



# Technical Assistance Report

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Project Number: 46085  
Capacity Development Technical Assistance (CDTA)  
October 2012

People's Republic of China: Pilot Implementation of  
the Drought Management Strategy  
(Cofinanced by the Multi-Donor Trust Fund under  
the Water Financing Partnership Facility)

Asian Development Bank

## CURRENCY EQUIVALENTS

(as of 8 October 2012)

Currency unit	–	yuan (CNY)
CNY1.00	=	\$0.1580
\$1.00	=	CNY6.3304

## ABBREVIATIONS

ADB	–	Asian Development Bank
DWR	–	department of water resources
FCDRH	–	flood control and drought relief headquarters
MWR	–	Ministry of Water Resources
PRC	–	People's Republic of China
TA	–	technical assistance
TMO	–	technical assistance management office

## TECHNICAL ASSISTANCE CLASSIFICATION

Type	–	Capacity development technical assistance (CDTA)
Targeting classification	–	General intervention
Sector (subsector)	–	Agriculture and natural resources (water-based natural resources management)
Themes (subthemes)	–	<b>Economic growth</b> (promoting economic efficiency and enabling business environment), social development (disaster risk management), environmental sustainability (natural resources conservation), capacity development (institutional development)
Climate change	–	Adaptation
Location (impact)	–	National (high), rural (medium), urban (medium), regional (low)
Partnership	–	Multi-Donor Trust Fund under the Water Financing Partnership Facility (contributors: the governments of Australia, Austria, Norway, Spain, and Switzerland)

## NOTE

In this report, "\$" refers to US dollars.

<b>Vice-President</b>	S. Groff, Operations 2
<b>Director General</b>	R. Wihtol, East Asia Department (EARD)
<b>Director</b>	Y. L. Feng, Environment, Natural Resources, and Agriculture Division, EARD
<b>Team leader</b>	Y. Kobayashi, Senior Water Resources Specialist, EARD
<b>Team members</b>	B. Konysbayev, Senior Counsel, Office of the General Counsel Q. Zhang, Lead Water Resources Specialist, EARD

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## I. INTRODUCTION

1. During the 2011 country programming review mission, the Government of the People's Republic of China (PRC) requested capacity development technical assistance (TA) from the Asian Development Bank (ADB) for the pilot implementation of a drought management strategy.<sup>1</sup> In August 2012, a fact-finding mission visited the PRC and reached an understanding with the government on the TA project's impact, outcome, output, cost estimates and financing plan, implementation arrangements, and the consultants' terms of reference. The design and monitoring framework is in Appendix 1.

## II. ISSUES

2. The PRC has a long history of fatalities and property damage from floods and droughts. To establish a national flood management strategy and implement the strategy in the provinces, ADB provided the Ministry of Water Resources (MWR) with TA projects for the Flood Management Strategy Study<sup>2</sup> and for Implementing the National Flood Management Strategy.<sup>3</sup>

3. Regarding drought, the PRC faces intensifying pressure on water resources from continued economic development, population growth, urbanization, and climate change. Water scarcity is causing conflict and competition between water users, and relatively small changes in rainfall are having increasing large impacts on supply availability. Maintaining food security and social stability is very important in the PRC, and worsening drought and water scarcity affect both. From 2006 to 2011, droughts cost the PRC CNY54.6 billion–CNY150.9 billion per year in direct economic losses, amounting to 0.17%–0.46% of the gross domestic product. From 1950 to 2011, drought annually affected an average of 214,700 square kilometers of farmland, reducing grain production by an average of 16.2 million tons. From 1991 to 2011, droughts annually inflicted water shortages on an average of 27.8 million people.

4. About 60.7 million people experienced drinking water shortages during a severe drought in 2000 and 2001 that affected more than 620 cities and towns in 18 provinces, driving water supplies dangerously low, especially in large cities. The 2-year drought reduced grain production by 114.7 million tons, raising concerns about food security in the PRC. In 2006, the PRC again suffered a severe drought, inflicting water shortages to 35.8 million people and reducing grain production by 41.7 million tons. From 2009 to 2010, an unusually severe drought spread across an area of southwestern PRC as large as western Europe and forced 20 million people to line up for drinking water.

5. The national, provincial, and local governments have established their drought-management plans, guidelines, rules, and regulations, such as drought relief guidelines and emergency plans. The major shortcoming of these measures has been that drought-relief actions are generally passive responses to crises caused by droughts. Although the PRC has made remarkable strides toward coping with drought by building water conservation structures and irrigation systems, this approach can adversely affect water cycles, ecosystems, and the environment. Generally, as drought impacts become more severe, the traditional approach of using structural measures becomes less practical or economically feasible. Structural measures

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<sup>1</sup> The TA first appeared in the business opportunities section of ADB's website on 6 September 2012.

