: Satisfactory

75. Project design incorporated lessons from previous projects and was relevant to the major strategic themes of the 2006 CPS for China and the 2002 Country Water Resources Assistance Strategy (section 1.1). The Bank contributed to the technical effectiveness of the project concept by enhancing the design from structural approaches to include nonstructural measures (section 2.1). The Bank ensured that a team of specialists was mobilized to address all relevant project aspects, in particular, including social and environmental safeguards, as well as M&E.

76. A relatively long preparatory phase (24 months) was necessary to ensure that Qinghai Province and Xining Municipality, which did not have experience in Bank projects, received adequate support. The participatory approach with iterative consultations with the population required sufficient time. The strategy consisting of putting in place an adequate and full-fledged O&M plan from the very start proved appropriate (section 2.5).

#### (b) Quality of Supervision

Rating: Satisfactory

77. **Focus on development impact.** The project's innovative approach combining structural and nonstructural measures was instrumental in maximizing the project's positive impact, especially for the flood protection component that included a flood warning system. Also, an innovative participatory approach allowed building incentives for vegetation conservation by providing alternative livelihood solutions to the local population (section 2.1).

78. In 2012, the Bank conducted an MTR supervision mission as planned at appraisal. The mission identified new activities relevant for the project contributing to higher impact on the development outcomes. The Bank team proactively provided guidance to the PMO to process a restructuring to take account of the shift in priorities at different administrative levels and remain focused on the impact (section 2.2). The project restructuring was carried out well with support from a mix of experts from the Bank. The high flexibility adopted in the restructuring was greatly appreciated, especially by farmers, as it allowed integration of their changing needs. During restructuring, the Bank team reoriented activities to stay fully aligned with national, provincial, and county priorities that shifted during implementation. The redefinition of several project activities justified a one-year extension of the project closing date to ensure smooth completion of all investments.

79. **Supervision of fiduciary and safeguard aspects.** All safeguard and fiduciary issues were addressed upstream during preparation so that no significant safeguard or fiduciary issue arose during implementation (section 2.4). The Bank paid adequate attention to resettlement issues by ensuring that the RAP was properly implemented and compensations payments were made before the works started. The Bank provided appropriate implementation support through reviews, discussions in the field, and trainings on the satisfactory implementation of agreed FM and procurement arrangements (section 2.4).

80. **Candor and quality of performance reporting.** Project ratings in the Implementation Status and Results Reports were candid. The project was consistently rated Satisfactory throughout implementation.<sup>5</sup> The Aide Memoire (AMs) described the issues encountered and the recommendations agreed with the implementing agencies.

81. **Adequacy of supervision inputs and processes.** Two supervision missions with an appropriate mix of experts were organized during each year of implementation. The Bank specialists provided thorough guidance on each of the project's key aspects. Focus on development impact was central to the supervision, as demonstrated by the AMs, although the Bank could have better prioritized some preeminent activities, for example, early warning system should have been established early as indicated in the PAD. To ensure adequate transition, the Bank provided guidance on operationalizing and maintaining the O&M systems as designed (section 2.5).

### **(c) Justification of Rating for Overall Bank Performance**

82. Bank performance in ensuring both quality at entry and quality of supervision is rated Satisfactory. As a result, the overall Bank performance is also rated Satisfactory.

## **5.2 Borrower Performance**

### **(a) Government Performance**

Rating: Satisfactory

83. During preparation and then implementation, both central and local governments showed strong commitment to project success, for example, by initiating preliminary studies before the first Bank exploratory mission (section 1.1 and section 2.1). The Government also mobilized the required substantial CFs. Active government involvement greatly facilitated overall project oversight and coordination between the different elements of the project institutional setting. Initially, a shortage of CFs directly affected payments to contractors at the county level. This was revised before it had an adverse impact on project implementation. The Government satisfactorily complied with the legal covenants in the Loan and Project Agreements (section 2.4).

### **(b) Implementing Agency or Agencies Performance**

Rating: Satisfactory

84. The implementing agencies were the XPMO, the Huangzhong County PMO, the Huangyuan County PMO, and the Datong County PMO.<sup>6</sup> All implementing agencies were highly committed to the project success. The PMOs had highly motivated staff who successfully engaged with local communities and established trust that is essential to an effective participatory approach. As mentioned in earlier sections (sections 2.4), the implementing agencies met all safeguard and fiduciary requirement at project completion. Minor shortcomings include the delay in preparing the application for restructuring. (Rating for XPMO: satisfactory).

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<sup>5</sup> Progress toward achievement of the PDO was rated Highly Satisfactory once.

<sup>6</sup> Although the Loan Agreement mentions Qinghai Province as the implementing entity, the actual project implementation was delegated to the agencies of cities.

85. The Huangzhong County PMO made rapid progress toward the achievement of project activities at the county level (section 2.2). The county was successful in managing FM and procurement in compliance with Bank policies. Contract management was also smooth and encountered no major difficulty. It did not face counterpart funding issues. No resettlement occurred in the county. By the end of 2013, Huangzhong County had almost finished all engineering works. (Rating for Huangzhong County PMO: satisfactory).

86. The Huangyuan County PMO and Datong County PMO lagged behind schedule, especially in implementing livelihood activities (section 2.2). Initially, the Huangyuan County PMO experienced challenges with the implementation of the RAP due to inexperience. Also, the activities slowed down because of the delay in the availability of CFs. At project completion, the county eventually managed to make up delays as funds became available and the PMO became more familiar with Bank procedures. (Rating for Huangyuan County PMO: satisfactory).

87. Datong County was faced with slow implementation progress as a result of insufficient and timely provision of CFs. However, by the end of the project, they were able to make up the delays and reach a significant performance level. FM capacity was strengthened with the support of the financial department of the county government. (Rating for Datong County PMO: satisfactory).

### **(c) Justification of Rating for Overall Borrower Performance**

88. Based on the abovementioned factors, the borrower's overall performance is rated Satisfactory.

## **6. Lessons Learned**

### **Lessons Applicable to Operations in China**

89. **Targeted capacity building during project preparation can greatly enhance project readiness and implementation (section 2.1).** Several trainings, including study tours, from the very beginning of the project were decisive in the project success during implementation. Although this was the first Bank-funded project for the municipality, with adequate capacity building at all project stages, staff quickly gained a good understanding of the project concept and caught up with the implementation of Bank procedures, demonstrating that a well-tailored and evolving training program can make a big difference between success and failure.

90. **Mobilizing CFs at the county level though highly desirable can be challenging in the context of China (section 2.2).** In China, counties have relatively low financial capacities as compared to other administrative levels such as municipalities and provinces. It is therefore essential to consider the county participation in the project financial effort as part of a long-term pedagogical process aiming at a progressive improvement of their financial capacities. Expectations should be realistic, as unavailability of CFs at crucial moments can seriously impede project implementation progress.

**Project-specific lessons applicable to similar operations (these lessons were reflected in similar operations in section 2.5).**

91. **A balanced mix of engineering and non-engineering measures optimizes flood management (section 2.1 and section 3.2).** An infrastructural approach needs to be complemented by a 'soft' approach based on soil and water conservation techniques combined with modern flood warning systems based on modern information technologies (GIS, remote sensing, and the global positioning system). Soil and water conservation techniques help reduce the impact of floods by solving the root causes such as erosion while the flood warning system facilitates real-time and accurate decision making by relevant authorities, thereby safeguarding lives and properties.

