

Ministry of Water Resources  
2. Lane 2, Baiguang Road  
100053  
Beijing

# **Water Resources Demand Management Assistance Project**

## **Monitoring and Evaluation Report**

### **Nr 4 : May 2010**

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## Summary

This is the final Monitoring & Evaluation (M&E) report related to the Water Resources Demand Management Assistance Project (WRDMAP). Most information is derived from a KAP (**K**nowledge, **A**ttitude and **P**ractice) survey, discussions at the CPMO Level, information from the Six Month Project Progress Reports, and feedback from the final conferences of the Central Case Study. The final year of the project was devoted largely to synthesizing the findings of the provincial case studies with international best practice and consultations at central level in order to provide guidance for improved water resource management nationally.

A more comprehensive analysis of the achievements and conclusions of the provincial case studies was presented in the 2009 M&E report. Very positive achievements have been demonstrated, with encouraging feedback particularly related to technologically based capacity building activities. This has clearly been a successful route for the introduction of the concepts and messages associated with integrated water resources management (IWRM) and water resources demand management (WRDM). Major achievements included many aspects of

- water resources modelling and GIS.
- groundwater monitoring and the understanding of groundwater management
- inter-sectoral co-operation through data sharing,
- establishing a working relationship between the Environmental Protection Bureau (EPB) and the Water Affairs Bureau (WAB)
- increased stakeholder consultation and participation in improving water resources management
- water saving activities through the pilot demonstration areas in Gansu and Liaoning
- support to WUAs In the context of water saving in agriculture
- issue of water rights, water abstraction permits and water allocation
- conjunctive use of surface water and groundwater in the water stressed area of Minqin County.
- Drought management planning in Chaoyang in Liaoning Province
- use of economic instruments

These achievements provided a good basis for development of the messages for the dissemination programme of the Central Case Study.

The major activity at the Central Case Study Level was the preparation of two overview documents (integrated water resources management and water demand management.) and 73 Thematic Papers and Advisory Notes related to current Chinese Practices, International Best Practices and recommendations for selected aspects of integrated water resources management (Table S.1). On the basis of these documents a team led by Tsinghua University has prepared a series of three books on water demand management, which should enhance local 'ownership' of the outputs.

Table S.1 CCS guidance documentation

IWRM Instrument (After GWP)	Thematic Papers	Advisory Notes	Examples	Manuals
1 – Water resource assessment [14]	5	8	1	0
2 – IWRM [20]	6	8	5	1
3 – Demand management [9]	3	5	0	1
4 – Administrative regulation [3]	2	0	1	0
5 – Economic regulation [9]	2	3	3	1
6 – Social change [12]	2	8	2	0
7 – Conflict resolution [3]	1	1	1	0
8 – Information exchange [3]	1	2	0	0
TOTAL [73]	22	35	13	3

These documents were presented at a series of nine Conferences which were attended by representatives from all mainland provinces of China. The responses of participants to the material presented was assessed through a questionnaire distributed at the end of each conference. The findings are summarised in Table S.1, and indicates that an overwhelming number believed that they had learnt something new and useful and would welcome a series of guidance documents on the topic. The combination of a rigorous theoretical approach and detailed factual experiences from the provincial case studies and international best practice was evidently appreciated by the participants and did much to help make the conclusions acceptable.

Table S.2 Feedback from dissemination conference series

	WDM (general+urban)	WRA modelling	WQ+collaboration	GW management	Climate change	IWRM	Rural WDM	WAPs/WRFs	Environment	Total	Percent
Date	04 Mar	18 Mar	19 Mar	29 Mar	15 Apr	11 May	12 May	19 May	20 May		
Nos Participants	79	38	41	65	47	72	72	61		475	
Nos Provinces represented	23	23	23	23	30	16	16	17		31	97%
Nos central level participants	17	6	6	4	8	16	16	3		76	16%
Nos forms completed	27	0	17	31	32	28	10	16		161	34%
Heard about topic before	27		11	23	29	27	10	12	Combined feedback for 19/20 May	139	86%
Now have better understanding	27		17	29	32	27	10	14		156	97%
Learnt new ideas of interest	27		17	30	32	27	10	15		158	98%
Believe more attention required.	27		17	24	32	27	10	16		153	95%
Are you responsible already	27		10	22	17	21	6	12		115	71%
Do you intend to do more	26		17	29	31	28	9	15		155	96%
Will convey messages to others	26		17	30	32	27	10	15		157	98%
Would like guidance documents	24		16	29	32	27	10	16		154	96%

It was also indicated that the attendees themselves would continue the dissemination process when they returned to their 'home offices'.

On the basis of the findings of this final monitoring and evaluation study, several recommendations have been made for use of the project outputs and ensuring the sustainable application of the approaches recommended by project.

- The CCS documentation should continue to be disseminated widely and their use encouraged, particularly at Province, Municipality and County levels.
- Wherever advanced techniques, computer applications, etc related to water resources management are introduced, as was done during the project, sufficient time and resources are allocated for capacity-building in the use of these techniques. Training material prepared under the project should be used and adapted as needed
- Where pilot projects are set up, they should be used as a basis for dissemination of practical applications
- There should continue to be rigorous assessment of the true implications of all new management measures, in terms of the resources (and incentives) needed to implement. Procedures should continue to be simplified and adapted to suit requirements, but without compromising the core objectives.
- A lot of material was produced initially by international consultants and then translated and adapted by national consultants. It is possible that the key messages could be presented in interesting or informative ways.
- Continued adaptation and updating of some of the CCS documents as needed. This must be driven by the Ministry of Water Resources, and is likely to increase the acceptability and usefulness of the documents. The use of a well designed web-site is recommended as the main route for dissemination and for keeping the materials accessible and up-to-date.

Overall, the sources of information indicate that project has largely achieved its objectives, within the constraints of what is possible in an individual 'project'. The activities were closely aligned with national priorities in the water sector and the outputs should continue to be of value, particularly if they are adapted and update by MWR.

## **1 Introduction**

This Monitoring and Evaluation Report, Number 4, largely follows the outline of the earlier Monitoring and Evaluation Reports Numbers 1, 2 and 3 of March 2007, March 2008 and March 2009. This report has been primarily put together by staff of the CPMO supported by local consultants, with advice from the ATL, International Case Study Leader for Gansu Province and the international consultant Monitoring & Evaluation Specialist. With reduced M&E staff available at the CRMO level, the report has been initially drafted by the international M&E consultant, who also carried out some KAP type survey questionnaires.

As discussed in the 'M&E Implementation Manual' of June 2006, measurement of achievement of the project goal is beyond the scope of project M&E, it relates to events or situations outside the scope of the individual case studies. This report however does mention some 'contributions to project goal' that may result from project interventions. The main areas being addressed by M&E are thus at the output level with consideration being given to project purpose, especially in the context of capacity building.

## **2 Progress towards Project Objectives**

### **2.1 Project Goal of Improved Livelihoods**

The Project Memorandum and the logical framework state that the goal of this project is to “*improve livelihoods through equitable access and sustainable use of water resources, particularly for poor women and men is to be achieved*”. However it is impossible to measure improved livelihoods resulting specifically from changed water use – not only are there many other factors that contribute substantially to livelihoods (markets, agricultural technologies, weather and the environment, of-farm incomes etc.), but impacts of water use on livelihoods and poverty are not measurable within the relatively short timeframe of the project.

This was recognised in the logframe and the goal level indicator was set at the policy level: “*China continues to progress towards MDG target of incorporating IWRM principles into government policy by 2005*”. In this regards considerable progress has been made through the widespread promotion of the idea of a “water saving society” through new laws and other initiatives that aim to ensure more rational and sustainable use of finite water resources.

### **2.2 Project Purpose of IWRM**

The purpose (immediate objective) of the project, as stated in the log frame, is “*Replicable integrated water resources management approaches and methods for implementation of the Water Law that respond to stakeholder and beneficiary demands developed. Approaches are to be tested, documented and promoted as best practices nationwide*”.

The log frame indicators for the purpose are:

- (a) IWRM policies and tools applied at all levels of government; and
- (b) improvement in water-related poverty and livelihoods over time.

The sections below describe how IWRM policies and tools have been applied and how the project has contributed to the application of these tools. Apart from IWRM a key aspect of the project is the development and establishment of Water Resources Demand Management (WRDM) principles and practices at different administrative/ operational levels of the water resources management system.

IWRM and WDM have been accepted as national policy, and are now being applied at all levels. Documentation has been prepared through the project which assists in the implementation of this policy, and supports the national strategy for water savings society. The IWRM planning processes recommended through the project support the comprehensive planning requirements of the water law.

It is not possible to measure changes in water-related poverty within the period of this project, and within the context of the case studies (which focus on water management institutions rather than water users). However, it has been possible to identify positive and negative social impacts which might arise from the water resources are managed. The IWRM planning process introduced through the project has identified the major social and poverty related impacts and given guidance for maximising positive impacts and mitigating or compensating for any negative impacts.

In this context it is of interest to quote elements from the speech of Minister, Mr Chen Lei, at the ‘Ministry of Water Resources Annual Conference’ held on 14<sup>th</sup> of February 2009. The title of the speech being ‘*To implement the strictest water resources management system and guarantee sustainable socio-economic development*’. This reflects many of the objectives of WRDMAP.

The speech makes reference to the directives being provided by others including Premier Wen Jiabao (*advocating water price reform*) and Premier Hui Liangyu (*improved water resources management overall incorporating optimised distribution, effective protection of water resources through an integrated water resources management system combining and coordinating with the whole river basin and administrative divisions, urban and rural areas through exploration/utilization and saving/protection*).