<sup>2</sup> ADB. 2006. *Technical Assistance to the People's Republic of China for the Flood Management Strategy Study*. Manila.

<sup>3</sup> ADB. 2007. *Technical Assistance to the People's Republic of China for Implementing the National Flood Management Strategy*. Manila.

cannot meet all requirements for drought management, and other measures such as drought monitoring, forecasting and warning, and water conservation have yet to be developed.

6. To systematically and comprehensively assess existing drought management and establish an integrated drought management strategy, ADB provided the MWR with TA for the Strategy for Drought Management.<sup>4</sup> This TA produced a national strategic framework for drought management and an action plan for implementing integrated drought management. Based on these TA outputs, the MWR prepared a national anti-drought plan that included a drought management strategy and an action plan.<sup>5</sup> Managing drought risk is the principle of this plan. A knowledge product on drought management incorporating lessons learned from the TA was published.<sup>6</sup>

7. The key recommendation of the TA was to shift from reactive emergency response to proactive risk management. To achieve this, the TA recommended that (i) flood control and drought relief headquarters (FCDRHs) take a leading role in proactive drought risk management, and (ii) FCDRHs undergo institutional and organizational reform and capacity development. During flood and drought emergencies, national and lower-level FCDRHs command operations, emergency responses, and post-disaster recovery. The national Office of the State FCDRH is located in the MWR. The offices of river basin FCDRHs are located in river basin commissions, provincial FCDRHs in provincial departments of water resources (DWRs), and city and county FCDRHs in city or county bureaus of water resources.

8. Following the recommendations of the TA, the government requested that a new TA be provided to pilot and develop tools for managing drought risk, strengthen the capacity of officials involved in drought management, prepare a detailed and tailored plan to manage drought risk for each pilot province, and prepare guidelines for implementing the national drought management strategy across the PRC. Gansu, Liaoning, and Sichuan will be the pilot provinces, as they have been seriously affected by drought and offer a range of locations that allow scaling up the piloted and developed models and methodologies.

9. The PRC's Twelfth Five-Year Plan, 2011–2015 supports the long-term goal of building a harmonious and moderately prosperous society through livelihood improvement and regionally balanced and environmentally sustainable growth. ADB's country partnership strategy, 2011–2015 for the PRC supports this social goal by focusing on three strategic pillars: inclusive growth, environmentally sustainable growth, and regional cooperation and integration.<sup>7</sup> As the TA will help the government implement the national drought management strategy, it aligns with the PRC's Twelfth Five-Year Plan and ADB's country partnership strategy to improve livelihoods and promote inclusive and environmentally sustainable growth. The TA aligns with the priorities of ADB's water policy by promoting a national focus on water sector reform and fostering the integrated management of water resources.<sup>8</sup> The TA is also consistent with the key pillar of ADB's Operational Plan for Sustainable Food Security in Asia and Pacific in improving the resilience of the agriculture and rural sectors against the impacts of climate change and associated climate variability and food price volatility.<sup>9</sup>

<sup>4</sup> ADB. 2009. *Technical Assistance to the People's Republic of China for Strategy for Drought Management*. Manila.

<sup>5</sup> MWR. *National Anti-Drought Plan*. Beijing.

<sup>6</sup> ADB. 2012. *Drying Up—What to Do about Droughts in the People's Republic of China: With a Case Study from Guiyang Municipality, Guizhou Province*. Manila.

<sup>7</sup> ADB. 2012. *Country Partnership Strategy: People's Republic of China, 2011–2015*. Manila.

<sup>8</sup> ADB. 2001. *Water for All: The Water Policy of the Asian Development Bank*. Manila.

<sup>9</sup> ADB. 2009. *Operation Plan for Sustainable Food Security in Asia and Pacific*. Manila.

### III. THE TECHNICAL ASSISTANCE

#### A. Impact and Outcome

10. The impact of the TA will be improved and sustained drought management in the PRC. The outcome of the TA will be changes in drought management from reactive emergency response to proactive risk management demonstrated in the three pilot provinces.

#### B. Methodology and Key Activities

11. The expected output of the TA will be strengthened capacity in FCDRHs in three pilot provinces to manage drought risk. Specifically, the TA will produce (i) tools for managing drought risk; (ii) a program of institutional and capacity development for managing drought risk and saving water, and an educational and public awareness program for water saving; (iii) a detailed and tailored plan for managing drought risk in each pilot province; and (iv) guidelines for implementing the national drought management strategy across the PRC.