92. **Livelihood improvement should be an integral part of watershed management projects (section 2.2).** Watersheds are socioecological systems with complex interactions between human activities and ecosystems. Interventions in watershed management activities can lead to an adverse impact on populations whose livelihoods depend mainly on natural resources within the river basin. The project involved local populations in decision making and took into account their interests through well-designed and agreed alternative livelihood improvement measures. This approach proved effective and conducive to creating incentives and establishing a sense of ownership of project assets. Coupled with building awareness of soil and water conservation through providing training, this approach contributed to sustainable impact.

93. **A flexible and demand-driven approach to livelihood improvement is an advantageous feature of Bank projects that is to be maintained (section 2.1 and section 3.2).** Compared to nationally funded projects, flexibility is a comparative advantage of Bank-funded projects. During project planning and implementation, as a result of dramatic changes in the industrial fabric of communities in the sub-watersheds, the traditional cropping and animal husbandry shifted to urban services, and villagers' awareness and needs also changed remarkably. To respond to these developments and subject to detailed investigation and analysis, a set of recommendations and plans were proposed for the midterm review, which significantly enhanced the degree and depth of participation. The Bank's responsiveness in adapting project activities to fit the changing needs was highly appreciated by farmers.

## **7. Comments on Issues Raised by Borrower/Implementing Agencies/Partners**

Not applicable

## Annex 1. Project Costs and Financing

### (a) Project Cost by Component (in US\$ Million Equivalent)

Components	Appraisal Estimate (US\$, millions)	Restructuring Estimate (US\$, millions)	Actual Estimate (US\$, millions)	Percentage of Appraisal	Percentage of Restructuring
1. Flood Control and Management	105.02	119.02	131.52	125	111
2. Wastewater Collection	10.13	10.36	11.95	118	115
3. Participatory Watershed Management	19.49	17.24	16.64	85	97
4. Institutional Strengthening and Capacity Building	11.12	7.77	7.59	68	98
5. Resettlement and Environmental Management	35.00	31.06	31.06	89	100
6. Project Management	18.11	16.58	13.44	74	81
<b>Total project Costs</b>	<b>198.87</b>	<b>202.18</b>	<b>212.20</b>	<b>107</b>	<b>105</b>
Interest during construction	8.44	4.98	4.15	49	83
Front-end Fee	0.25	0.25	0.27	108	108
<b>Total Financing Required</b>	<b>207.56</b>	<b>207.41</b>	<b>216.62</b>	<b>104</b>	<b>104</b>

*Note:* Totals may not tally due to rounding. Costs at completion are close to estimates at restructuring. The largest variation is observed in Components 2 and 6 (Wastewater Collection and Project Management). This variation is due to slight cost overruns for Component 2.

### (b) Financing

Source of Funds	Appraisal Estimate (US\$, millions)	Restructuring Estimate (US\$, millions)	Actual Estimate (US\$, millions)	Percentage of Appraisal	Percentage of Restructuring
<b>IBRD Funding</b>	<b>100.00</b>	<b>100.00</b>	<b>100.00</b>	<b>100</b>	<b>100</b>
<b>Counterpart Funding</b>	<b>107.56</b>	<b>107.41</b>	<b>116.62</b>	<b>108</b>	<b>109</b>
<b>Total Financing Required</b>	<b>207.56</b>	<b>207.41</b>	<b>216.62</b>	<b>104</b>	<b>104</b>

*Note:* Totals may not tally due to rounding.

## Annex 2. Outputs by Component

Output	Original Target Values (PAD)	Formally Revised Value (Restructuring Paper)	Actual Achievement at ICR	Percentage of PAD	Percentage of Revised
<b>Component 1: Flood Control and Management</b>					
<b>Xining City</b>					
Mainstream of Huangshui River Haihu Bridge to Xigang Railway Bridge protection against 1/100 flood with 744 m <sup>3</sup> /s	7.42 km	7.42 km	7.42 km	100	100
Nanchuan River Ducao to Yuanding Bridge protection against 1/100 flood with 287 m <sup>3</sup> /s	9.45 km	9.45 km	9.45 km	100	100
Beichuan River Ducao to Yuanding Bridge protection against 1/100 flood with 430 m <sup>3</sup> /s	7.78 km	7.78 km	7.78 km	100	100
14 gullies rehabilitated	7.655 km	7.655 km	7.655 km	100	100
<b>Datong County</b>					
Ta'er Bridge to Liming Bridge protection against 1/50 flood with 257 m <sup>3</sup> /s	11.35 km	11.35 km	11.35 km	100	100
7 gullies rehabilitated	14.67 km	14.67 km	14.67 km	100	100
<b>Huangyuan County</b>					
Dikes for Embankment Nanchuang River Dalu Bridge to County Party protection against 1/50 flood with 412 m <sup>3</sup> /s	11.608 km	11.608 km	11.608 km	100	100
Dongfeng Bridge to Babai Bridge protection against 1/50 flood with 471 m <sup>3</sup> /s	2.514 km	2.514 km	2.514 km	100	100

<b>Output</b>	<b>Original Target Values (PAD)</b>	<b>Formally Revised Value (Restructuring Paper)</b>	<b>Actual Achievement at ICR</b>	<b>Percentage of PAD</b>	<b>Percentage of Revised</b>
5 gullies rehabilitated	6.818 km	6.818 km	6.818 km	100	100
<b>Huangzhong County</b>					
2 gullies rehabilitated	5.862 km	5.862 km	5.862 km	100	100
<b>Summary</b>					
Total length of dikes (1/100)	24.65 km	24.65 km	24.65 km	100	100
Total length of dikes (1/50)	25.472 km	25.472 km	25.472 km	100	100
Total length of gullies	35.005 km	35.005 km	35.005 km	100	100
Three recreation areas totaling 2.72 km <sup>2</sup> Areas including plantations guardrails, pavement lighting (Xining downtown, Chengnan New District, Datong, and Huangyuan)	1.76 km <sup>2</sup>	1.76 km <sup>2</sup>	1.76 km <sup>2</sup>	100	100
Dike strengthening works along Bei-Chuan River from Kangjia Bridge to Chaoyang Hydropower Plant Outlet	Not originally planned	3.5 km	3.5 km	n.a.	100
Extension of dike works from Menyuan Bridge to the River Inlet	Not originally planned	1 km	1 km	n.a.	100
Gully management works upstream of Dujia Gully	Not originally planned	1 km	1 km	n.a.	100
<b>Emergency preparedness for the Xining Municipality, including strengthening the capability of</b>					

<b>Output</b>	<b>Original Target Values (PAD)</b>	<b>Formally Revised Value (Restructuring Paper)</b>	<b>Actual Achievement at ICR</b>	<b>Percentage of PAD</b>	<b>Percentage of Revised</b>
<b>the Xining Municipal Flood Control and Drought Relief Organization.</b>					
Automatic software and information-based solution for early flood warning with the integrated components	Completed	Completed	Completed	Completed	Completed
Data collection system for rainfall, meteorological, engineering, disaster, and social economic situation	Completed	Completed	Completed	Completed	Completed
Computer network of Xining City and the 3 counties	Completed	Completed	Completed	Completed	Completed
<b>Component 2: Wastewater Collection*</b>					
<b>Xining city</b>					
Construction of wastewater interception pipes in Xining City	57.040 km	57.040 km	57.040 km	100	100
Improvement of piped rainstorm water collection system in Xiaoqiao District of Xining City	1.725 km	1.725 km	1.725 km	100	100
About 15 km extension of the improvement works along Nanchuan River from Da'nanchuan Dam to Xiejiazai Bridge	Not originally planned	15 km	15 km	n.a.	100
<b>Huangzhong County</b>					
Rehabilitation of the main sewage interception pipes	3.206 km	3.206 km	3.206 km	100	100