Some of the main recommendations in the speech of Mr Chen Lei (the 6 Transitions) for improved water resources management being:

- Change quickly from water supply management to water demand management;
- Focus on conservation rather than new source development;
- Change quickly from treatment and recovery to pollution prevention (change from reactive management to proactive);
- Accelerate transition from unstructured and unplanned development to rational and ordered development (through improved and effective planning)
- Accelerate transition from ‘extensive utilisation’ to ‘effective utilisation of water resources’;
- Accelerate the transformation from ‘administrative (water resources) management’ to ‘integrated (water resources) management’.

These all relate to the endeavours of WRDMAP.

In terms of achieving these objectives the speech also states:

*“As the development of society and the economy takes place, significant changes of water resources conditions can occur requiring new targets and measures together with new methods of water resources management. We must emancipate our minds, reform and innovate, set advanced management concepts, innovate ways and methods of management, enhance scientific and technological support, improve management measures and methods, make great efforts to address institutional obstacles that constrain sustainable utilization of water resources, set a modern water resources management system with sound institutions, rational mechanisms and an all-inclusive legal system thereby creating a new water resources management model with Chinese characteristics”.*

## **2.3 Conclusions**

The aims and objectives of WRDMAP as well as the capacity building route reflect the content of the Minister’s speech (in total 24 pages) and the current top level thinking about water resources management improvement requirements.

It is hoped that based on the experiences of the various case studies, the various studies on current water management practices in China and the addition of international best practice, the project, through the activities of the Central Case Study can help achieve the goals as stated in the speech.

It should be noted that the Minister's speech referred to the new water resources management interventions being put in place in the Shiyang and the Daling River Basins.

With respect to the log frame indicators for the project purpose, the project has been clearly making progress. There is a good awareness of the aims, objectives and activities of the project from the water management station level, through district, county, municipality, province and up to the highest levels of the Ministry of Water Resources. The project messages related to IWRM and Water Resources Demand Management have also been disseminated more widely through a series of nine conferences at central level, to which participants from all mainland Provinces and Autonomous Regions (except Xizang AR) have been present. A series of 73 advisory booklets on key aspects of IWRM and WDM were distributed at these conferences. These conferences stimulated considerable debate and discussion and provided additional feedback which could be incorporated in the guidance booklets. These conferences followed on from those held in Lanzhou and Shenyang at which the completion reports for the provincial case studies were presented, and the conclusions and lessons arising from these case studies were disseminated to a wider audience within the province. Representatives of the Ministry of Water Resources and the Department of Water Resources of Liaoning Province presented the progress and current conclusions of the project in two separate sessions at the Yellow River Forum held in Zhengzhou in October 2009.

The process of building national ownership of case study results and technical guidelines has been strengthened with the introduction of experts of **Institute of Hydrology & Water Resources**, School of Civil Engineering, Tsinghua University and the **Institute of Science Communication, Beijing**. The organisations have a specific brief to strengthen the Chinese versions of the CCS documentation programme and possibly reformat these to the specific requirements of the Ministry and the audiences the Ministry wish to target with dissemination messages and material. This should ensure that material originating in WRDMAP reaches the widest possible audience, so enhancing the impact of the project.

### 3 Progress towards Case Study Objectives

#### 3.1 Introduction

The seven case studies all aim to promote improved water management practices. Specifically the Central Case Study and Case Studies G1 and L1 aim to further the adoption and dissemination of IWRM, Case Studies G2, L2 and L3 aspire to introduce demand management systems, and Case Study G3 has the objective of sustainable water use, while Case Study L3 also aims to improve the regulation and delivery of water services. Case study L2 also focuses on improving mechanisms for inter-sectoral co-operation. The results of the case studies are summarised below in terms of how a range of IWRM principles and management tools have been applied across all seven case studies.

This section of the M&E report aims to describe the achievements of each case study in relation to each of the eight tools of IWRM: (i) water resources demand and assessment; (ii) IWRM planning; (iii) demand management and water use efficiency; (iv) administrative regulation; (v) economic regulation; (vi) social change and water aware society; (vii) conflict resolution by participation and consultation; and (viii) information exchange. This section has been divided into sections for each of these tools, although inevitably some case study outputs and achievements tend to span more than one of these tools.

**Figure 3.1: Application of IWRM tools in case studies**

Management Tool	CCS	G-1	L-1	G-2	L-2	G-3	L-3
1. Water Resources and Demand Assessment	●	●	●			●	
2. IWRM Planning	●	●	●	●	●		
3. Water Use Efficiency	●			●		●	●
4. Administrative Regulation	●			●	●	●	●
5. Economic Regulation	●			●	●	●	●
6. Social Change and Water Aware Society	●	●	●	●		●	●
7. Conflict resolution by participation & consultation	●	●	●	●		●	●
8. Information Exchange	●	●	●		●		

Key: Prime Focus ●  
 Secondary Focus ●

## 3.2 Central Case Study

### 3.2.1 Overall progress and achievements

Some of the notable project achievements at the Central Case Study Level :

- Preparation of **Thematic Papers** related to current Chinese Practices in various selected aspects of water resources management;
- Preparation of **Thematic Papers** related to International Best Practices in various selected aspects of water resources management;
- Preparation of water resources management **Advisory Notes** on selected aspects of water resources management;
- Preparation of water resources management **Example (Best Practice) Notes** on selected aspects of water resources management;

These reports, notes and papers are being prepared in both Chinese and English. The table below shows how these documents cover the various IWRM instruments. All 73 documents were completed by end of May 2010 (in English and Chinese, apart from two which are only available in Chinese).

Table 3.1 CCS guidance documentation

IWRM Instrument (After GWP)	Thematic Papers	Advisory Notes	Examples	Manuals
1 – Water resource assessment [14]	5	8	1	0
2 – IWRM [20]	6	8	5	1
3 – Demand management [9]	3	5	0	1
4 – Administrative regulation [3]	2	0	1	0
5 – Economic regulation [9]	2	3	3	1
6 – Social change [12]	2	8	2	0
7 – Conflict resolution [3]	1	1	1	0
8 – Information exchange [3]	1	2	0	0
TOTAL [73]	22	35	13	3

In addition two major overview documents have been prepared, covering integrated water resources management and water demand management. These synthesize the major points from the above documents, together with additional information from international best practice, in order to provide a coherent overview of the entire subject. These were requested by the CPMO as a major output from the project and it is believed that these will be of great value. These were complete in English by the end of March 2010.

As already mentioned, the involvement of the **Institute of Hydrology & Water Resources**, School of Civil Engineering, Tsinghua University and the **Institute of Science Communication, Beijing** will strengthen the Chinese versions of this documentation. In particular they may reformat some documents – such as by producing shorter leaflets or longer guidelines aimed at specific audiences that the Ministry wish to reach with dissemination messages. The involvement of these institutes will enable WRDMAP outputs to be further developed and disseminated after the project ends, and so maximise WRDMAP impact and sustainability. They are also preparing three overarching books:

- Water demand management (concept, framework and practices)
- Water demand management (approaches and techniques)
- Book for public dissemination of water demand management

The first is broadly in alignment with the GWP approach, but the structure has been adapted to suit the Chinese context. The second focuses on specific techniques which are relevant to aspects of WDM, whilst the third is aimed at public understanding of IWRM and is thus an important part of the GWP tool for promoting a water-aware society. These documents are structured as follows:

#### **Water demand management (concept, framework and practices)**

- Concept
  - Problem and background
  - Basic concept
  - Main Objective
  - Framework and key elements
- Strategy
  - Measures
    - Administrative instruments [*'3 red lines'*]
    - Economic instruments
    - Self-management instruments
  - Support
    - Enabling legislation
    - Technical support
    - Education
  - Hotspot issues
    - Social
    - Ecology and environment
    - Risk
- Practices
  - International case studies
  - Gansu case study
  - Liaoning case study

### **Water demand management (approaches and techniques)**

- Basic approach
  - Definition and implications of water demand management
  - Influencing factors
  - Implementation approach
  - Needs for key techniques
- Key techniques
  - Water resource assessment and forecasting
  - Conjunctive use
  - Water resources monitoring and metering
  - Water dispatching and control
  - Application of MIS and GIS
  - Water-saving techniques (agricultural and urban)
  - Modelling, water quality monitoring
  - Financial management and pricing
  - Drought assessment
- Operation manual
  - WUA construction
  - Willingness to pay surveys
  - Drought management planning

### **Book for public dissemination of water demand management**

- Preface
- Basic knowledge and concepts
  - Status of water resources in China and the world
  - Concepts and role of WDM
  - Basic knowledge of WDM
  - Your role in WDM
- Methods and actions
  - WDM measures to be adopted
  - WDM methods to be known
  - WDM cooperative behaviour
- Basic skills
  - General skills
  - Coping skills

- Appendices
  - Legal provisions
  - Official documents

### **3.2.2 Knowledge, Attitude, Practice Survey**

The CPMO staff and consultants who were involved in implementing this survey in previous years are no longer involved with WRDMAP. The international M&E Specialist interviewed 11 persons – mostly involved in the CCS. Previous M&E reports included KAP surveys covering participants in the provincial case studies, and these case studies have now been completed. A check list of questions was used, although the actual issues discussed varied between interviews, reflecting the background of the respondent and their involvement in WRDMAP.

The KAP interviews show that, before WRDMAP started, most respondents had some idea about IWRM, but most were not aware of WDM (although they were familiar with the concept of a water saving society, which has much in common with WDM). WRDMAP activities have improved everyone's understanding about IWRM and WDM, and people report they now have a comprehensive knowledge of these subjects. Two particular areas where they say that they have gained knowledge are public participation and water modelling; although a few respondents said that they still need to fully understand issues of practical implementation. WRDMAP has been seen as a source of information on international best practice for water management.

Information from WRDMAP has been supplemented by other donor-supported projects and, especially, by the annual MWR conference and by the speeches of the Minister of Water Resources at this conference.

IWRM and WDM are seen as being vital for the water sector in China. The Minister of Water Resources has endorsed the demand management approach, and the DoWR is now drawing up draft guidelines for the implementation of strict controls on water use by provinces and other sectors. In doing this, DoWR staff have benefited from getting an understanding of IWRM and WDM through WRDMAP. In Liaoning province (the interviews did not include anyone from the Gansu case studies), IWRM experiences from WRDMAP will be used to make water savings across the province.