12. The TA will be implemented over 18 months. To the end of the second month, consultants will (i) review past and ongoing national and provincial activities for managing drought risk and saving water, and assess their outcomes for inclusion in the pilots; (ii) survey staff of FCDRHs in national and other government administrations and staff of other agencies to assess their understanding of drought risk management; and (iii) survey water users in the three pilot provinces to assess their understanding of water saving and measures toward introducing water-saving mechanisms.

13. To the end of the ninth month, the consultants will (i) develop a mechanism to collect data for drought management, including agency cooperation; (ii) develop a comprehensive database for drought management in the three pilot provinces; (iii) establish methodologies for analyzing drought hazards and mapping drought risk by mapping the likelihood and severity of drought in the three pilot provinces; (iv) conduct scenario analyses in the three pilot provinces identifying priority areas for drought management with the greatest benefit, and establish a methodology for analysis; (v) develop a drought forecasting system; (vi) develop an early warning mechanism to guide decisions on water availability and control; and (vii) hold provincial workshops on these tools for managing drought risk.

14. To the end of the 16th month, the consultants will (i) prepare for agencies a program of institutional and capacity development for managing drought risk and saving water, as well as an educational and public awareness program for water users on saving water that considers the roles of FCDRHs in national and other government administrations and of other agencies in managing drought risk and saving water and how to spur cooperation between agencies; (ii) implement part of the institutional and capacity development program in the three pilot provinces; (iii) conduct an international study tour for the staff of the MWR and DWRs of the three pilot provinces; (iv) develop, based on pilot activities, a plan for managing drought risk that is tailored to the specific issues of each pilot province; (v) prepare guidelines for implementing drought risk management across the PRC; and (vi) hold national and provincial workshops on the institutional and capacity development program, the education and public awareness program, provincial plans for managing drought risk, and the drought risk management implementation guidelines.

### C. Cost and Financing

15. The TA is estimated to cost \$750,000, of which \$400,000 will be financed on a grant basis by ADB's Technical Assistance Special Fund (TASF-other sources); and \$200,000 equivalent will be financed on a grant basis by the Multi-Donor Trust Fund<sup>10</sup> under the Water Financing Partnership Facility, and will be administered by ADB. Funding from the Multi-Donor Trust Fund will be used for specific activities shown in Appendix 2.

16. The government will provide counterpart support in the form of office accommodation; domestic transportation, remuneration, and per diem for counterpart staff; and other in-kind contributions. The detailed cost estimates and financing plan are in Appendix 2.

### D. Implementation Arrangements

17. The MWR, including the national Office of the State FCDRH, will be the executing agency for the TA. The MWR is responsible for administering water resources throughout the PRC and has shown strong capacity to execute ADB-assisted projects, such as the Yellow River Flood Management Sector Project,<sup>11</sup> the Flood Management Strategy Study (footnote 2), Implementing the National Flood Management Strategy (footnote 3), and the Strategy for Drought Management (footnote 4). The respective DWRs, including the FCDRH offices of the three pilot provinces—Gansu, Liaoning, and Sichuan—will be the implementing agencies.

18. A TA management office (TMO) will be established in the MWR to administer the day-to-day activities of the TA and coordinate with ADB and the three pilot provinces. A TA implementation office will be established in each DWR. The MWR and DWRs will assign experienced full-time staff to serve as the directors of the TMO and the TA implementation offices, as well as counterpart staff to work closely with TA consultants. The MWR and DWRs will provide office space, access to communications and copiers, and logistical support for TA implementation. The director of the TMO will manage and liquidate funds provided by ADB and the government for training, seminars, and conferences.

19. A steering committee will be established under the MWR to guide TA implementation. The steering committee members will be senior representatives of the MWR, including the national Office of the State FCDRH; the DWRs, including the FCDRH offices of the three pilot provinces; and other agencies of the three pilot provinces, including the departments of agriculture, housing and urban–rural development, and meteorology. The steering committee will meet at the inception, interim, midterm, and final stages of TA implementation and when important outputs of the TA are produced.

20. The TA will be implemented over 18 months, tentatively starting on 8 January 2013 and ending on 11 July 2014. Substantial time will be devoted to surveys, fieldwork, workshops, and capacity development. The consultants will submit an inception report within 4 weeks of TA commencement and an interim report 9 months after TA commencement. A draft final report will be submitted 16 months after TA commencement, and a final report at TA conclusion. The inception, interim, and draft final reports will be subject to review by ADB and the government.