Output	Original Target Values (PAD)	Formally Revised Value (Restructuring Paper)	Actual Achievement at ICR	Percentage of PAD	Percentage of Revised
in Huangzhong County					
<b>Datong County</b>					
Construction of a main wastewater collection pipeline for the improvement and extension program for water supply and sewage systems in Qiaotou District of Datong County	10.500 km	10.500 km	10.500 km	100	100
<b>Component 3: Participatory Watershed Management</b>					
Afforestation	n.a.	n.a.	945 ha	n.a.	n.a.
Vegetation recovery	n.a.	n.a.	1249 ha	n.a.	n.a.
Terrace	n.a.	n.a.	407 ha	n.a.	n.a.
Check dams	n.a.	n.a.	216	n.a.	n.a.
Swamping dams strengthened	n.a.	n.a.	9	n.a.	n.a.
Total area with soil and water conservation measures	10,034 ha	n.a.	10,233	102	n.a.
<b>Direct livelihood improvement</b>					
Village roads	n.a.	n.a.	11.2 km	n.a.	n.a.
Cow shelters	n.a.	n.a.	191	n.a.	n.a.
Cattle shelters	n.a.	n.a.	36	n.a.	n.a.
Pig pens	n.a.	n.a.	168	n.a.	n.a.
Cow/cattle	n.a.	n.a.	191	n.a.	n.a.
Calf	n.a.	n.a.	62	n.a.	n.a.
Goats/sheep	n.a.	n.a.	37	n.a.	n.a.
Solar Water heaters	n.a.	n.a.	288	n.a.	n.a.
<b>Component 4: Institutional Strengthening and Capacity Building</b>					
Flood warning management center construction	10,800 m <sup>2</sup>	10,800 m <sup>2</sup>	10,800 m <sup>2</sup>	100	100
Training to implementing agencies	2,328 persons	n.a.	3,330 persons	143	n.a.
Training to farmers	2,695 persons	n.a.	16,061 persons	596	n.a.

Note: Totals may not tally due to rounding.

\* In Component 2 some activities were dropped and new activities added: As specified in the project restructuring paper, activities dropped from the project include (a) the construction of 4.6 km of dike improvement and

wastewater collection pipes from Chaoyang Power Station to Railway Bridge, (b) the construction of Nanchuan wetland upstream of Haishan Bridge and Beichuan wetland downstream of Chaoyang intake pumping station in Xining City; and (c) the improvements in Maojia Valley in Datong County and Quaner Valley in Huangyuan County.

As a result, the loan savings were used to support new identified subprojects, which are mostly extensions of current subprojects, including (a) about 15 km extension of the improvement works along Nanchuan River from Da'nanchuan Dam to Xiejiazai Bridge; (b) about 3.5 km of dike strengthening works along Beichuan River from Kangjia Bridge to Chaoyang Hydropower Plant Outlet; (c) about 1 km extension of dike works from Menyuan Bridge to the River Inlet; and (d) about 1 km of gully management works upstream of Dujia Gully. All new activities and outputs were completed by project closure.

\*\*The PAD or restructuring paper did not explicitly provide the details of livelihood activities, as they were to be refined in consultation with the beneficiaries.

Component 5 on Resettlement and Environmental Management and Component 6 on Project Management supported the other components to ensure the overall project compliance with Bank safeguard policies and the project's day-to-day management. Specifically, Component 6 funded the development and operation of (a) an MIS (b) strengthening the capacity of Xining Municipality to carry out procurement, construction supervision, quality control, FM, and project M&E system.

### Annex 3. Economic and Financial Analysis

1. The EIRRs were recalculated at ICR, using updated prices and actual project costs. The methodology used follows that at the appraisal.

#### Identification of Economic Benefits and Costs

2. **Economic benefits.** The project has generated a variety of economic benefits to Xining City as well as the cities in the lower reaches of Huangshui River and Yellow River. The economic benefits and costs of the project were identified and quantified as much as possible. As listed in table 3.1, the economic benefits consist of avoided flood damages, amenity and land value increases, health improvements associated with water pollution control, ecological upgrading and agricultural production increases from the use of sustainable watershed management practices, and soil conservation and resulting sediment reduction in the lower reaches of Yellow River.

Table 3.1. Economic Benefits

Type of Benefits	Flood Control and Wastewater Component	Watershed Management Component
Avoided flood damages	++	+
Amenities and land value increase in urban areas	++	+
Environmental health improvement by wastewater collection	+	—
Agricultural production and livelihood increase	—	++
Watershed ecosystem improvement	+	++
Soil erosion protection and resulting sediment reduction in the lower reaches of Yellow River	—	++

Note: “+” for moderate economic benefits and “++” for high economic benefits.

3. **Economic costs.** The main economic costs for each component are identified as capital investment, including associated resettlement and environmental mitigation costs of the investments as identified in the safeguard analysis and O&M including replacement cost of capital investment (mechanical or electrical equipment and other items exceeding their useful lifespan).

#### General Assumptions, Basic Data, and Methodology

4. The economic analysis assumes that market prices for the main elements of costs and benefits are not at much variance from their economic values; therefore, shadow prices and conversion factors were not applied. The economic benefits and costs are valued in 2015 price levels. All of them are net of inflation, duties, and taxes.

5. The project analysis duration for the flood control and wastewater collection components is 40 years plus 5 years of construction period and that of the watershed management component is 30 years plus 5 years.

6. In China, the discount rate accepted by the Chinese Government for most of its projects is normally 8 percent.<sup>7</sup> The rate can be as low as 6 percent for investments with long-term social and environmental benefits but difficult to quantify, which is in line with the latest Bank Opportunity Cost of Capital at 6 percent.

7. Economic benefits and costs of each component were first identified and quantified to the extent possible. Cost-benefit analysis was then used to examine the economic feasibility of each component and the entire project. For the component of wastewater collection, the economic analysis was done together with that of the flood control component because the construction works for flood control (rehabilitating dikes and waterways) and wastewater collection systems (laying sewerage mains along the riverbank) will be constructed together and it is difficult to separate the civil works and costs by subcomponent (for example, flood control and wastewater treatment).

## **Economic Analysis by Component**

### *Flood Control and Wastewater Collection Component*

8. The objectives of the component are to reduce the risk of flooding, protect human life and property, and to improve the environment and amenities of project areas within Xining Municipality (that is, Xining City and its three surrounding counties Datong, Huangyuan, and Huangzhong). The component will fund the building or strengthening of riverbanks of the main rivers running through the urban built areas of Xining City, Datong County seat, and Huangyuan County seat. It will also fund minor water/drainage courses in surrounding gullies. The investment will enhance the flood control standards from 1:30 to 1:100 in Xining, from 1:30 to 1:50 in Datong and Huangyuan, and from 1:10 to 1:30 in Huangzhong. Together with the flood control construction, the wastewater collection systems will be constructed simultaneously, mostly along the rehabilitated dikes.

9. **Alternatives.** The ‘without-project’ scenario would be to leave the situation as it is, that is, low flood control standards and high flood loss (losses account an average of over RMB 200 million per year according to statistical data in the last 21 years), poor water environmental quality, and low quality of life. The proposed project will decrease the flood risk to 1:100 (that is, a probability of 1 percent), largely avoid flood damages, and improve the environment and amenities of the area. The alternative options considered include building dams and other storage facilities to store flood waters. They were ruled out because of their low effectiveness and high costs.