A major factor that is limiting the application of IWRM and WDM is the problem of getting different institutions to fully cooperate. At the centre it is difficult to get the Ministries of Environment and Water Resources to really work together. Another problem is getting a full understanding of IWRM and WDM at the provincial level – with ideas such as demand management, water rights and water markets being very new concepts. This is a particular problem in the west, where capacity is more limited. Another problem in the west is said to be that higher levels of poverty limit the scope to reduce water demand by increasing tariffs – although with careful design of the tariff structure, these need not be a problem.

The project was considered effective at introducing the concepts at local level. Rather than just provide a brief overview, the project provided information on best practice, in-depth support and on-the-job training in various subjects related to WDM. This has made it much easier for people to understand the need for and benefits of new concepts such as stakeholder participation. People have found it useful to learn about the whole process of IWRM and WDM, rather than just individual components. Even so changing from supply management to demand management is recognised to be a slow process.

### 3.2.3 Dissemination workshops

A series of conferences was held in March-May to disseminate the central case findings and documentation (incorporating the results of the provincial case studies) widely across the country. A total of nine conferences were held, eight in Beijing and one (climate change) in Nanjing. Representatives from all mainland provinces and autonomous regions (apart from Xizang), as well as all river basin commissions (apart from the Tarim) attended at least one conference. This very wide participation across all regions of the country is indicative of the high importance given to the project and of the value given to the CCS guidelines. The conferences were kept quite small to enable a free discussion, with typically 40-70 participants.

Table 3.2 Dissemination conferences

Main Topic	Date	Number of participants	Number of provinces
WDM (general + urban)	04/03/2010	79	23
WR Assessment. + modelling	18/03/2010	38	13
Water Quality + collaboration	19/03/2010	41	23
Ground Water management	29/03/2010	65	23
Climate change	15/04/2010	47	30
IWRM	11/05/2010	72	16
Rural WDM	12/05/2010	72	23
WAPs/WRFs	19/05/2010	61	17
Environment	20/05/2010	61	17

### 3.2.4 Feed back from dissemination workshops

The responses of participants to the material presented were assessed through a questionnaire distributed at the end of each conference. The findings are summarised in Table 3.3. This summarises the number of people responding yes to a series of questions about the subject of the conference. This indicates that an overwhelming number believed that they had learnt something new and useful and would welcome a series of guidance documents on the topic. This shows how WRDMAP is having an impact on knowledge in water sector in China.

An important feature of the project was the combination of a rigorous theoretical approach and detailed factual experiences from the provincial case studies and international best practice derived from the experience of the international consultants. This focus on details, rather than loose concepts, was evidently appreciated by the participants and did much to help make the conclusions acceptable.

Table 3.3: Feedback from dissemination conference series

	WDM (general+urban)	WRA modelling	WQ+collaboration	GW management	Climate change	IWRM	Rural WDM	WAPs/WRFs	Environment	Total	Percent
Date	04 Mar	18 Mar	19 Mar	29 Mar	15 Apr	11 May	12 May	19 May	20 May		
Nos Participants	79	38	41	65	47	72	72	61		475	
Nos Provinces represented	23	23	23	23	30	16	16	17		31	97%
Nos central level participants	17	6	6	4	8	16	16	3		76	16%
Nos forms	27	0	17	31	32	28	10	16		161	34%
Heard about topic before	27		11	23	29	27	10	12	Combined feedback for 19/20 May	139	86%
Now have better understanding	27		17	29	32	27	10	14		156	97%
Learnt new ideas of interest	27		17	30	32	27	10	15		158	98%
Believe more attention required.	27		17	24	32	27	10	16		153	95%
Are you responsible already	27		10	22	17	21	6	12		115	71%
Do you intend to do more	26		17	29	31	28	9	15		155	96%
Will convey messages to others	26		17	30	32	27	10	15		157	98%
Would like guidance documents	24		16	29	32	27	10	16		154	96%

The details of the feedback from participants at the first of these seminars are presented in Table 3.4 as an example. This indicates considerable interest in water demand management, and also that the seminar presented new ideas and concepts.

**Feedback from the Demand Management Seminar, MWR Beijing – 4 March 2010**

Question		Response	Total number of responses
Organisation Level	National (central)	4%	24
	Provincial	83%	
	Other	13%	
Had you heard about Water Demand Management before this meeting?		Yes - 96% No - 4%	27
After this meeting, do you now have a better understanding of Water Demand Management?		Yes – 100% No – 0%	27
Were there new ideas and principles presented today that might be of interest and use to you?		Yes – 96% No - 0%	27
Do you think that Water Demand Management should be given more attention by the organisations in your home area?		Definitely: 81% Possibly: 19% No: 0%	27
Are you responsible for Water Demand Management type activities already?		Yes : 44% No: 56%	27
Do you and your organisation intend to give more emphasis to demand management activities in future?		Yes: 100% No: 0%	26
Will you convey the messages and ideas presented today to your colleagues when you return to your home office?		Yes: 100% No: 0%	26
Would you welcome more guidance documents on water demand management issues?		Yes: 96% No: 4%	24

In addition, there has been and continues to be mass media coverage of the project. A final documentary film is currently under preparation and will be used to disseminate the findings more widely. The materials produced by the central case study have been requested by other projects, and it is apparent that they are highly regarded by many professionals in the water sector.

### **3.3 Provincial Case Studies**

#### **3.3.1 Overview**

The project has had significant influence in changing practices and increasing broad awareness of many aspects of water resources management. The changes are subtle and not easy to quantify as they are changes in attitudes, understanding and approaches, rather than physically measurable transformations. The project supported WABs and other agencies in their routine work, and thus it is not always easy to identify the direct impact of the project over and above the impact of parallel activities undertaken by the same organisations. Key areas where the project appears to have stimulated further change are listed below, following the structure of the IWRM principles and management tools.

The provincial case studies concluded with a major conference in each provincial headquarters which disseminated the results widely amongst stakeholder organisations. In parallel there was intense media coverage which ensured public dissemination.

### 3.3.2 Provincial case study completion conferences

Major conferences were held in Lanzhou and Shenyang in July 2009 after completion of the provincial case studies. These were attended by 165 people in the case of Gansu and 157 for Liaoning.

#### Gansu

MWR/DFID/consultants	16	
Provincial stakeholder organisations	15	
Water Resources/Affairs Bureaus	104	Municipality and county
Research Institutes	12	National and provincial
Media	18	
<b>Total</b>	<b>165</b>	

#### Liaoning

MWR/DFID/consultants	9	
Provincial stakeholder organisations	27	
Water Resources/Affairs Bureaus	52	Municipality and county
Environmental protection Bureau	16	
Water savings centre	20	
Research Institutes	26	National and provincial
Media	7	
<b>Total</b>	<b>157</b>	

Provincial level stakeholder representation included, as well as various departments within the water resources department, Land resources, Economic committee, Finance Bureau, Women's federation, Agricultural committee, Price Bureau, Development and Reform Commission, Poverty Alleviation Office, Building and Construction, Forestry, Environmental protection, and Legal bureaus.

In addition videos were made of each case study and were broadcast on local television, special issues of local papers were published, and there was considerable media coverage in each Province.

### 3.3.3 IWRM – conceptual issues and planning

Areas where WRDMAP has contributed to change for IWRM include:

- Incorporation of the concepts of IWRM into normal management practice;

- Method for doing stakeholder analyses, and identifying stakeholder interests and perceptions;
- Development of IWRM planning procedures, incorporating social economic and environmental aspects;
- Introduction of an alternative, improved approach to drought management and drought management planning;
- Establishment of IWRM Training Centres;

**(a) Gansu case study**

In the Shiyang River Basin, the IWRM planning process has been designed to complement the Strategic Plan that has been prepared and approved by Government. Some of the measures included in the Strategic Plan being:

- Surface water transfer from the south to the Minqin area;
- Reduction in water allocation in the river basin based on an irrigated area reduction of 1.3 million mu (86,667 ha);
- Irrigation canal lining;
- Drip irrigation development on 350,000mu (23,500 ha);
- Greenhouse development on 276,500mu (18,500ha);
- Closure of some tubewells (to match the reduced water allocation);
- Provision of IC Card to tubewell units to facilitate charging and to achieve 'total amount control'.

Many of these elements have been included in the water resources simulation modelling undertaken for the Shiyang River Basin. WRDMAP has provided advice and recommendations to support elements of the interventions being undertaken. Guideline documents have been prepared for various aspects.

As a precursor to the preparation of the IWRM Plans a River Basin Profile was prepared. This task, which was outside the designed scope of the Project, was carried out in order to improve stakeholder analysis and participation, and to provide the basis for the preliminary data and information collection exercise. The River Basin Profile documents provided an insight into the local drivers for improving water resources management. In the Shiyang river Basin over 200 copies of the River Basin Profile (about a 100 page document) were delivered to stakeholders.

The process of the development of the IWRM Plan has created awareness in the minds of SRBMB staff of the importance of stakeholder participation. They now appreciate that the implementation of such a plan needs considerable stakeholder participation, especially to maximise the positive impacts of the Strategic Plan. A good effort has been made to involve stakeholders in water resources development and management activities. It is believed that this is a significant improvement on the situation prior to the commencement of the project in 2005.

A new multi-sectoral organisation in the Shiyang River Basin has been established to assist in the implementation of the Strategic Plan. The mandate of the '*SRB Masterplan Implementation Management Commission of Wuwei Municipality*' was agreed in August 2008. The commission is a multi-sectoral group and follows much of the requirements of an IWRM process whilst the Strategic Plan has many of the elements of an IWRM Plan. However it should be noted that the Strategic Plan has relative little on flood planning and water quality management.