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<sup>10</sup> Contributors: the governments of Australia, Austria, Norway, Spain, and Switzerland.

<sup>11</sup> ADB. 2001. *Report and Recommendation of the President to the Board of Directors on a Proposed Loan and Technical Assistance Grant to the People's Republic of China for the Yellow River Flood Management (Sector) Project*. Manila.

All reports will be written in English and translated into Chinese. The outline terms of reference for consultants are in Appendix 3.

21. The TA will be carried out by a team of consultants, engaged through a firm, providing 10.0 person-months of international consultancy and 24.5 person-months of national. ADB will engage the consultants following its Guidelines on the Use of Consultants (2010, as amended from time to time). The consulting firm will be selected using simplified technical proposals and quality- and cost-based selection with a quality–cost weighting ratio of 80:20. Equipment for TA consultants will be procured following ADB's Procurement Guidelines (2010, as amended from time to time) and handed over to the MWR upon TA completion. Disbursement under the TA will be in line with ADB's *Technical Assistance Disbursement Handbook* (2010, as amended from time to time). Advance payment facilities will be established to facilitate timely TA implementation. ADB funds for training, seminars, and conferences will be transferred to an existing MWR bank account and managed and liquidated by the director of the TMO. ADB will undertake intensive review and supervision by fielding missions at critical stages of TA implementation—particularly inception, midterm, and final—and by extending regular support from ADB headquarters and the PRC Resident Mission.

#### **IV. THE PRESIDENT'S DECISION**

22. The President, acting under the authority delegated by the Board, has approved (i) ADB administering a portion of technical assistance not exceeding the equivalent of \$200,000 to be financed on a grant basis by the Multi-Donor Trust Fund under the Water Financing Partnership Facility; and (ii) ADB providing technical assistance for the balance not exceeding the equivalent of \$400,000 on a grant basis to the Government of the People's Republic of China for the Pilot Implementation of the Drought Management Strategy, and hereby reports this action to the Board.

### DESIGN AND MONITORING FRAMEWORK

Design Summary	Performance Targets and Indicators with Baselines <sup>a</sup>	Data Sources and Reporting Mechanisms	Assumptions and Risks
<b>Impact</b> Improved and sustained drought management in the PRC	Drought risk management strategy implemented in at least 15 drought-prone provinces by 2020  The number of people threatened by water shortage decreased by 30% by 2020 as compared with 2012  Grain production reduction due to drought decreased by 30% by 2020 as compared with 2012	FCDRH and MWR documents and/or reports such as the Bulletin of Flood and Drought Disaster in China  Provincial documents and/or reports	<b>Assumptions</b> The process of changing drought management is well supported by FCDRHs, the MWR, and related agencies with continuous basic research and necessary funding.  The outcome of the pilots is incorporated as lessons into the ongoing process of changing drought management.
<b>Outcome</b> Changes in drought management from reactive emergency response to proactive risk management demonstrated in the three pilot provinces	Tools for managing drought risk used in the three pilot provinces by 2014  A plan for managing drought risk approved and implemented in each of the three pilot provinces by 2014	FCDRH and MWR documents and/or reports  Documents and/or reports of the three pilot provinces	<b>Assumption</b> The outputs of the TA are well supported by FCDRHs, the MWR, the three pilot provinces, and other agencies.
<b>Output</b> Strengthened capacity in FCDRHs in three pilot provinces to manage drought risk	Tools for managing drought risk developed and adopted by 2013  A program for agencies on institutional and capacity development for managing drought risk and saving water prepared and adopted by 2013  An educational and public awareness program for water users on saving water prepared and adopted by 2013  A plan for managing drought risk prepared for and adopted by each of the three pilot provinces by 2014	FCDRH and MWR documents and/or reports  Documents and/or reports of the three pilot province	<b>Assumptions</b> The MWR and the governments of the three pilot provinces maintain sufficient numbers of dedicated staff with the required qualifications for the TA.  Necessary information is available on time.  All geographic sites are accessible without any government restrictions.  <b>Risk</b> Provision for staff inputs to the pilot activities is not included in the annual budgets or planned programs of