10. **Economic benefits and costs.** The economic benefits of flood control investments are mainly twofold: avoided flood damages and increased amenities. The avoided flood damage was estimated based on the actual annual loss to floods (obtained from the historical data of the last 21 years) adjusted by reduced flood occurrence probability, the trend of economic growth of flood affected areas, and the share of the project contribution in the total flood control effort in the city. Specifically, the total economic loss to floods in Xining (excluding three counties) in 1986–2006 was RMB 3.8 billion, with an annual average of RMB 182 million. The completion of the project

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<sup>7</sup> China National Development and Reform Commission (NDRC) and China Ministry of Construction (MOC), 2006. *Economic Analysis of Construction Projects: Methods and Parameters*. Beijing: China Planning Press.

will significantly increase the city's flood protection standards and reduce the expected occurrence of flooding from the current situation of 1 flood in 30 years to 1 flood in 100 years. Thus, most of the flood damages could be avoided at a probability of 99 percent. On the other hand, given the rapid economic growth of the city (an annual average GDP growth of over 10 percent in 2001–2015), economic values of flood affected areas would be increasing too. Therefore, future flood damages in the without-project scenario would be higher than actual annual losses in the past. To be conservative, it is simply assumed that the flood damage annually avoided by the entire flood control effort in the first year of the full operation of the project will be equal to the actual annual loss of RMB 182 million and the values will grow at an annual rate of 3 percent. This is an example of the avoided damages valuation approach. Because before this project the Government has already rehabilitated the dike of 21 km long in the central areas of the city, the contribution share of this project has to be figured out. The project will help complete the remaining 24.6 km of dikes within the city plus 7.6 km in the gullies within or nearby the city. The two items comprise 76 percent in length of the flood protection system the city plans to complete. Considering the difference in economic values of different urban sections along the rivers running through the city, the percentage needs to be further weighed according to the commercial values of flood-affected areas. A ratio of 4:2:1 (central area: non-central: outskirts) was applied and, as a result, the contribution of the project to avoided flood damages was estimated to be 40 percent of the total annual loss. The same approach was applied to the three counties of the project. With this, it was estimated that about RMB 94.6 million of flood damages could be avoided annually by the project.

11. The dike rehabilitation and wastewater collection investment also has significantly improved the aesthetic values and sanitation condition of the areas along the riverbank and improved amenities for the people who live there. These benefits, however, are not directly reflected in monetary terms. A hedonic approach was used in the analysis, which estimated the change in the value of lands affected by the project; it was then used to approximately represent the economic benefit of the amenity increase. Since its Government began to implement its flood control plan, Xining City has already experienced an increase in values of residential and commercial lands along the rehabilitated riverbanks. The increase in the market value of land is the main benefit quantified in the flood control and wastewater collection components of the project. According to the estimates of Xining Land and Resource Bureau, the average net increase of RMB 700–1000 per m<sup>2</sup> (depending on location) was used to estimate the increased value of the land next to the rehabilitated riverbank in Xining and RMB 135 per m<sup>2</sup> in Datong and Huangyuan counties. The areas of the lands affected by the project, including both existing and planned residential and commercial areas, are 12.3 km<sup>2</sup> in Xining, 0.3 km<sup>2</sup> in Datong, and 0.12 km<sup>2</sup> in Huangyuan.

12. Wastewater collection definitely presents environmental health benefits to Xining. But the wastewater collection investment is only part of a big water pollution control effort implemented by the city; it is difficult to single out and measure the environmental health benefit of the project. So, it is impossible to quantify the benefits from wastewater collection and associated health improvement in the project due to the lack of water quality data and clear causal links between wastewater collection, water quality, and public health. Instead, this environmental benefit was only described.

13. Based on the above factors, this component has generated an EIRR of 29.4 percent.

### *Sustainable Watershed Management Component*

14. This component was designed to improve eco-systems and improve the livelihoods of farmers in 17 pilot gullies/watersheds through investments in activities for soil erosion reduction, water restoration, and agricultural productivity increase. Investments would be mainly for two groups of activities: erosion control and agricultural productivity increase, including terracing, tree and grass planting, silt retention, water restoring facilities, and drainage improvement; and community livelihood activities including green houses, biogas, and animal husbandry.

15. The major economic benefits of this component are (a) production and income increase of local farmers and (b) soil erosion reduction and ecological upgrading, both within and outside the project areas. The production and income increases of local farmers can be derived from the productivity change of respective soil and water conservation activities and livelihood measures funded by the project, such as farmland terracing, reforestation, grass planting, animal husbandry in covered pens, green houses, and biogas or solar stoves. This is an application of the change in production valuation technique. The productivity data have been well-established in a study by the Hydraulic Research Institute of the Yellow River Basin Commission from other soil conservation projects in watersheds in the Yellow River Basin close to Qinghai and were used in this analysis. The estimated economic benefit of all production increases gradually and reaches its maximum of RMB 11.5 million per year in year 15.

16. The ecological upgrading benefit to local communities was represented by the value of water restored and energy saved through the project and the local price of RMB 0.05 per ton of water for irrigation was used in the calculation, while the ecological benefit to those who live downstream beyond the project area was approximately estimated by the avoided cost of dredging the silt which was transported to and deposited in the middle and lower reaches of Yellow River. The unit cost used in the analysis is RMB 20 per ton of silt dredged and the total annual benefit is about RMB 9.0 million from year 10 onward. It is worth noting that the ecological benefits could be significantly underestimated in this analysis.

17. Based on the above, the project component has registered an EIRR of 15.1 percent.

### **Project Level Evaluation and Sensitivity Analysis**

18. The EIRR of the combined flood control and wastewater collection investments is 29.4 percent (22.1 percent in the PAD) and the sustainable watershed management component 15.1 percent (13.8 percent in the PAD). According to the PAD approach, the project EIRR is 26.9 percent (21.4 percent in the PAD), calculated on the basis of the aggregated economic cash flows of the two components. The project therefore is economically viable by component and as a whole.

19. The main reason behind the noticeably higher project EIRR is that increases in values of residential and commercial lands along the rehabilitated riverbanks turned out to be higher than the PAD estimation.

20. No sensitivity test has been conducted as robust economic viability is calculated on the very conservative estimates of benefits. The EIRR rates therefore should be considered as the floor values of the analysis results.

## **Fiscal Sustainability Analysis**

21. The fiscal sustainability and debt repayment obligations of the local governments have been analyzed, considering the trends of economic growth and government fiscal revenues including transfer payment.
22. The GDP growth rates in the past decade (2006–2016) ranged between 8 percent and 15 percent. With the moderation of the growth, the rates are estimated between 6.5 percent and 7 percent in the current Five-Year Plan (2016–2020), while the fiscal revenues have been conservatively forecast to increase 3–5 percent annually.
23. Xining Municipality and three project counties under its jurisdiction are designated as national-level poverty pocket areas in China. As such, they have been receiving a significant amount (over 60 percent of the total government financial revenue) of government transfers from central and provincial governments. With the increasing poverty reduction efforts by the central and provincial governments, the high level of government transfers is expected to further increase in the years to come.
24. During the Bank loan service period, the repayment of the Bank loan is estimated to be below 0.2 percent of the estimated fiscal revenue for Xining and the three project counties in 2016 and will noticeably decrease in the following years with the annual increases of fiscal revenues.
25. It is an established practice and the governments have firmly committed to cover, in their regular budget expenditure, the O&M costs (which is a fraction of the annual loan payment) of the infrastructure works built under the project.
26. Based on the above factors, Xining Municipality as well as the three project counties are all in a reliable fiscal position to repay the Bank's loan and provide O&M costs for the infrastructure works.