**(b) Liaoning case study**

In the Daling River Basin the focus has been on preparing an IWRM Plan for the Upper Daling River Basin which comprises most of Chaoyang Municipality. This activity generated much interest in the development of an IWRM for the full Daling River Basin. As an extra activity has been supported by the project, the IWRM Plan is being extended to cover the whole river basin. This is more in line with the requirements at the provincial level rather than the local level. However, one of the objectives of the project was to investigate the pros and cons of preparing and eventually executing IWRM Plans on the basis of the existence of a river basin organisation or the more common current situation, an existing standard administrative unit, in this case a municipality. The fact that the WRD decided to extend the IWRM plan prepared at project level to cover the entire river basin is a good indicator of the new planning process trialled.

A River Basin Profile was also prepared for the Daling River Basin in order to improve stakeholder analysis and participation, and to provide the basis for the preliminary data and information collection exercise.

### **3.3.4 Water resource monitoring and modelling**

Areas where WRDMAP has contributed to change in water resource monitoring and modelling include:

- Improved groundwater management with particular emphasis on improved water level monitoring;
- Introduction of water resources simulation modelling skills to different levels of water sector management/administration;
- Introduction of water quality modelling to different levels of water sector management /administration and environmental sector management /administration;

**(a) Gansu case study**

For the Shiyang River Basin it was decided to use the WEAP software for water modelling. The WEAP package met all the technical requirements and is also freely available to government agencies around the world. It was developed in the USA by the Stockholm Institute, who agreed that the user interfaces could be translated from English into Chinese. WRDMAP funded this translation, including the tutorials and user manual, during the early stages of the project. The software is thus available in Chinese to other government agencies and offices in China. Under the project, nine licensed copies of the WEAP software were arranged, including two with the Shiyang River Basin Management Bureau in Wuwei, one with the Provincial Hydrology Bureau in Lanzhou, one with Minqin WAB, and one with the international consultants.

The project has enabled numerous counterpart staff to develop skills in model development and model use. Additionally, improved modelling skills have also been developed amongst staff of the provincial consultants (Water Resources and Hydrology Bureau in Lanzhou) and in Lanzhou University.

A groundwater model of the SRB was developed by Tsinghua University as part of the development of the Strategic Plan. Tsinghua University 'Groundwater Model' is a combined surface water and groundwater model of the SRB. As a part of the WRDMAP, the Tsinghua Groundwater Model was refined and improved with use of additional data:

- High resolution land surface elevation mapping. In the original model, topography had been based on 1:250,000 scale mapping, which was considered too coarse to evaluate sensitive groundwater level fluctuations in the north and north-east of Minqin. A high resolution DTM at 1:50,000 scale was used in model refinement to represent topography better in the Minqin area. (Mapping data being purchased through the project).
- Data from 41 groundwater observation wells operated by the Land Resources Bureau, including:
  - the well co-ordinates;
  - the ground elevation at the well;
  - the historic groundwater level records, or depth to water table records (at only seven of the 41 wells were more than two years of data available).

It is hoped that in the future model refinement will be possible based on the information from the 35 automatic groundwater observation wells established through project funds. Surveys were also carried out of water levels in 36 open dug wells in the desert fringes around the Minqin area. Interestingly, herdsmen reported that the water depths in these wells had not varied significantly in the past 20 years. This provided very useful additional information to assist in refining the groundwater simulation model.

Workshops have been held wherein the modelling approaches and outputs have been presented to stakeholders in the river basin. These meetings were held in Wuwei and Lanzhou and were well attended. In general the modelling results supported the initiatives incorporated within the strategic plan, but in addition they enable quantification of the economic impact in more detail than had been included in the strategic plan. This is useful for identifying additional social mitigation measures.

The water resources simulation modelling was well received by the counterpart organisations. However, several WAB offices wanted to use the model themselves, WEAP licenses were arranged for many project offices and staff were trained to different levels of expertise. It was, however, recommended that all modelling work in the SRB be co-ordinated and managed by experts at the SRBMB supported by modellers from the Lanzhou Water Resources and Hydrology Bureau. This is to avoid the risk of models being adapted differently by different people so that conflicting results might start to emerge. This issue has been discussed locally.

**(b) Liaoning case study**

The water resources modelling system used in the Daling River Basin is based on two model components operating within the same ArcGIS user interface: The hydrological model (NAM) and the water allocation model (MIKE BASIN). All the modelling activities were carried out in the Chaoyang WAB; staff here became familiar with model usage and were involved in data processing and data entry. However, the main modelling skills that were developed through the project are in Shenyang WRD / Water Resources and Hydrology Bureau. This is, in fact, probably the best solution since it will enable the skills developed to be used throughout Liaoning province and also matches more closely with staff capabilities, workloads and interests.

MikeBasin software licences were purchased for Liaoning Department of Water Resources, Chaoyang WAB, Liaoning Hydrology Bureau and Chaoyang Hydrology Bureau. Extensive training has been provided in the use of NAM and MikeBasin.

During the course of the project, concern was raised over the reliability of the water use information. As a consequence, the Chaoyang Water Affairs Bureau, supported by the provincial consultants (Provincial Water Resources and Hydrology Bureau) undertook a water use data gathering programme that necessitated much field work in visiting a host of water use stakeholders and obtaining their water use information. This covered urban areas (water supply companies), industrial units as well as irrigation areas. This exercise not only created more confidence in the information used in the modelling, but also enable extensive stakeholder consultation to be undertaken, including discussions with individual stakeholders on water availability and usage issues.

The fact that MikeBasin works within an ArcGIS environment means all the water resources and water use data is now also held in a GIS and is accessible for other uses. The fact that the project has also provided GIS to other counterpart offices means that good facilities exist for data sharing. It will be interesting to monitor the extent to which this takes place in the future.

The local modelling team are considered to be well trained in model use. The MikeBasin model is provided by DHI who have a large permanent office in Shanghai. Local support can thus always be provided. This is covered by the annual license fee for the software.

In order to support the improvement in water quality management within the Chaoyang Municipality, a water quality model of the main river system was developed. Initially this was to be piloted in the vicinity of Chaoyang City itself with a view to extending the model to other parts of the Chaoyang Municipality area (Upper Daling River Basin) or through developing other individual models for specific key areas in the upper basin that was known to have water quality problems in the river system.

Local staff in the Chaoyang WAB and EPB had no experience of water quality modelling prior to the project but were knowledgeable in a variety of subjects in the area of water and environmental management. They were university educated in relevant subjects such as Environmental Science, and Water Resources, but detailed knowledge of water chemistry, hydrology and hydraulics could not be assumed.

Using the Qual2K water quality modelling software, training of counterpart staff focussed on water quality modelling, with other subjects being explained as and when necessary. Although there was much interest shown in water quality modelling by staff of Chaoyang WAB, Chaoyang EPB as well as the consultants from the Liaoning Water Resources and Hydrology Bureau, there has tended to be a reliance on the international consultant to lead the process. This is quite understandable with the introduction of a new approach and concept. It is hoped that all three organisations will continue the development and use of water quality modelling in the future. It is also hoped that the Liaoning Water Resources and Hydrology Bureau take the skills learned to other river basins and municipality situations in Liaoning Province.

Although a simple model, it is believed that both the WAB and EPB immediately saw the benefits of the water quality modelling approach. There was considerable interest in expanding the water quality model as much as was possible within the timeframe of project activities at the provincial level and the limits imposed by the data available.

Model results to date generally indicate the scale of the unavailable information. For example, in the Shijia tributary, the model could not match the observed pollution levels at the downstream end of the tributary. To achieve the observed pollution levels, more pollution is required. It is likely that there are ungauged effluent discharges entering the tributary for which data is not available.

This should be seen as a positive result of the modelling work. This has been pointed out during the course of the modelling since expectations might have been dampened by the impact the lack of data was having on the ability to build a 100% predictive model for the river basin. This will take time, effort in collecting extra data and patience to achieve.

### **3.3.5 Water resources demand management**

Areas where WRDMAP has contributed to change in water resource demand management include:

- Concept of water resources demand management (WRDM) seen as a whole rather than a series of separate activities, one of which being the WSS establishment;
- Increased awareness of the importance of user participation in achieving effective demand management
- Knowledge of practical potential water saving techniques in agriculture;
- Awareness of the need to improve flow measurement in irrigation systems, and how this can be used to improve irrigation management;
- The introduction of the basics of asset management for a WSC;
- The provision of equipment and training in active leak detection and control in urban pipe network system;
- Establishment of targets for water savings, and methods for monitoring progress towards these targets.

**(a) Gansu case study**

Project activities aimed at reducing demand for water in Gansu focused on small pilot groundwater and surface water irrigation areas in Wuwei and Jinchang municipalities. The original plans for the project did not intend to make any investment in improvements in irrigation infrastructure, with all 'water saving' to be achieved by non-structural means. However, some funds were made available in the later stages of the project for improvements to the irrigation systems in the pilot areas - mainly related to canal lining and water measurement structures.

In the pilot WUA areas, GIS was introduced to delineate canal commands, record crop areas and also to incorporate socio-economic data. Training programmes and other activities provided advice on the methods and procedures to save water in agriculture. Overall, considerable effort has been made by all to address the issues of water saving in agriculture / irrigation practices with a great deal of new ideas and technologies being introduced to facilitate the changes.

Project benefits / initiatives that are believed to be sustainable include raised awareness in WABs and WMDs of the:

- Importance of understanding the needs or situation of farmers;
- Importance of good training and sustained support to WUAs;
- Importance agreed sharing of responsibilities between WUAs and water management stations;
- Importance of non-structural water saving activities to complement structural interventions;

In Minqin County pilot WUAs of Wen'er and Zhouhe, the reported reductions in water deliveries over the project duration have been of the order of 25% to 30% (See Table 2.1.5 of the G3 Provincial Case Study Final Report). This is largely as a result of increases in surface water deliveries following improvements and lining of the surface canal system, and more rigorous compliance with permits. The reduction in groundwater use was 40-50%, with the impact of this being offset by more reliable surface water deliveries. Although part of the saving is due to reduced recycling of losses, it is apparent that water deliveries are more precisely managed in accordance with crop needs and the pumping costs will have been reduced by 40-50% which is a significant financial benefit to the farmers.