Design Summary	Performance Targets and Indicators with Baselines <sup>a</sup>	Data Sources and Reporting Mechanisms	Assumptions and Risks
	Guidelines for implementing drought risk management across the PRC prepared and adopted by 2014		the three pilot provinces.
Activities with Milestones		Inputs	
1. Basic surveys 1.1 Review past and ongoing national and provincial activities for managing drought risk and saving water, and assess the outcome for inclusion in the pilots by month 1 1.2 Survey staff of FCDRHs of national and other government administrations and of other agencies to assess their understanding of drought risk management by month 2 1.3 Undertake water user surveys in the three pilot provinces to assess their understanding of water saving and measures for introducing water-saving mechanisms by month 2 2. Tools for managing drought risk 2.1 Develop a mechanism to collect data for drought management, including agency cooperation by month 3 2.2 Develop a comprehensive database for drought management in the three pilot provinces by month 5 2.3 Establish methodologies for analyzing drought hazard and mapping drought risk by mapping the likelihood and severity of drought in the three pilot provinces by month 6 2.4 Conduct scenario analyses in the three pilot provinces, identifying priority areas for drought management with the greatest benefit, and establish a methodology for analysis by month 7 2.5 Develop a drought forecasting system by month 8 2.6 Develop an early warning mechanism to guide decisions on water availability and control by month 9 2.7 Hold provincial workshops on tools for managing drought risk by month 9 3. A program on institutional and capacity development and an educational and public awareness program 3.1 Define the roles of FCDRHs in national and other government administrations and of other agencies for managing drought risk and saving water by month 10 3.2 Identify how to spur cooperation between agencies for managing drought risk and saving water by month 10 3.3 Prepare a program for agencies on institutional and capacity development for managing drought risk and saving water, and an educational and public awareness program for water users on saving water by month 11		<b>ADB: \$400,000</b>	
		<b>Item</b>	<b>Amount (\$'000)</b>
		Consulting services, 22.5 person-months	292.00
		International and local travel	18.00
		Reports, communications, and translation	5.70
		Equipment	6.00
		Training, seminars, and conferences	45.00
		Surveys	8.80
		Miscellaneous administration and support costs	4.00
		Contingencies	20.50
		<b>Multi-Donor Trust Fund under the Water Financing Partnership Facility:<sup>b</sup> \$200,000</b>	
		<b>Item</b>	<b>Amount (\$'000)</b>
		Consulting services, 12.0 person-months	142.20
		International and local travel	15.70
		Reports, communications, and translation	4.00
		Equipment	6.00
		Training, seminars, and conferences	15.00
		Surveys	3.10

Activities with Milestones	Inputs
3.4 Implement part of the institutional and capacity development program in the three pilot provinces by month 13	Miscellaneous administration and support costs 4.00
3.5 Conduct an international study tour for the staff of the MWR and the departments of water resources of the three pilot provinces by month 13	Contingencies 10.00
	<b>Total: \$600,000</b>
4. A plan for managing drought risk in each pilot province 4.1 Develop a plan for managing drought risk in each pilot province based on pilot activities that is tailored to address the specific issues in each province by month 14 5. Guidelines for implementing drought risk management across the PRC 5.1 Prepare guidelines for implementing drought risk management across the PRC by month 15 6. Final workshops 6.1 Hold national and provincial workshops on the institutional and capacity development program, the education and public awareness program, the provincial plans for managing drought risk, and the drought risk management implementation guidelines by month 16	Note: The government will provide counterpart support in the form of office accommodation; domestic transportation, remuneration, and per diem for counterpart staff; and other in-kind contributions.

ADB = Asian Development Bank, FCDRH = flood control and drought relief headquarters, MWR = Ministry of Water Resources, PRC = People's Republic of China, TA = technical assistance.

<sup>a</sup> Baselines will be established at the beginning of TA implementation.

<sup>b</sup> Contributors: the governments of Australia, Austria, Norway, Spain, and Switzerland. Administered by ADB.

Sources: Asian Development Bank.

**COST ESTIMATES AND FINANCING PLAN**  
(\$'000)

Item	Total Cost
<b>A. Asian Development Bank<sup>a</sup></b>	
1. Consultants	
a. Remuneration and per diem	
i. International consultants	135.80
ii. National consultants	156.20
b. International and local travel	18.00
c. Reports and communications	5.70
2. Equipment <sup>b</sup>	6.00
3. Training, seminars, and conferences	
a. Facilitators	9.00
b. Training program	36.00
4. Surveys	8.80
5. Miscellaneous administration and support costs	4.00
6. Contingencies	20.50
<b>Subtotal (A)</b>	<b>400.00</b>
<b>B. Multi-Donor Trust Fund under the Water Financing Partnership Facility<sup>c</sup></b>	
1. Consultants	
a. Remuneration and per diem	
i. International consultants	60.20
ii. National consultants	82.00
b. International and local travel	15.70
c. Reports and communications	4.00
2. Equipment <sup>b</sup>	6.00
3. Training, seminars, and conferences	
a. Facilitators	3.00
b. Training program	12.00
4. Surveys	3.10
5. Miscellaneous administration and support costs	4.00
6. Contingencies	10.00
<b>Subtotal (B)</b>	<b>200.00</b>
<b>Total</b>	<b>600.00</b>