## Annex 4. Bank Lending and Implementation Support/Supervision Processes

### (a) Task Team members

Names	Title	Unit	Responsibility/ Specialty
<b>Lending</b>			
Syed I. Ahmed	Lead Counsel	LEGAM	Legal
Wendao Cao	Senior Agriculture Economist	GFA02	Agriculture
Yi Dong	Senior Financial Management Specialist	GGO20	
Daniel R. Gibson	Consultant	OPSPQ	
Xiaowei Guo	Senior Procurement Specialist	GGO08	
Shunong Hu	Senior Water Engineer	GWA02	
Liping Jiang	Senior Irrigation Engineer	GWA02	
Minhnguyet Le Khorami	Program Assistant	GFA04	
Patria Consuelo M. Morente	Senior Financial Assistant	TRODR	
Geoffrey Spencer	Consultant	GSURR	
Qingtao Xie	Local Consultant Short Term	GWADR	
Xiuzhen Zhang	Interpreter/Translator	GSDTI	
Dan Xie	Program Assistant	EACCF	
<b>Supervision/ICR</b>			
Ximing Zhang	Senior Water Resources Specialist	GWADR	Task Team Leader
Yoro Sidibé	Young Professional (Economist and Water Resources Specialist)	GWADR	ICR Author
Jingrong He	Procurement Specialist	GGODR	Procurement
Shunong Hu	Senior Water Engineer	GWADR	Water Engineering
Zongcheng Lin	Senior Social Development Specialist	GENDR	Social Development
Liping Jiang	Senior Irrigation Engineer	EASCS	Irrigation Engineering
Fang Zhang	Financial Management Specialist	GGODR	Financial Management
Feng Ji	Safeguards Specialist	GENDR	Safeguards
Daniel R. Gibson	Safeguards Specialist	OPSPQ	Safeguards
Jian Xie	Safeguards Specialist	GENDR	Safeguards
John Morton	Safeguards Specialist	GSURR	Safeguards
Qingtao Xie	Safeguards Specialist	GSURR	Safeguards
Songling Yao	Safeguards Specialist	GSURR	Safeguards
Yan Sun	Social and Resettlement Expert	Consultant	Safeguards
Qi Zhu	Financial Management Expert	Consultant	Financial Management
Dawei Yang	Financial Management Expert	Consultant	Financial Management
Mantang Cai	Watershed Management Expert	Consultant	Financial Management
Chang Ning Chen	Flood Management Expert	Consultant	Flood Management
Xueming Liu	Senior Economist	Consultant	Economist

### (b) Staff Time and Cost

Stage of Project Cycle	Staff Time and Cost (Bank Budget Only)	
	No. of Staff Weeks	US\$, thousands (including variable costs)
<b>Lending</b>		
FY2008	28.53	157.59

Stage of Project Cycle	Staff Time and Cost (Bank Budget Only)	
	No. of Staff Weeks	US\$, thousands (including variable costs)
FY2009	41.40	250.04
<b>Total:</b>	<b>69.93</b>	<b>407.63</b>
<b>Supervision/ICR</b>		
FY2010	21.46	80.25
FY2011	11.03	68.60
FY2012	18.10	81.40
FY2013	7.61	48.14
FY2014	12.39	72.97
FY2015	7.80	64.33
FY2016	10.23	59.73
<b>Total:</b>	<b>88.62</b>	<b>475.42</b>

## Annex 5. Beneficiary Survey Results

	Project Management			Project Results			Life Quality after the Project		
	Highly Satisfied	Satisfied	Dissatisfied	Highly Satisfied	Satisfied	Dissatisfied	Highly Satisfied	Satisfied	Dissatisfied
<b>Xining City</b> <b>Number of households: 50</b>	46	4	0	48	3	0	50	0	0
	92%	8%	0%	96%	4%	0%	100%	0%	0%
<b>Huangzhong County</b> <b>Number of households: 50</b>	47	3	0	48	2	0	50	0	0
	94%	6%	0%	96%	4%	0%	100%	0%	0%
<b>Huangyuan County</b> <b>Number of households: 70</b>	68	2	0	69	1	0	69	1	0
	97%	3%	0%	99%	1%	0%	99%	1%	0%
<b>Datong County</b> <b>Number of households: 80</b>	76	4	0	78	2	0	80	0	0
	95%	5%	0%	97.5	2.5	0%	100%	0%	0%
<b>Total</b>	237	13	0	243	8	0	249	1	0
	95%	5%	0%	97%	3%	0%	100%	0%	0%

## **Annex 6. Stakeholder Workshop Report and Results**

Not Applicable

## **Annex 7. Summary of Borrower's ICR and/or Comments on Draft ICR**

### **1. Project Review**

#### **1.1 Evaluation of Bank and Borrower Performance**

##### **1.1.1 Main Contributions of the Bank and the Borrower**

1. The Bank has been involved in a number of relevant projects, which supported both structural and nonstructural measures and provided support to river basin commissions and provincial agencies for participatory approaches for water resources management. The many lessons drawn from these projects have been incorporated in the design of this project. Therefore, the Bank's involvement has allowed the use of experience, particularly in development of nonstructural measures, as well as the introduction of international and national technical assistance, new technology, materials, and construction methods. The Bank has given adequate attention to sustainability issues during the project preparation and design stages. The eleventh Five-year plan for water resources development for Xining Municipality identifies that nonstructural measures are very important for the development of an integrated flood control and management system.

2. The Xining Flood and Watershed Management Project would be financed by an IBRD Specific Investment Loan in the amount of US\$100 million. The Bank loan will be on standard IBRD terms for a LIBOR-based U.S. dollar denominated single currency variable spread loan, payable in 30 years, including five years of grace, and annuity principal repayment, which is consistent with the borrower's choice of similar Bank-financed projects.

##### **1.1.2 Key Performance Indicators**

3. The project not only used the Bank's and the borrower's funding to achieve integrated flood and watershed management, but also established sewage and drainage collection systems. The construction of these systems will transport sewage, which was previously discharged directly into open drainage canals flowing into rivers, to sewage treatment plants for treatment. For all urban areas, plans have been made to ensure that necessary treatment capacity is in place at the time the construction is completed. Arrangements have also been made to ensure sludge produced from the treatment plants is properly disposed in landfills. Key performance indicators, upon project completion, include the following: (a) the population protected from flooding had reached 414,300; (b) annual reduction of urban wastewater discharged directly into rivers in Xining totaled over 2 million tons; and (c) annual reduction of soil erosion amounted to 898,000 tons.

##### **1.1.3 Evaluation of Management Efficiency and Effectiveness**

4. The application for the project was submitted in early 2007 and the project was listed in the Bank's pipeline for 2007–2009 at the end of 2007. Project appraisal was completed in September 2008 and the Loan Agreement was signed in August 2009 and the loan was effective in November 2009. It took more than three years from project application to loan effectiveness, indicating that the Bank's efficiency was average in terms of project preparation and appraisal. During the implementation stage, the Bank sent a total of 12 supervision missions and prepared corresponding AMs. The Bank's efficiency was high in terms of addressing implementation issues

and managing the overall implementation progress. The Bank's supervision has ensured implementation progress as scheduled. From loan effectiveness, the project had been implemented for 72 months (91 percent of the implementation period). Cumulative loan disbursement accounted for 77 percent of the total loan (including advance payments for the special account and front-end fee). Operation of the MIS and M&E system has been good.

5. During the project implementation, each of the Bank's supervision missions was arranged in advance and in a detailed and orderly manner. The completion review workshop was held in September 2015. All Bank supervision missions are efficient and have achieved significant supervision outcomes.