**(b) Liaoning case study**

In Liaoning WRDMAP work on demand management focussed on leak reduction in water supply systems. This involved leak detection and the more effective management and maintenance of the water supply system.

An active leak detection programme was undertaken in part of the service area of Beipiao WSC. Although full training was provided for staff and all equipment used and found to be fully functional, there was limited interest shown by the WSC in expanding the programme themselves. This was due to limited staff and a lack of financial resources to repair leaks, and the realisation that an asset survey would also be needed. Excessive household water leaks were another problem.

InfoWorks software was used to set up a pilot model for a part of the Beipiao water supply distribution pipe network that was to be the subject of the pilot leak detection studies. This was done under a training course provided by the software suppliers and the trainees were representatives of the Beipiao WSC and representatives of the Liaoning Water Resources and Hydrology Bureau.

Although training in the use of the model has been provided and advice given as to the value of modelling the pipe distribution network of the WSC, it is not believed that the management of the WSC have the same viewpoint. It was difficult to identify any enthusiasm by 'WSC management' to see the potential usage and benefits of network modelling. This was probably due to the realisation of the data collection exercise that would be required to be undertaken to establish a complete network. Such data collection / survey is particularly difficult in Beipiao since there is limited asset location knowledge as the system was built over several decades. Some of the oldest pipework was installed by the Japanese, and there is also only limited information on some of the subsequent pipe-network development.

It is believed that, at the current time, software packages such as InfoWorks for pipe network modelling would be of interest to provincial level cities such as Shenyang and perhaps municipality level cities such as Chaoyang. In general it is probably too early to take such technology to county level towns. Beipiao WSC has not fully utilised all the equipment for the leak reduction programme that was purchased and used under project activities. This has now been transferred to Chaoyang WSC, and consideration should also be given to transferring the license for InfoWorks from Beipiao WSC to Chaoyang WSC.

Before any software license (InfoWorks WS) transfer is made, it is believed that the Liaoning PPMO make a final effort to encourage the Beipiao WSC to use the software and of course make the effort to survey the existing assets including pipeline alignments. The Project has provided metal detectors (pipe locators) and digital GPS system to enable this work.

Asset management: sustainable asset management is a key factor for business performance in the water supply sector. Understanding how an asset performs in its environment is essential to delivering service to customers in a cost-effective and sustainable manner. A process for asset management was initiated in Beipiao WSC with infrastructure surveys. The list of infrastructure in parts of the service areas of the WSC was prepared with the use of site surveys and GPS equipment procured under the project. This was used as the basis for establishing an asset management system. Base maps at a scale of 1:1,000 were procured under the project and translated into CAD format for use in the asset database (MS Access).

However, although the process was initiated, the counterpart organisation did not take on board the requirement to extend the data collection programmes to other parts of the WSC service area. Without a populated database it was not possible to demonstrate the broader aspects of asset management to the WSC in other than an outline descriptive format. The forms of and reasons for the establishment of an asset management system was presented at workshops to senior management and staff of the WSC. It is believed that the WSC did not believe they had the man-power at the time of project activities to undertake the the required asset data collection programme. It is hoped that budgets are being identified in the WSC for this to be undertaken to full benefit can be obtained from project activities.

### **3.3.6 Administrative regulation**

Areas where WRDMAP has contributed to change in administrative regulation of water resources include:

- An appreciation of the need to improve WAPs and make the process a related part to water allocation planning and water resources management practices;

- The introduction of the concept of the relationship between WAP and EDPs and water quality management;
- Recommendations for WAP auditing process.

**(a) Gansu case study**

Several workshops were held on the issue of water abstraction permitting and water resources fees in both Gansu and Liaoning provinces. These topics have been of considerable local interest and the project has responded to this. In Gansu there has been much interest and debate during the course of the project on the issue of integrated surface water and ground water permits – which was a new concept introduced by the project.

It is believed that the project has been quite successful in improving abstraction permit management in the study areas, and in improving the arrangements for collecting and managing the data needed to support permit management. However, it is believed there is still a great deal to do before all the data and information requirements associated with SCD 460 are fully and comprehensively implemented. It is recommended that audits or assessments be carried out on the state of WAP issuance and management, and guidance documents have been prepared for how this should be done. A workshop on this topic with WABs from all counties throughout the SRB attracted great interest.

**(b) Liaoning case study**

Under the project, hardware (computers), software (ArcGIS) and training was financed through project funds. This clearly created some enthusiasm for the project by the counterpart organisations that might not exist under ‘non-project’ situations. However,

- Although achieving a reasonable level of co-operation and data provision, this was sometimes related to the immediate organisations receiving such items. Data from other organisations was not as easy to obtain.
- The project was seen as being implemented through the Ministry of Water Resources and hence primarily supporting the WABs, additionally, most project ‘benefits’ were seen to relate to these same organisations. This perhaps weakened the level of interest by the EPB.

The establishment of the Ministry of Environmental Protection also impacted on the situation. The establishment of the new organisation created a degree of uncertainty as to the role and responsibility of the new organisation and its satellite departments. There was noticed to be a slight reduction in co-operation within the project thereafter but this might have been due to the need for individuals from EPB to pay more attention to the internal organisational changes that were taking place within the organisation(s). It should also be noted that earlier, staff changes at the senior level with Chaoyang EPB also affected the situation but this was subsequently addressed.

In all situations, co-operation between different departments or organisations is clearly dependent upon the approval for, and encouragement of, senior level personnel – the higher the level that this comes from the better. However, it needs all administrative levels to have similar views to effect real sustainable change.

In November 2008, the State Council issued a 'directive' requiring that organisations related to the Ministry of Water Resources and the Ministry of Environmental Protection investigate means and mechanisms to ensure sufficient co-operation is achieved to enable water quality management to be effective. This created a degree of increased interest in the activities of the project, particularly by the Water Resources Department in Shenyang (Liaoning Province). It is likely that increased or renewed interest also took place within the EPBs and perhaps also other project related stakeholders.

It is believed that, through the project, counterpart organisations (and local consultants) have found that more good quality knowledge of water use in the urban and industrial areas is essential for improved water resources management.

Project activities have given much attention to the issue of water abstraction permit management. There is found to be an increasing realisation of the importance of this issue and how, if undertaken effectively, it is a powerful water resources management tool. (In the past it has tended to be a paper exercise without sufficient linkage to actual resource availability or to water management itself). Project activities have raised the profile of the subject through the introduction of GIS/MIS and the entry of WAP data into the system and the use of the data in the simulation modelling activities.

In relation to the function zoning, this has been addressed in the project in the context of achieving greater co-operation between Chaoyang WAB and Chaoyang EPB. Both organisations have different environmental function zones that are basically similar but drawn up in different ways. The project has attempted to facilitate an agreement between the two to yield a single environmental function zoning. The use of water quality modelling and improvement in data sharing has been used to attain a common product. However, there is a reluctance to rationalise the two zoning systems since each organisation believes they have a mandate/ responsibility to produce their own 'zoning'. Other recent projects have also tried to reconcile this issue including the World Bank Hai He Project where a relatively complex approach was developed to use both zoning approaches and produce, through a logical system, a hybrid version that should have been acceptable to both organisations.

### **3.3.7 Economic regulation**

Areas where WRDMAP has contributed to change in economic regulation of water resources include:

- Clarification of the issues surrounding water resources fees related to practices in country and internationally;
- Implementation of recommendations related to management and use of WRFs derived from agriculture;
- Introduction and demonstration of financial modelling for small to medium WSCs;
- Introduction of urban water tariff design procedures;
- Introduction of formal ability-to-pay assessments and willingness-to-pay surveys and analysis;

#### **(a) Gansu case study**

The project has increased the awareness of livelihood issues in all the provincial case studies but particularly so in the Shiyang River Basin where it was already a concern to many. The need to consult more with communities has been acknowledged by all.

The project worked with the staff of SRBMB and county WABS to calculate the level of water resource fees needed for cost recovery. Initial estimates of management system costs in the Shiyang River Basin, expressed per unit water abstracted, can be summarised as:

- SRBMB / WABs                    Y0.002
- WMD / WMS                      Y0.006
- WUA                                Y0.002

The total cost recovery required is thus similar to the current Y0.01/m<sup>3</sup> WRF in Jinchang Municipality and for groundwater resources in Wuwei Municipality. In Wuwei Municipality the WRF for surface water is Y0.1 to Y0.2 /m<sup>3</sup> (increased from the earlier Y0.03 to Y0.06 /m<sup>3</sup>) for urban and industrial uses.

However, this does not allow for the costs of ‘... *conservation, protection...*’ nor for any of the costs associated with aspects of the Strategic/Master Plan. However, some view the WAP and IC management as being measures which effectively address the requirements of ‘*conservation, protection*’.

This was a useful process undertaken in conjunction with the staff of the SRBMB and county WABs. The issue of ‘conservation’ and ‘protection’ in relation to environmental situation was seen locally to be covered through the process of strict water resources management. Thus the pricing of these aspects is seen to be covered by the issuance of WAPs and the adoption of IC cards.

#### **(b) Liaoning case study**

The willingness-to-pay survey undertaken with project support in Beipiao (urban area) provided some interesting information. Generally, most people were willing to pay more for their water if delivery times could be improved and the quality of the water also improved. This is a typical response found in many countries and situations where delivery does not meet local expectations.

During the project Beipiao WSC moved from flat rate volumetric tariff for domestic consumers to a block tariff, with users taking more than the volume considered adequate for basic needs being charged 2 and 3 times more per unit than the basic rate. However such block tariffs with increasing prices for successive blocks for domestic customers are becoming more common and a number of cities in Liaoning have already adopted rising block tariffs for domestic consumption. This move to block tariffs in Beipiao cannot be attributed to any project intervention.