Note: The technical assistance is estimated to cost \$750,000, of which contributions from the Asian Development Bank and the Multi-Donor Trust Fund under the Water Financing Partnership Facility are presented in the table above. The government will provide counterpart support in the form of office accommodation; domestic transportation, remuneration, and per diem for counterpart staff; and other in-kind contributions. The value of government contribution is estimated to account for 20% of the total TA cost. Funding from the Multi-Donor Trust Fund will be utilized first on a front-loading basis.

<sup>a</sup> Financed by the Asian Development Bank's Technical Assistance Special Fund (TASF-other sources).

<sup>b</sup> Equipment as shown below:

Type	Quantity	Cost (\$)
Office computers with wireless broadband internet access	5	9,500
Printer (1), facsimile machine (1), digital cameras (2), and other small peripherals (1)	5	2,500

<sup>c</sup> Contributors: the governments of Australia, Austria, Norway, Spain, and Switzerland. Administered by the Asian Development Bank.

Source: Asian Development Bank estimates.

## **OUTLINE TERMS OF REFERENCE FOR CONSULTANTS**

### **A. Background**

1. To systematically and comprehensively assess existing drought management and establish an integrated drought management strategy, the Asian Development Bank (ADB) provided the Ministry of Water Resources (MWR) with capacity development technical assistance (TA) for the Strategy for Drought Management. The key recommendation of this TA was to shift from reactive emergency response to proactive risk management. Based on the outputs of the TA, the MWR prepared a national anti-drought plan that included a drought management strategy and an action plan. Managing drought risk is the principle of this plan.

2. Following the recommendations of the TA, the government requested that a new TA be provided to pilot and develop tools for managing drought risk, strengthen the capacity of officials involved in drought management, prepare a detailed and tailored plan to manage drought risk for each pilot province, and prepare guidelines for implementing the national drought management strategy across the People's Republic of China (PRC). Gansu, Liaoning, and Sichuan will be the pilot provinces, as they have been seriously affected by drought and offer a range of locations that allow scaling up the piloted and developed models and methodologies.

### **B. Reporting Requirements**

3. The consultants will submit an inception report within 4 weeks of TA commencement, an interim report 9 months after TA commencement, a draft final report 16 months after TA commencement, and a final report at TA conclusion.

4. The inception, interim, and draft final reports will be subject to review by ADB and the government. All reports will be written in English and translated into Chinese. Five copies of each report in English will be submitted to ADB, and five copies in both Chinese and English will be submitted to the MWR.

5. The inception report will present an approach for the TA, including a work plan and an implementation schedule. The interim report will present (i) past and ongoing international, national, and provincial activities for managing drought risk and saving water and assessment of the outcome for inclusion in the pilots; (ii) the results of surveys of staff of the flood control and drought relief headquarters (FCDRHs) of the national and other government administrations and of other relevant agencies, including assessment of their understanding of drought risk management; (iii) the results of water user surveys in the three pilot provinces, including the assessment of their understanding of water saving and measures for introducing water-saving mechanisms; (iv) a mechanism to collect data for drought management, including agency cooperation; (v) the development of a comprehensive database for drought management in the three pilot provinces; (vi) methodologies for analyzing drought hazard and mapping drought risk; (vii) scenario analyses of the three pilot provinces identifying priority areas for drought management with the greatest benefit, and a methodology for analysis; (viii) the development of a drought forecasting system; and (ix) the development of an early warning mechanism to guide decisions on water availability and control.

6. The draft final report will cover (i) the contents of the interim report; (ii) the roles of the FCDRHs in national and other government administrations and of other agencies in managing drought risk and saving water and how to spur cooperation; (iii) a program for agencies on institutional and capacity development for managing drought risk and saving water; (iv) a summary and the results of implementation of part of the institutional and capacity development

program in the three pilot provinces; (v) an educational and public awareness program for water users on saving water; (vi) a summary and the results of an international study tour for the staff of the MWR and the departments of water resources (DWRs) of the three pilot provinces; (vii) a plan for managing drought risk based on pilot activities that is tailored to address the specific issues in each pilot province; and (viii) guidelines for implementing drought risk management across the PRC. The final report will reflect comments made by ADB and the government.