## **2.2 Analysis of Issues**

6. Main issues raised by the borrower, implementing agency, and partners are summarized below.

### **2.2.1 Rationale and Social Adequacy of the Project**

7. Qinghai is one of the economically underdeveloped provinces in China with a high proportion of ethnic minority population. As the political, economic, cultural, and transport center of Qinghai Province, Xining Municipality takes up two-fifths of the province's GDP and plays an important role in promoting socioeconomic development in the province. The municipality is located in the Huangshui River Basin and at the confluence of two other branches, the Nanchuan and Beichuan Rivers. In the summer months, the municipality often experiences concentrated storms. As a result, the region is prone to flooding, which could lead to catastrophic losses to the already fragile economy of the city and the province. Meanwhile, traditional farming communities are mainly distributed along both sides of large and small gullies in the Huangshui River Basin and practice irrigated agriculture using locally available surface water. Local flash floods and other natural disasters have imposed serious threats to property and lives of rural residents. The objectives of the project are to enhance flood control, watershed management, and flood warning capacity in the project areas and strengthen industrial wastewater and domestic sewage treatment capacity in these areas. These objectives are consistent with economic and social development in the project areas.

8. Before the project implementation was launched, people in the project areas had implemented greening and landscaping activities along the gullies in Xining periphery, flood discharge works, 'Grain for Green' programs, and ecological protection programs. As a result, these activities and programs had achieved initial ecological and socioeconomic benefits and were well-accepted by local people. Given the lessons learned, residents in the project areas had corresponding participation experience and were prepared for potential adverse impacts of the project. Based on field surveys conducted by independent third parties including the social assessment (SA) team, participatory watershed management team, and resettlement team, it had been confirmed that all ethnic groups in rural and urban areas welcomed the project and understood and supported the project's structural and nonstructural measures. Positive impacts of previous programs are evident, adverse impacts of the project have been prevented and controlled, and ethnic, religious, and culturally sensitive spots have been excluded. Therefore, implementation of the project has favorable social conditions and does not have unforeseeable social risks.

## **2.2.2 Institutional Capacity Building and Public Consultation**

9. Public consultation of the project aims not only to ensure the right to information of various stakeholders, but also to ensure the participation of the general public. County PMOs employed talented people through open recruitment and other approaches to ensure the alignment of knowledge structure and capacity of staff with the needs of the project. All PMOs have made efforts to ensure leaders' support and participation of leaders and relevant departments of governments at all levels. Government support and participation have facilitated PMOs to enhance work efficiency and effectiveness. Participating communities have established corresponding organizations based on the contents and actual needs of the project, which has promoted participation of local residents and enhanced the sustainability of participation.

## **2.2.3 Gender, Poverty, and Development**

10. Given the division-of-labor model of 'men being responsible for external affairs and women for household affairs' and lower educational level of women than men in the project areas, the need for women's participation in the project could easily be neglected. Most of the local young and middle-aged men are doing migrant work as average families rely heavily on income from migrant work. Women play a leading role in both household affairs and community affairs. Therefore, the participation of communities and residents in the project areas is directly affected by the capacity and level of participation by women. Special attention has been given to protecting women's rights and benefits during public mobilization, communication, informed consultation and participation, as well as to organizing informed consultations and skill training that are in line with women's needs. The project has effectively promoted women's participation, improved their status in their respective families, and enhanced their capacity and self-confidence.

11. Poor families are prone to be marginalized due to lack of labor force, lack of basic production means, poor labor skills, and lower own funding. Given this, during informed consultations with communities and farmers, special discussions were organized about how to support poor families and engage them in project activities. The project areas are richer areas in Qinghai Province, but overall socioeconomic development levels in the province are low and there is a lack of basic facilities, which is a common barrier impeding community development. Given this context, the project has managed to get support from various-levels of government and relevant authorities in the project areas to promote infrastructure development and improvement, create conditions for community development, and lay a foundation for community-driven poverty alleviation activities.

## **2.2.4 Ethnic Minorities**

12. Ethnic minorities in the project areas are mainly the Hui and Tibetan groups. With the exception of a number of ethnic minority communities, the Tibetans normally mix with Han and Hui people. This pattern has been in existence for a long time. There is high level of acculturations among local populations. For ethnic minority concentrated communities, the SA team developed an EMDP, which has played an important role in promoting ethnic minority development and achieving the project's positive political and social impacts. The SA team also suggested that for communities where ethnic minority populations mix with the Han people and where differences

are not significant in terms of livelihoods and development, it is necessary to achieve balanced benefits and common development for all communities to avoid new conflicts or disputes.

## **2.2.5 Resettlement and Land Acquisition Policy Framework**

13. Most of the resettlement and land acquisition took place in the peripheries of Xining with a small part in Huangyuan County, and there is resettlement involved in Datong and Huangzhong counties. Both rural and urban migrants are Han people and there are no Hui, Tibetan, or other ethnic minority communities. Detailed arrangements have been made in the Resettlement Action Plan and Process Framework to address adverse impacts of resettlement and land acquisition for the project, with special considerations being given to land contractors. Subject to consultations among themselves, farmers who have had their land taken, who would continue to work on the farm or rely more heavily on land, chose replacement land. Considerations were also given to the combination of resettlement and urbanization. An important precondition for the combination is the sustainability of affected people's livelihoods and the provision of opportunities for them to integrate into an urban lifestyle. The key is to conduct extensive consultation with the affected people on the RAP and respect their views.

14. To ensure effective implementation of plantation and water and soil conservation measures on barren public mountains and slopes, ownership of plantations and allocation of benefits from these plantations have been clarified. During informed consultations with communities and residents in the project areas, the PMO has listed these issues as one of the priorities.

## **2.2.6 Cultural Heritage**

15. The Ta'er Monastery located at Lusha'er Town of Huangzhong County is a Tibetan monastery which has been listed as a national heritage for protection. During field survey, the SA team paid special visits to the monastery to meet with responsible monks, keep them informed of the project progress, and hear their views. Relevant monks indicated that they were aware of the project and its implementation would have positive impacts on the monastery's surrounding environment. Based on field visits and consultations with the PMO and local residents, the SA team identified that there were no sensitive issues relating to another important Tibetan monastery, the Guanghui Monastery, which is located at Dongxia Town of Datong County, as the construction sites of the project are distant from the monastery and its sacred space.

16. There are no house demolition activities in Hui communities and thus the project does not have adverse impacts on religious activities of mosques and Hui residents.

## **3.3 Review of Good Practices**

### **3.3.1 Watershed-wide Flood Management**

17. The Huangshui River watershed is vulnerable to flooding due to serious soil erosion. Therefore, an effective flood control intervention requires the combination of soil and water conservation measures, engineering measures, biological measures, and livelihood measures. The implementation of soil and water conservation measures has helped reduce sediment flows into Huangshui River by more than 20 percent, regulate surface runoff intensity, store floodwater, shift

and retard the passage of the flood peak, control flash floods, and reduce the frequency of flash floods.

18. The project has adopted a participatory approach toward the management of individual watersheds while adhering to national laws and regulations on soil and water conservation. The project has actively explored soil erosion control models suiting local realities and has served as a demonstration for preventing and controlling soil erosion, improving the regional ecological environment, and enhancing living standards of the people (especially ethnic minorities and the poor), as well as for achieving coordinated and sustainable social, economic, and environmental development. A range of measures have been implemented, which include: (a) banning grazing and conducting public communication campaigns in remote barren mountains where large-scale afforestation and construction of retaining and storage works are costly and less effective. The purpose is to facilitate the growth of already existing trees and vegetation in these mountains and enhance their capacity of soil and water conservation; (b) afforestation and communication and education campaigns in villages to further avoid soil erosion, strengthen soil and water conservation, as well as construction of check dams to retain sediment from upstream and avoid sediment flows into urban rivers; and (c) periodic dredging of four riverways in urban areas to reduce silt deposition, lower riverbed elevation, afforest riverbanks and protect slopes and strengthening with eco-concrete to mitigate impacts of soil erosion upstream on urban areas and avoid deposition of silt from soil erosion within urban areas.