The project developed a financial model for WSC operation and reviewed the financial management practices of Beipiao WSC. Training was imparted on improved financial management approaches that could be adopted. Additionally recommendations were made to improve the software package being used. However, it is unsure as to whether this advice had been taken up. If there had been a positive response, then the project might have been able to address this issue and provide additional training.

### **3.3.8 Social change and a water-aware society**

Areas where WRDMAP has contributed to building water-aware society include:

- Improvements to the understanding of WUAs, and clarification of their operational scope and responsibilities;

- Incorporation of social considerations in demand management, administrative and economic regulation.
- Assistance with wider dissemination of water savings and water demand management

Great effort was put into improving participation in WUAs in the project. It became apparent at an early stage that WUAs had originally been established in a way which did not give them a significant role, but which relied on them assisting water management stations in many ways. This was not a sustainable situation as it required them to undertake many tasks for which they had little incentive. Much effort was put into defining a role which met the requirements of the water users and the WMS. This role is now fairly well-defined in groundwater and conjunctive management WUAs, where new management tools have been introduced and financing mechanisms set up. The role of surface water WUAs is still emerging as the management of secondary or main canals by WMSs still leaves little role for WUAs, but they are moving towards joint management of the secondary canals.

#### **(a) Gansu case study**

The project activities that have been undertaken to support social change and a water-aware society have included:

- Training and awareness programmes related to crop selection and crop water requirements;
- Training and awareness programmes related to agronomic practices that can result in water saving including changing plot sizes, irrigation methods and land levelling (to improve irrigation coverage of farm plots);
- Training and awareness programmes related to irrigation scheduling;
- Training and awareness programmes related to monitoring of water use;
- General propaganda and public dissemination related to water savings

This programme has helped clarify the role of water user associations (WUA), introduce improvements to the way they work and thereby contribute towards water saving society construction. In addition, there has been training on agricultural methods of water saving (such as new cultivation and irrigation methods). The training undertaken was linked in to on-going government programmes – such as the 22345 programme – to avoid duplication. Feedback has also been introduced into the training from the work at Zhangye as well as the experiences of the Pro-Poor Rural Water Reform Project (also funded by DFID).

The project has supported the government in many of its awareness-raising activities, particularly those aimed at water users. Though this process a number of new and unfamiliar concepts have been introduced, and new techniques have been learnt in water management practices in the SRB. The project has also encouraged consultation in all activities and stimulated more active forms of participation through, for example, the use of participatory rural appraisal (PRA) tools for village assessments. Finally, WUAs have been set up to create forums in which all water users should be able to participate in decision-making.

Progress has been achieved on the project by rigorously defining responsibilities and making them coherent so that individuals and WUAs can work independently within their area of responsibility and relate efficiently to water management stations. This has encouraged WUAs to become more active and to cooperate with each other and with the WMS. Quotas have been adopted for female members of WUA executive committees, although it is still difficult to ensure that they are able to participate or change the way irrigation is managed in the interests of women. Financial constraints have been addressed by a combination of awareness-raising, involving the township government in water resources fee management, and repayment of part of the fees to the WUAs.

The needs and methods for participation were assessed through a stakeholder analysis conducted in 2006. Workshops were held on the topic in the early days of project activities and all provincial case study offices prepared a 'Stakeholder Consultation Plan'. These plans took some time to produce and much advice was given in their preparation. The process of preparing the plans was believed to form a significant level of awareness training. Participatory planning methods adopted at village were innovative and believed to have a good impact in promoting awareness and willingness to participate in WUAs in the early stages. These helped changed perceptions that WUAs were being promoted to help the Government implement difficult measures, and encouraged the belief that WUAs are established to help WUAs manage water efficiently and cope with limitations to the supply of water.

The stakeholder analysis was itself done in a participatory manner, and included analysis of who the stakeholders were, what information or involvement they needed, and how this might best be achieved. In addition the analysis considered the relations between stakeholders, their capacity to participate, and the risks arising from insufficient stakeholder involvement.

To reinforce this, the River Basin Profile document for the Shiyang river Basin was prepared through a stakeholder consultative process in the early stages of the Project. Further consultation took place during the period of preparation of the IWRM Plans and final presentation of the plans were made to large assemblies of stakeholders.

#### **(b) Liaoning case study**

The project has paid great attention to the issue of stakeholder communication and consultation right from the start of the project. Workshops were held on the topic in the early days of project activities and all provincial case study offices prepared a 'Stakeholder Consultation Plan'. These plans took some time to produce and much advice was given in their preparation. The process of preparing the plans was believed to form a significant level of awareness training.

In the follow on workshops related to IWRM planning, the importance of consultation and communication with the major stakeholders was emphasised as being a key element of the process. To reinforce this, the River Basin Profile document for the Daling River Basin was prepared through a stakeholder consultative process in the early stages of the Project. Further consultation took place during the period of preparation of the IWRM Plans and final presentation of the plans was made to large assemblies of stakeholders.

In Beipiao, a large workshop was held to elicit the opinions of major stakeholders as to the form of regulatory approach that could be used in relation to the Beipiao WSC. Examples of international practice were presented as 'food for thought'. However, it was clear that the process was good as a general awareness raising exercise and that any change would only be made by higher level decision making. It is hoped that discussion along the lines of 'change' are in process.

### **3.3.9 Conflict resolution**

Areas where WRDMAP has contributed to conflict resolution include:

- Reduction of conflicts caused by lack of understanding or awareness of the reasons for changes in water supply or management systems;
- Creation of environment for discussing and resolving conflicts.

The project found that public participation is potentially highly beneficial in avoiding conflict which could be expected to arise as a result of the introduction of very stringent water saving requirements. WUAs are one way by which participation has been encouraged, and they have helped implement some difficult measures in a non-confrontational way (eg well closure and greenhouse construction). These have been supported by mass awareness campaigns. It is believed that the actions of WRDMAP in strengthening and ensuring financial viability of WUAs in Minqin helped reduce conflict over the well closure and IC card implementation programme.

There are limitations to the amount WUAs can achieve, since there may need to be additional external support or compensation, but the WUAs are effective in ensuring that local needs and problems are taken into account and in articulating any additional support required. Thus it is possible that they have made it easier for differences of opinion to be presented and thus apparently increase conflict. However, this is a matter of presentation rather than substance and by making the issues better-known to the water management stations, the WUAs have proved to be valuable in avoiding many potential conflicts.

In the context of wider IWRM planning, stakeholder opinions can easily be solicited through workshops, but it is not easy to incorporate these into combined, agreed plans. Inconsistency in data styles and formats can also make it difficult to agree on some basic parameters. Thus this too creates perception that participation is not effective. However, ignoring these differences and working in parallel, without communication or participation, creates even greater problems. Even a limited degree of participation which enables differences of opinion, fact or approach to be clearly stated is valuable in itself. It makes the next stage in participation, of true collaboration, much easier. The project has helped in getting these concepts much more widely appreciated amongst stakeholders.

### **3.3.10 Information exchange**

Areas where WRDMAP has contributed to information exchange include:

- Knowledge gain through overseas study tours to Australia, South Africa, England and Denmark, and from domestic study tours and visits.
- Knowledge transfer from trainers invited from other programmes and areas of China.
- Development of communication plans.
- Consultations between stakeholder organisations for preparation of IWRM plans and other activities, in some cases based on improved informal relations and in others due to specific memoranda of understanding.
- Development of improved presentation skills, and use of participatory training techniques.

It is believed that the improved stakeholder communications initiated through WRDMAP for IWRM planning are being sustained, and that the multi-stakeholder implementation committee in Wuwei continues to function. Experiences observed on the international study tours have supported the WRDMAP emphasis on information exchange with stakeholder organisations, and this encouraged the study tour participants to adopt such methods themselves.

### **3.3.11 New technology**

Areas where WRDMAP has contributed to the introduction of new technology include:

- Introduction of GIS to various aspects of water resources management together with GPS equipment for geo-referencing of features / infrastructure;
- Introduction of water resources simulation modelling related to water allocation and scenario planning;
- Introduction of water quality modelling;
- Introduction of equipment and skills to undertake active leak detection and control;
- Use of improved computer software packages;
- Provision of active leak detection equipment (Liaoning Province only);
- Provision of automatic groundwater level equipment with telemetric data transfer to central console system;
- Establishment of IWRM Training Centres with project provided equipment.

Results of these activities have been described in the sections above.

## **3.4 Recommendations of the 2009 M&E Report**

Several recommendations were made in the previous M&E report – notably to:

- Provide more training at the provincial/municipality level in technologically related subjects to a wider audience of trainees;
- Undertake broader dissemination of project information at the provincial/municipality level;

However, this report also pointed out the difficulties of putting this recommendation into practice since the project design requires the focus of the remainder of the project to be at the Central Level through a Central level IWRM/WRDM Document Dissemination Programme. Additionally, the FA budget limitation is believed to be such that further training activity at the case study level is unlikely to be possible. However, it is believed that ongoing training and dissemination at the local level by counterpart organisations did take these recommendations into account.

It also recommended that since counterpart involvement to date on the project has been dominated by the staff from government organisations at the municipality and provincial levels, these staff should be involved closely in dissemination at CCS level. Their good awareness of project concepts and goals should perhaps be used directly at the CCS level. National consultants and counterparts were less involved in implementation at provincial case study level, and are thus less able to discuss the practical details and issues more. As the aim of the CCS is to provide the Ministry with the materials and the wherewithal for disseminating best practices, or improved practices to attain IWRM / WRDM concepts and management to the provincial and municipality/county level, then the use of the provincial level consultants to assist in doing this would be advantageous. It is appreciated that people at the same administrative level may be better suited to transmitting messages to someone at the similar level. This recommendation was adopted in both the first round of CCS workshops in later 2008/early 2009, and the final conference series in March-May 2010.