## **C. Terms of Reference**

### **1. International Consultants**

**7. Drought risk management specialist and team leader** (6 person-months). The specialist will have a bachelor's or higher degree, or equivalent qualification, in water resource management or a related field and at least 15 years of work experience in drought management. Experience in conducting projects as a team leader will be highly regarded. The specialist will have substantive and administrative responsibility for the effective and timely implementation of the TA and for the quality and consistency of all TA outputs. The specialist will also lead in formulating and developing TA outputs by coordinating all TA activities, ensuring and coordinating stakeholder participation, coordinating and consolidating the inputs of government agencies and other specialists, and appropriately managing other specialists. The specialist will ensure that all consultants work closely together so that all individual output components are well integrated and complement one another. Specifically, the specialist will do the following:

- (i) Review past and ongoing national and provincial activities for managing drought risk, and assess the outcome for inclusion in the pilots.
- (ii) Establish baselines for performance targets and indicators specified in the design and monitoring framework of the TA.
- (iii) Together with the national capacity development specialist, survey staff of the FCDRHs in national and other government administrations; the MWR and its surrogate institutions at other tiers of government administration, such as provincial DWRs; and other agencies to assess their understanding of drought risk management and how to use this approach.
- (iv) Develop a mechanism to collect data for drought management, including agency cooperation.
- (v) Provide the national software specialist with requirements for (a) a comprehensive database for drought management in the three pilot provinces, including necessary meteorological data, remote-sensing data, satellite data, geographical information system data, and land and water resources data; (b) software to map the likelihood and severity of drought and conduct scenario analyses in the three pilot provinces based on historical data, changing weather patterns, and changing local conditions such as population, water storage, grazing intensity, and landscape; and (c) software to forecast droughts by monitoring climatic conditions, including climate change impacts such as declining rainfall patterns, soil moisture, and stored water in the three pilot provinces.
- (vi) Establish methodologies for analyzing drought hazard and mapping drought risk by mapping the likelihood and severity of drought in the three pilot provinces.
- (vii) Conduct scenario analyses in the three pilot provinces identifying priority areas for drought management with the greatest benefit, and establish a methodology for analysis.

- (viii) Develop an early warning mechanism to guide decisions at the start of, during, and after a drought on water availability and control defining the roles of the FCDRHs in national and other government administrations; the MWR and its surrogate institutions at other tiers of government administration, such as provincial DWRs; and other agencies.
- (ix) Define roles of FCDRHs in national and other government administrations; the MWR and its surrogate institutions at other tiers of government administration, such as provincial DWRs; and other agencies in drought management, particularly drought risk management.
- (x) Identify how to spur cooperation between agencies for drought management, particularly drought risk management.
- (xi) Together with the national capacity development specialist, prepare a program for agencies on institutional and capacity development for managing drought risk.
- (xii) Together with the national capacity development specialist, implement part of the institutional and capacity development program.
- (xiii) Organize and conduct an international study tour for staff of the MWR and the DWRs of the three pilot provinces.
- (xiv) Strengthen the capacity for managing drought risk of officials of national and pilot province FCDRHs and other national and provincial agencies, as necessary, by implementing part of the institutional and capacity development program, including seminars, workshops, and/or training; through the international study tour; and through on-the-job training in the course of preparing a plan for managing drought risk in each pilot province.
- (xv) Develop, together with the staff of the FCDRHs and of other agencies in each pilot province, a plan for managing drought risk in the province based on pilot activities, which is tailored to address the specific issues in the province.
- (xvi) Prepare guidelines for implementing drought risk management across the PRC.
- (xvii) Prepare inception, interim, draft final, and final reports.

8. **Water saving specialist** (4 person-months). The specialist will have a bachelor's or higher degree, or equivalent qualification, in water resource management or a related field and at least 10 years of work experience in saving water and managing water demand. The specialist will do the following:

- (i) Review past and ongoing national and provincial activities for saving water and assess the outcome for inclusion in the pilots.
- (ii) Together with the national capacity development specialist, survey staff of the FCDRHs in national and other government administrations; the MWR and its surrogate institutions at other tiers of government administration, such as provincial DWRs; and other agencies to assess their understanding of water saving.
- (iii) Assess measures for introducing water-saving mechanisms, such as education and awareness raising, water pricing, and wastewater recycling.
- (iv) Define the roles of the FCDRHs in national and other government administrations; the MWR and its surrogate institutions at other tiers of government administration, such as provincial DWRs; and other agencies in water saving.
- (v) Identify how to spur cooperation between agencies for water saving.
- (vi) Together with the national capacity development specialist, prepare a program for agencies on institutional and capacity development for saving water and an educational and public awareness program for water users on saving water.