19. Overall, the project has taken a watershed-wide approach to managing remote barren mountains, villages, and urban areas in an integrated manner, strengthening soil and water conservation and reducing soil erosion and ensuring that riverways are not blocked. These interventions have facilitated flood control and flood discharge and contributed to the protection of ecological environment and creation of eco-riverways and eco-towns.

### **3.3.2 Integrated Flood and Environmental Management**

#### **3.3.2.1 Soil and Water Environment Management**

20. In reviewing the indicator system, considerations have been given to indicators of the population protected from flooding, area protected from flooding, and total economic value of areas protected from flooding, and those of annual reduction of urban wastewater directly discharged into rivers, portions of landscapes and green belts created, length of wastewater collection network built/upgraded, and percentage of wastewater collected by the network. The setup of these indicators aims to reduce water pollution and avoid water quality deterioration while achieving flood control. The use of eco-concrete for riverbank protection can protect the riverbanks and it does not affect vegetation growth or block water penetration. During the construction of flood control works, close attention was paid to soil and water conservation to avoid deposition of silt from soil erosion in riverways, hence avoiding flooding of urban areas as a result of elevated riverbeds. Achieving soil and water conservation requires tree planting and reforestation and expansion of the greening area, which would further reduce sandstorms and clean the air, improve environmental quality, and achieve the benefits of integrated flood and environmental management.

### **3.3.2.2 Environment-friendly Construction**

21. Air pollution in the construction sites of flood control works is predominately from exhaust gas emitted by construction equipment such as excavators, air compressors, drilling machines, and vehicles; dust generated by concrete mixing, road transportation, and spoil handling; and coal dust generated by production activities and cooking. Construction sites of this project have low population density and flood control works are mainly small control and check dams. As a result, the amount of dust is small. For a few construction activities, wet operation is adopted to reduce dust.

22. Solid waste and spoil shall be transported to designated disposal sites and shall not be piled up in areas around the construction sites to avoid adverse impacts on the living environment and transport of residents of Bendong Village and Naiwen Village, piled up in riverside areas, or directly disposed into rivers. To reduce soil erosion, earth-rock excavation activities shall be avoided on rainy days and effective soil and water conservation measures shall be implemented for solid waste and spoil disposal sites, such as top soil management and greening measures.

23. Ecological impacts during construction were mainly resulted from excavation, construction, and other activities. To mitigate these impacts, measures were taken, including education and management of construction teams and workers from other areas; hiring construction workers to protect forest and vegetation in areas surrounding the construction sites; ban of unauthorized felling of tree within and outside construction sites; and after completion of construction activities, cleaning of construction sites and vegetation recovering. Ecological rehabilitation of temporary land after its use must be carried out at an earlier date.

### **3.3.3 Combination of Engineering and Non-engineering Measures**

24. Engineering measures are ‘hard’ measures and refer to the construction of water works (such as reservoirs, dikes, culverts, and sluice gates) to regulate floods, reduce flood peak or divert or detain floods, change the natural flow of floods and eventually control floods, and reduce damages and losses. Non-engineering measures are ‘soft’ measures and refer to measures for reducing flood damages and losses through legal, administrative, and economic means or means other than flood control works, such as issuing and disseminating water-related laws and regulations (or operation guidelines for operators of water works), building a modern flood control commanding system (to promptly and effectively address water-related crises and reduce damages and losses), and developing flood insurance, among others. The two types of measures aim to benefit the general public and reduce economic losses. They rely on each other to be effective and either of them is indispensable.

25. A flood control system is a complex system comprising natural and human factors and including engineering and non-engineering measures. These two types of measures are interdependent and form an integrated modern flood control system. Without engineering measures, flood control would not be achieved and without non-engineering measures, water-related facilities and structures could lead to disasters. Establishing an improved system of non-engineering measures for flood control can effectively reduce flood events. The combination of the two types of measures would improve flood protection levels and provide an enabling

environment for sustainable socioeconomic development. Dujia Gully sub-watershed offers an example.

26. Based on the above, we found that the combination of engineering and non-engineering measures has achieved real benefits: use of solar water heaters has reduced the use of firewood for heating and boiling water, which helps protect vegetation, enhances soil and water conservation capacity, and reduces natural disasters; the dam-top road has facilitated farmers' access to other areas and the market and enabled the use of cars (local farmers have purchased more than 40 cars), thereby increasing their income and improving their living standards. This case has been widely reported by Xining Evening News and other media. These measures have addressed farmers' safety concerns over natural disasters, improved their living conditions, further enhanced their productivity, and created more economic benefits.

### **3.3.4 Combination of Sustainable Livelihood Measures and Watershed Management**

27. Sustainable livelihood measures are designed to promote development practitioners to view poverty from the perspective of daily production and livelihoods of target groups (such as farmers), identify solutions that suit local realities, help achieve effective use of local resources, and are in line with the will of local people, rather than addressing local issues/problems by relying heavily on the large amount of resources brought in by migrants.

28. Watershed management refers to rationally allocating land use for agriculture, forest, animal husbandry, and other sectors based on a watershed as a unit and on comprehensive planning, developing, and implementing locally appropriate integrated management measures to protect, improve, and rationally utilize natural resources to fully enable ecological, economic, and social benefits of land, water, and other natural resources.

29. The combination of sustainable livelihood measures and watershed management requires us to identify the above solutions while protecting, improving, and rationally utilizing land, water, and other natural resources to achieve sustainable development of farmers' livelihoods and production. The Huji Gully sub-watershed offers an example.

30. The above measures have truly integrated sustainable livelihood measures and watershed management and provided effective solutions for achieving sustainable development of farmers' livelihoods and production.

### **3.3.5 Participatory Approach**

31. A participatory approach is defined as a process that embraces the value of decision making by local people, empowers communities and farmers, and enables key stakeholders to have a chance to influence and jointly control resource use and make joint decisions through a range of activities.

32. The participatory approach encourages local people to independently participate in the processes of project planning, design, implementation, benefits distribution, and M&E and helps achieve sustainable development of communities through enhancing local people's capacity of self-decision making, self-management, and self-development.

33. The application of a participatory approach in project planning requires a shift from planner-driven planning and implementation to community-driven planning and implementation. In the process of watershed management, we have adopted the participatory approach. The Lasa Gully sub-watershed provides an example.

34. The concept and methods of a participatory approach need to be reflected and applied throughout the project cycle to ensure participatory operation of all project steps, including project planning and design, implementation management, and M&E.

### **3.3.6 Dynamic Bottom-up Planning Process**

35. Smooth implementation of the project, a perfect combination of each segment of the project, and extensive adoption of the participatory concept have been achieved under the guidance of a dynamic planning process. The process of preparing a participatory watershed management plan and extensively involving farmers to understand and re-understand the current status of their communities is a process of jointly establishing development targets, organizing, putting together, and mobilizing resources, for communities to learn and strengthen relationships with the outside world and for local people to enhance their capacity.

36. The project has conducted a detailed analysis of the relationships between watershed resources and management and the environment and livelihoods. It provided, in the first place, access roads urgently needed by farmers, constructed private-good soil and water conservation works (terracing), public-good works (reforestation and check dams), and livelihood improvement works and has taken measures to enhance the self-development capacity of farmers in the watershed. These activities and measures have laid a solid foundation for the sustainability of watershed management. As a result of farmers' participation, a broad-based social foundation has been provided for planning and design of the project and smooth implementation as scheduled; expected targets of the project have been guaranteed and project outcomes have been shared by farmers. Only with extensive participation of farmers and through truly involving them in all stages of watershed management can multiple targets be achieved, including those of ecological protection, economic development, and livelihood improvement.