On a more practical perspective, it is clear that a lot of material is being and should be produced at the CCS in relation to the IWRM/ WRDM Documentation Programme. It is important the messages contained in such documents are interesting, educational, sometimes challenging but also compliant with regulations and norms and succinct. And this all needs to be in Chinese. The eventual material MUST be written and owned by Chinese professionals. Translating material written in English by international experts can only serve a means to the eventual goal of Chinese Guideline Documents eventually written and owned by Chinese professionals. It is essential that a process is immediately established to ensure that this is the case. This must be driven by the Ministry of Water Resources and the CCS Project Director. It has proved extremely to achieve this in practice, and much of the final material continued to be produced by international consultants. However, much greater emphasis has been placed in the later stages on 'polishing' and rewriting the translated versions of key documents by senior Chinese consultants with relevant technical expertise. It is believed that the quality, readability and acceptability has been greatly improved as a result. Feedback from the conference participants has generally been very favourable about the value of the documents.

Ownership of the documentation by MWR remains a concern, but it was for this reason that the team from Tsinghua University was set up to write a series of three books on demand management. It is believed that this, in conjunction with the enhanced quality of the documents produced directly by the WRDMAP will go a long way towards alleviating this problem.

Owing to budgetary constraints and the need for broad dissemination of project prepared material, it is recommended that the use of a well designed web-site should be the main route for dissemination. This could be linked to the use of the MWR Weekly Newspaper 'China Water Resources News' [[www.chinawater.com.cn](http://www.chinawater.com.cn)] could be a useful route. This is still believed to be a good approach and will be adopted.

## 4 Achievement of Milestones

WRDMAP Project progress results in relation to Project Milestone (project progress indicators as given in the Project Memorandum) achievements are as defined in the progress reports; refer to Water Resources Demand Management Assistance Project: Six Month Progress Report No. 8 of January 2010.

A summary of the milestone achievement record is presented in the tables below.

Nr	Item/ Study	Milestones	Expected month of achievement	Actual PMB Approval
<b>YEARS 1 to 3</b>				
1	CCS	Development of a remote access process for the intranet site or the separate construction of a Water Community Extranet Site.	4 # Nov05	16 May 2006
2	All	Inception Report	6 # Jan06	16 May 2006
3	G1	High turnout at IWRM Awareness workshops in Lanzhou, Wuwei and Jinchang	7 # Feb06	2 Nov 2006
4	L1	High turnout at IWRM Awareness workshops in Chaoyang and other selected towns including Beipiao.	8 # Mar06	2 Nov 2006
5	G2	Trial areas approved for trialling demand management approaches	10 # May06	2 Nov 2006
6	L1	Training programme undertaken and effective. Individuals able to define how IWRM will affect their roles and activities in water management.	11 # Jun06	8 Feb 2007
7	L2	GIS produced of current abstraction and discharge permitting details in Chaoyang. (Integrated into work of Case Study L.1).	11 # Jun06	2 Nov 2006
8	G1	Completion of SRB water resources profile document through a participative process.	12 # Jul06	8 Feb 2007
9	CCS	Draft guidelines and manuals on IWRM and the use of tools to facilitate IWRM and demand management at the river basins level produced.	12 # Jul06	24 Sep 2007
10	G2	Feedback report on the effectiveness and acceptance of the various current forms of fee types reported and disseminated	14 # Sep06	8 Feb 2007
11	L2	Inventory of abstraction and discharge permits shared between WAB and EPB with responsibilities defined for upkeep and working document and technical guideline note produced defining how water qualities in surface and groundwaters will be jointly managed by WRB and EPB clearly defining roles.	14 # Sep06	8 Feb 2007
12	L1	Completion of Daling water resources profile	16 # Nov06	15 Jun 2007

<b>Nr</b>	<b>Item/ Study</b>	<b>Milestones</b>	<b>Expected month of achievement</b>	<b>Actual PMB Approval</b>
		document through a participative process. This being presented at a workshop.		
13	G1	Basin Water Resource Master Plan published and distributed to stakeholders and workshop held to disseminate the information in and implications of the Plan.	17 # Dec06	11 Mar 2009
14	L3	Baseline survey of Beipiao WSC management, operation and performance. Report thereon with GIS appendix.	18 # Jan07	15 Jun 2007
15	G2	Training programme undertaken with feedback on receipt/effectiveness reported. Individuals able to define how demand management will affect their roles and activities in water management.	19 # Feb07	15 Jun 2007
16	L3	Training of WSC staff in technical, regulatory and financial management and public consultation.	19 # Feb07	18 Jun 2008
17	G3	Status Report and Water Use Profile for Minqin produced by WRB in discussion with WUAs	20 # Mar07	20 Dec 2007
18	L2	Preparation of Drought Action Plan incorporating guidelines for the management of abstraction and discharge permits during drought situations with meetings in several parts of Chaoyang municipality where the drought management provisions are presented /discussed.	21 # Apr07	18 Jun 2008
19	L3	Baseline survey of Beipiao WAB, regulations and procedures. Report thereon with GIS appendix.	21 # Apr07	18 Jun 2008
20	G3	Establishment of WUA mandates and acceptance by WRBs.	23 # Jun07	18 Jun 2008
21	L1	Basin Water Resource Master Plan (IWRM) submitted to Liaoning WRD and once approved by LWRD, Basin Water Resource Master Plan (IWRMP) published and distributed to stakeholders.	24 # Jul07	2 Dec 2009
22	CCS	Holding of an annual Water Legislation workshop in MWR Beijing, Lanzhou (Gansu) and Shenyang (Liaoning) and the production of the first annual summary report on the development of new legislation, decrees and administrative instructions in Gansu and Liaoning with particular reference to the Case Studies.	24 # Jul07	NOT ACHIEVABLE. ACCEPTED BY DFID AS SO
23	L3	Baseline survey of socio-economic conditions in Beipiao with particular focus on water availability, water supply reliability and affordability, associated health issues and overall community relationships with regard to water, WAB and WSC. Report thereon with	27 # Oct07	18 Jun 2008

Nr	Item/ Study	Milestones	Expected month of achievement	Actual PMB Approval
		GIS appendix.		
24	G3	Trial issue of permits to model WUAs in case study areas.	28 # Nov07	NOT ACHIEVABLE. ACCEPTED BY DFID AS SO
25	L3	Implementation of water saving plan by WSC. Production of a water saving plan through stakeholder consultation. Issuance of the plan to operational offices and planning organisations. Public announcement of the measures.	28 # Nov07	Will not be achieved! (WSC do not wish to persue). DFID accept the situation.
26	G1	Case Study G1 Report	34 # May08	11 Mar 2009
27	G2	Case Study G2 Report	34 # May08	11 Mar 2009
28	G3	Case Study G3 Report	34 # May08	11 Mar 2009
29	L1	Case Study L1 Report	34 # May08	11 Mar 2009
30	L2	Case Study L2 Report	34 # May08	11 Mar 2009
31	L3	Case Study L3 Report	34 # May08	11 Mar 2009
32	G3	Undertaking the first training session on the roles and responsibilities of WUAs. Programme designed for repeat training each year before the irrigation season.	34 # May08	18 Jun 2008
33	All	Combined Final Report	36 # Jul08	2 Dec 2009

**YEARS 4 and 5**

34	CCS	Undertaking 6 workshops in non-project provinces to disseminate project lessons in relation to demand management procedures and mechanisms;	40 # Nov08	WITH REDUCED CONTRACT SUM – TASK HAS BEEN DISCONTINUED. DFID are aware and accept the situation. Would be covered by MWR Dissemination Strategy
35	CCS	Undertaking 6 workshops in non-project provinces to disseminate project lessons in relation to integrated water resources management through participatory processes;	44 # Mar09	WITH REDUCED CONTRACT SUM – TASK HAS BEEN DISCONTINUED. DFID are aware and accept the situation. Would be covered by MWR Dissemination Strategy
36	CCS	Production of operational manuals (simple) to guide water resources management personnel in consultative and participatory processes;	48 # Jul09	
37	CCS	Production of simple explanatory broadsheets (or similar) and posters related to project findings, summary guidelines and awareness campaigns in line with the project dissemination strategy and programme	50 # Sep09	26 Mar 2010

Nr	Item/ Study	Milestones	Expected month of achievement	Actual PMB Approval
		(milestone to be the production of the first 4 products);		
38	CCS	Introduction of case study lessons and project recommendations into MWR training material.	52 # Nov09	<i>Depends on MWR Dissemination Strategy</i>
39	CCS	Introduction of case study lessons and project recommendations into Gansu Province WRD/EPA training material.	54 # Jan10	<i>Depends on MWR Dissemination Strategy</i>
40	CCS	Introduction of case study lessons and project recommendations into Liaoning Province WRD/EPA training material.	54 # Jan10	<i>Depends on MWR Dissemination Strategy</i>

Note:

1. Expected month of achievement is related to July 1st 2005.
2. Modifications are possible based on the recommendations of the Inception Report.

#### Extension Activities

Nr	Item/ Study	Milestones	Expected month of achievement	Actual PMB Approval
E1	L1	Creation of time series data for use in the Mike Basin Model	Sep 2008	11 Mar 2009
E2	G1	Creation of time series data for use in the Mike Basin Model	Sep 2008	11 Mar 2009
E3	G3	Summary Note of Activity – Abstraction permits / Household Water Rights / Ticketing System	Jan 2009	2 Dec 2009
E4	L1	IWRM Plan for the whole Daling River Basin	Apr 2009	BASICALLY COMPLETED BY LOCAL CONSULTANTS.
E5	G2	Workshop on the Auditing of Abstraction Permits	May 2009	2 Dec 2009
E6	G1	Climate Change Report – Shiyang River Basin	Jun 2009	2 Dec 2009
E7	L1	Climate Change Report – Daling River Basin	Jun 2009	2 Dec 2009
E8	G1/L1	Climate Change Workshop (Daling & Shiyang)	Jun 2009	2 Dec 2009
E9	G2	Summary Note of Activity – Water Saving Trials (G2A)	Oct 2009	
E10	G1	Draft Guidelines for transfer of Surface Water from upstream to downstream in the Shiyang River Basin	Nov 2009	WITH REDUCED CONTRACT SUM – TASK HAS BEEN DISCONTINUED. DFID are aware and accept the situation.