- (vii) Together with the national capacity development specialist, implement part of the institutional and capacity development program.
- (viii) Assist the international drought risk management specialist and team leader in organizing and conducting an international study tour for the staff of the MWR and the DWRs of the three pilot provinces.
- (ix) Strengthen the capacity for saving water of officials of national and provincial FCDRHs and other national and provincial agencies, as necessary, by implementing part of the institutional and capacity development program, including seminars, workshops, and/or training; through the international study tour; and through on-the-job training in the course of preparing a plan for managing drought risk in each pilot province.
- (x) Provide inputs to the plans for managing drought risk in the pilot provinces; the guidelines for implementing drought risk management across the PRC; and the inception, interim, draft final, and final reports.
- (xi) Undertake any other work assigned by the team leader.

## 2. National Consultants

9. **Drought risk management specialist and deputy team leader** (9 person-months). The specialist will have a bachelor's or higher degree, or equivalent qualification, in water resource management or a related field and at least 10 years of work experience in drought management. The specialist will assist the international drought risk management specialist and team leader in accomplishing the tasks described in para. 7. The specialist will also undertake any other work assigned by the team leader.

10. **Water saving specialist** (6 person-months). The specialist will have a bachelor's or higher degree, or equivalent qualification, in water resource management or a related field and at least 7 years of work experience in saving water and managing water demand. The specialist will assist the international water saving and demand management specialist in accomplishing the tasks described in para. 8. The specialist will also undertake any other work assigned by the team leader.

11. **Economic and financial specialist** (1.5 person-months). The specialist will have a bachelor's or higher degree, or equivalent qualification, in economics or finance and at least 7 years of work experience in economic and financial analysis. The specialist will do the following:

- (i) Assist the international drought risk management specialist and team leader in conducting scenario analysis in the three pilot provinces by comparing the financial sustainability of alternative scenarios.
- (ii) Provide inputs to the plans for managing drought risk in the pilot provinces, including financing plans.
- (iii) Provide inputs to the inception, interim, draft final, and final reports.
- (iv) Undertake any other work assigned by the team leader.

12. **Software specialist** (3.5 person-months). The specialist will have a bachelor's or higher degree, or equivalent qualification, in computer programming and modeling, software development, or other related field and at least 7 years of work experience in software development. The specialist will do the following:

- (i) Develop a comprehensive database for drought management in the three pilot provinces, including necessary meteorological data, remote-sensing data, satellite data, geographical information system data, and land and water resources data, fulfilling requirements provided by the international and national

- drought risk management specialists, as well as preparing a users' guide.
- (ii) Develop software to map the likelihood and severity of drought and conduct scenario analyses in the three pilot provinces based on historical data, changing weather patterns, and changing local conditions such as population, water storage, grazing intensity, and terrain, fulfilling the requirements provided by the international and national drought risk management specialists and preparing a users' guide.
- (iii) Develop software to forecast droughts by monitoring climatic conditions, including climate change impacts such as declining rainfall patterns, soil moisture, and stored water in the three pilot provinces, fulfilling requirements provided by the international and national drought risk management specialists, and preparing a users' guide.
- (iv) Provide inputs to the inception, interim, draft final, and final reports.
- (v) Undertake any other work assigned by the team leader.

13. **Capacity development specialist** (4.5 person-months). The specialist will have a bachelor's or higher degree, or equivalent qualification, in human resources and institutional studies or related fields and at least 7 years of work experience in capacity development for water resource management. The specialist will do the following:

- (i) Together with the drought risk management specialists, survey staff of the FCDRHs of the national and other government administrations; the MWR and its surrogate institutions at other tiers of government administration, such as provincial DWRs; and other agencies to assess their understanding of drought risk management and how to use this approach.
- (ii) Together with the water saving specialists, survey staff of the national and other FCDRHs; the MWR and its surrogate institutions at other tiers of government administration, such as provincial DWRs; and other agencies to assess their understanding of water saving.
- (iii) Together with the drought risk management specialists and water saving specialists, prepare a program for agencies on institutional and capacity development for managing drought risk and saving water, as well as an educational and public awareness program for water users on saving water.
- (iv) Plan, design, organize, and implement seminars, workshops, and/or training based on the institutional and capacity development program in the three pilot provinces.
- (v) Assist the international drought risk management specialist and team leader in organizing and conducting an international study tour for the staff of the MWR and the DWRs of the three pilot provinces.
- (vi) Provide inputs to the plans for managing drought risk in the pilot provinces; the guidelines for implementing drought risk management across the PRC; and the inception, interim, draft final, and final reports.
- (vii) Undertake any other work assigned by the team leader.