37. For each of the processes, from the dissemination of plans and establishment of planning groups to the collection of second-hand data and household survey, and to the production of watershed planning reports, farmers and planning groups have participated in interactions with experts and consultations and have provided feedback. During the project design, instruments such as villagers' meetings, focus groups, and household interviews have been applied to learn about farmers' ideas and needs. Project activities have been developed jointly with local farmers so that their wishes and needs and those of other stakeholders are fully expressed and reflected in the project implementation plan.

38. To achieve coordinated development of economic, ecological, and social benefits, farmers have been mobilized to proactively participate in project implementation. During the implementation of the Flood Control and Management Component, a parallel pilot program of participatory livelihood measures was implemented, which has generated significant benefits to farmers' production and livelihoods and promoted economic development of control-group villages outside the project areas.

**Annex 8. Comments of Cofinanciers and Other Partners/Stakeholders**

Not applicable

## **Annex 9. List of Supporting Documents**

- World Bank. 2009. Xining Flood and Watershed Management Project. Report. Project Appraisal Document. 117p.
- World Bank. 2009. Loan Agreement for Xining Flood and Watershed Management Project. Report. Loan Number 7712-CN. 22p.
- Project Supervision Documents, Aide Memoire, and Implementation Status and Results Reports
- Borrower's Draft Completion Report
- Country Partnership Strategy for China (CPS 35435-CN, May 23, 2006)
- Country Water Resources Assistance Strategy (CWRAS-2002)
- China Country Water Resources Partnership Strategy (2013–2020)

## **Annex 10: Summary of Good Practices**

**A separate study was conducted to capitalize the good practices and experiences from the project. Below is a summary of the main conclusions.**

### **Integrated Participatory Flood and Environment Management and Watershed Management**

#### **Xining Flood and Watershed Management Project**

##### **Executive Summary**

Integrated watershed management, preferably under the direction of a watershed or basin management body, has been prescribed in water policy literature and in other quarters for decades. Few instances may be found where this recommendation has been successfully implemented. This gap between prescription and practice is sometimes attributed to inadequate community participation in integrated management. Most watershed management projects failed to succeed because they did not, or did not effectively, address the equity issues of benefits, community participation, scaling up approaches, and monitoring and evaluation (M&E). Moreover, most of these projects relied heavily on government investments, were structure-driven, and failed to address the issue of the efficient use of natural resources such as soil and water. When the Chinese Government went to the World Bank to seek assistance to solve its problems in Xining Municipality, the capital city of Qinghai Province, the Bank applied an integrated participatory approach to manage the watersheds, through the Xining Flood and Watershed Management Project (XFWMP).

Over the past years, Xining Municipality has been committed to building flood management works. Although some facilities have been built, they fail to meet the needs of flood management and an integrated flood management system is yet to be created. The project design and implementation was complex because the project covers multiple sectors and a large amount of different ethnic minorities live in the project areas. However, the project has been successfully prepared and implemented by applying an integrated participatory approach, including basin-wide flood and environment management, participatory livelihood development, dynamic planning and implementation, and sustainable development management. The project has been efficiently and effectively implemented and achieved or exceeded all the targets set at appraisal. Surveys show significant increases in beneficiary incomes and a high degree of beneficiary satisfaction.

**Basin-wide flood and environment management.** Flood and environment should be comprehensively managed from a basin-wide perspective. The XFWMP has taken a basin-wide approach to comprehensively manage remote barren mountains, villages, and urban areas in an integrated manner, strengthening soil and water conservation, reducing soil erosion, and ensuring that waterways are not blocked. These interventions would facilitate flood management and flood discharge and contribute to the protection of the ecological environment and creation of eco-waterways and eco-towns.

**Participatory livelihood development and dynamic planning and implementation.** Local community participation is essential for the success of watershed management. A participatory approach was applied throughout the whole project cycle. To promote community participation in the watershed for site selection, implementation, and assessment of activities, various committees/groups were formed. It was also necessary to provide tangible private economic

benefits to individuals. Most importantly, full participation is necessary from the initial stage of watershed selection to the selection of treatment activities and M&E. Relevant plans have been prepared before the launch of participatory watershed management, which involved farmer households in the process of jointly setting development targets; organizing, pooling, and mobilizing resources; and enhancing the capacity of local people. In developing participatory livelihood measures, focus has been placed on farmers' actual needs. These measures were developed through a number of surveys and two rounds of public consultation. Farmers have been treated as principal stakeholders throughout the processes of midterm review, construction supervision, and procurement as well as participatory operations and maintenance (O&M) and M&E. Implementation of these measures has greatly promoted economic development of local communities and farmers.

The process from planning to implementation and O&M of most projects is not reversible. However, due to adoption of a participatory approach, each phase of the XFWMP is a dynamic process: (a) project planning could be adjusted based on issues raised during the implementation and management process; (b) the project set up community management groups to ensure active engagement of farmers and communities and focused on the opinion of ethnic minorities based on adequate understanding of their priorities; and (c) the project established a participatory M&E system to effectively manage project activities in the watershed and also created a bottom-up information and data reporting system.

**Sustainable development management.** A comprehensive O&M plan has been developed for the XFWMP covering staff arrangements, technical support, funding provisions, and other aspects. This plan will be effectively implemented during project operation. The O&M of the project requires, above everything else, clear definition of institutional and staff arrangements, that is, who shall be responsible for O&M management. Xining Municipality has a number of river systems, which affect each other and whose management is relatively complex. To address this situation, a 'river head system' has been adopted to manage these river systems. Pursuant to the system, management responsibilities for each river section are assigned to an individual rather an institution or agency.

A summary of the good practices from the Xining model are as follows:

- (a) **Planning and design of basin-wide flood control.** Water and soil conservation upstream can reduce the frequency of flood occurrence and improve the performance of flood management downstream.
- (b) **Integration of livelihood development and watershed management.** Integration of livelihood development into watershed management can fully mobilize local residents' enthusiasm. While the environment improves, local residents' perceptions and ideas change through the development of production and life. Therefore, some tillage practices against soil and water conservation are prevented. Villagers participating in watershed management through empowerment can reduce the cost of O&M which is helpful for sustainability of the project.
- (c) **Participatory measures for livelihood.** Livelihood measures designed through participatory approaches meet the needs of local residents well. While the income level of the residents increased, the ecology and environment of watersheds also improved.
- (d) **Dynamic bottom-up planning.** Repeated dynamic planning process can design the best

possible solution to meet the needs of multi-stakeholders.

- (e) **Attention of leadership and institutional arrangement.** The project leadership management implementation office was established during both the planning and designing phase and the implementation phase. This office includes the steering group of the county, the planning group of the county, coordinators in the township, the planning group of the community, and the management group of the village.
- (f) **Application of information technology.** Application of project management information system (MIS) improved the efficiency of the project with regard to management, reimbursement, and tracking of progress. On the other hand, the flood warning system as well as the application of remote sensing technology and the geographic information system facilitated information on flood management in the project.
- (g) **Sustainable operations and maintenance.** Relative working staff and funding for O&M after completion of the project shall be clearly assigned. The project adopted the 'river head system' to specify maintenance responsibilities to each person; the government at each level shall guarantee the maintenance funds according to the ownership of the project.

Should there be consideration in the future of further project assistance in watershed management some of the lessons learned in this project—such as arrangements for participative design and implementation and inclusion of small items—such as solar water heaters to generate beneficiary interest and motivation—should be adopted as best practices. Similarly, overall management arrangements should also be adopted, but with the important modification of allowing adequate funding to go to the bureaus of Agriculture, Livestock, and Forestry in addition to Water Resources. This would allow greater transfer of a wider spectrum of ideas and technology to the upland communities about increasing their incomes and living standards while complying with local government directives to stop grazing livestock.

## **MAPS**

**Source of all maps: World Bank Cartography Unit, GSDPG**