Considering that the milestones and milestones delivery dates were established during the tendering phase in 2004, it is believed that the attainment of project milestones has been quite successful. However, despite the fact that many of the milestone achievements have been successfully completed it is acknowledged that there is still a need to reinforce the awareness creation in relation to IWRM and demand management both within the stakeholder community as well as amongst the counterparts.

## 5 Project Risks

### 5.1 Status and changes in Project Risk

#### 5.1.1 Introduction

No major changes of project risks have been reported over the lifetime of the project. A regular review of project risks was given in the Water Resources Demand Management Assistance Project: Six Month Progress Reports Numbers 1 through 6.

Below is summarised a status assessment of the project risks and concerns expressed in the Inception Report. The 'risks' were as presented in the Project Memorandum, and relate both to implementation of the project, and subsequently to the long term sustainability of approaches recommended through the project.

In addition, there were also concerns raised in the inception report, which relate to the risks for implementing the project. These are presented in two sets of tables below for the project as a whole and each case study.

#### 5.1.2 General Project Risks

Project Memorandum identified Risk	Status at project start	Final status
<b>P.R1. Risk: A</b> (of Project Memorandum, Annex F, RISK APPRAISAL, Table 1 Risk Matrix): <i>Political willingness to adopt demand management.</i>	There is a seen need by government agencies to adopt demand management approaches in both Gansu and Liaoning. Project risk is therefore low.	<b>Low.</b> Demand management (DM) practices seem to have far greater importance in the Shiyang River Basin than in the Daling River Basin. Government and MWR are publicly placing increasing emphasis on DM.
<b>P.R2. Risk: B</b> (of Project Memorandum, Annex F, RISK APPRAISAL, Table 1 Risk Matrix): <i>Unintended negative impacts of demand management on poor people</i>	As yet too early within the project to assess this risk.	<b>Low/Medium.</b> The issue of trying to mitigate adverse impacts on the poor is becoming much more recognised in the case study areas, particularly the SRB. There remains a risk that budgetary support for participatory methods will not be sustained, or that insufficient compensation will be provided to offset unavoidable impacts
<b>P.R3. Risk: 'c'</b> (of Project Memorandum, Annex F, RISK APPRAISAL, Table 1 Risk Matrix): <i>Acceptance of demand management tools to balance resources and demands.</i>	There is a seen need by government agencies to adopt demand management approaches in both Gansu and Liaoning. Project risk is therefore low.	<b>Low.</b> Government and MWR are publicly placing increasing emphasis on DM. The emphasis on particular tools varies, but overall they are accepted. Residual risk is in ensuring that an appropriate combination of tools is used in each situation

<b>Inception Report 'concern'</b>	<b>Status at project start</b>	<b>Final status / impact</b>
P.R4. Lack of understanding of the wider aims of the project (i.e. the need for broader water-related and cross-cutting issues to be considered in the context of integrated water resources management (IWRM));	Understanding on the project aims has been greatly improved. Project risk is therefore low.	<b>Low.</b> Although the aims of the project are more widely appreciated, the ability to effect change within some of the institutional settings remained very difficult.
P.R5. Insufficient engagement of CPMO with the provincial case study activities;	Engagement of CPMO with the provincial case study activities has been much improved. Project risk is therefore low.	<b>Low.</b> Gradual improvement during the provincial case studies, but residual influence on their ability to apply lessons for the CCS
P.R6. That counterpart staff are able and willing to undertake the roles and workloads needed for case study implementation, and that there are adequate domestic consultancy inputs to provide the advice and support required.	This concern still exists and every effort is being made by the CPMO and PPMOs to address the issue.	<b>High.</b> Issue was addressed, but staff availability was affected by demands of the Government's 'Stimulus Package' on counterparts and national level consultants. This affected the final production and ownership of CCS documentation. The impact was mitigated by an intense effort by a small number of consultants
P.R7. Insufficient domestic consultancy input.	This concern still exists.	<b>High.</b> This risk was real at the provincial level, but management has minimised the impact / effect. This also influences production of the CCS output material.
P.R8. Unrealistic expectations with rural and urban communities of what can be expected from project delivery and implementation, notably in G3 and L3.	This concern still exists.	<b>Low.</b> Initial high expectations were been replaced by a degree of realism, and recognition of what was achievable in a project of this nature.
P.R9. Problems with the efficient disbursement and management of the FA budget and funding process.	This concern has now been resolved.	<b>Low.</b> Problems existed in 2007 and 2008, but improved management is now believed to be in place.
P.R10. IWRM should cover both water quantity and water quality management in an integrated or combined manner. There is little project content on water quality issues and this could establish an incorrect impression in some that IWRM pays little regard to water quality.	This concern has now been resolved partly.	<b>Low.</b> This is still believed to be a shortcoming of the Project. Final documentation has drawn attention to this gap, but has focused on producing materials useful for other aspects of IWRM

### 5.1.3 Central Case Study

<b>Project Memorandum identified Risk</b>	<b>Status at project start</b>	<b>Final status</b>
CCS.R1. Insufficient engagement of CCS with organisations and bodies that should be the recipients of the dissemination programme of the project;	This concern still exists but is being addressed as per the mitigation measures identified in the Inception Report.	<b>Realised.</b> The level/form of counterpart staff for CCS activities is limited and impacted on the levels of actual and potential achievements of the CCS (see SMR4* and P.R6).

Inception Report 'concern'	Status at project start	Final status / Impact
CCS.R2. Insufficiently effective overseeing of the provincial case studies in order to maximise their worth for the CCS and hence the project as a whole;	This concern still exists but is being addressed as per the mitigation measures identified in the Inception Report.	<b>Medium.</b> The level of counterpart staff available for CCS activities has continued to be limited (see above). This has been alleviated slightly by the involvement of two professionals, Ms Liu Xinai and Mr Zhang Haitao who joined the CCS in June 2007 in support of the Project Director Mr Wang Guoxin (see SMR3* and P.R6).
CCS.R3. Inability for the central level domestic consultants or the international consultants to achieve adequate rapport and credibility of worth in the eyes of the provincial level consultants. This could impair feedback from the provincial case studies.	This concern is now seen to be small only.	<b>Low.</b> Co-operation between the international consultants and the provincial level consultants is not believed to have created any major impediments although it has not been without some difficulties. (However, this has been mainly due to the large geographical coverage of the project, language issues and the intermittent nature of the international consultants inputs. Local consultants also have input constraints).

#### 5.1.4 Case Study G1: Shiyang River Basin IWRM Planning

Project Memorandum identified Risk	Status at project start	Final status
G1.R1. Stakeholder acceptance of the role of the SRBMB – in terms of the approval of a new mandate for the organisation;	This concern has been reduced greatly with issuing management regulation of SRBM.	<b>Risk not realised.</b> Mandate of the organisation has been approved. (SMR4*).
G1.R2. Inability to access all data sets could result in the WRA being considered to be insufficiently accurate for management decisions; the situation is complicated in as much as a large amount of the hydrological data required by the SRBMB is held by the Hydrology Bureau, the domestic consultant... will this facilitate the establishment of a strong and comprehensive data base within the SRBMB?	Considerable case study activity has been undertaken to ensure that this risk is kept to a minimum.	<b>Medium.</b> Sufficient data has been made available to the project to enable project deliverables to be produced. However, it took longer than originally envisaged to get some of the data. There are still issues of getting up to date data, and this is likely to continue, although it is easier for local organisations to obtain information for their own use than it is for them to share the data with outside organisations.

Inception Report 'concern'	Status at project start	Final status / Impact
G1.R3. Stakeholder acceptance of the role of the SRBMB – in terms of co-operation and involvement at participatory workshops;	This concern has been reduced greatly with issuing management regulation of SRBM.	SRBMB is now officially established together with a river basin management commission. Stakeholder contact is now required to firmly establish the SRBMB as the focus of water management in the river basin. Although improving this is a long term issue for the SRBMB.

### 5.1.5 Case Study G2: Water Saving Societies in Wuwei and Jinchang

Project Memorandum identified Risk	Status at project start	Final status
G2.R1. Wuwei Municipal government approval for model project for testing water saving technology;	There is keen interest in the water saving trial concept. However, there is a desire by all local parties to make such trials as comprehensive as possible, encompassing not only non-structural measures but also structural interventions.	<b>Not realised</b> This concern is now dispelled (see SMR4*).
G2.R2. Wuwei Municipal government approval for model project testing water resource fees and administrative service fees;	Keen local interest on having a thorough assessment of fee types and modes of implementation. Risk of project output delivery now seen as low.	<b>Low.</b> Fee levels have been increased during the course of the project. Several workshops and reports have covered this topic. Few changes to the structure of charges has taken place, during the project – which focused on explaining the basis for improved charging systems.
G2.R3. Jinchang Municipal government approval for model project for full cost recovery of service delivery by water management stations (Jinchang);	The status is as above.	<b>Realised.</b> Full cost recovery including recovery of capital investments is not seen as a realistic approach considering the low farm incomes.

Inception Report 'concern'	Status at project start	Final status / impact
G2.R4. Failure to effectively integrate the water saving programme activities already planned by the municipalities under a government programme with the plans of WRDMAP;	Concern now seen to be low level.	<b>Not realised.</b> It is believed that project activities have influenced local non-project programmes and activities.

G2.R5. The separation of activities between Jinchang and Wuwei resulting in lost opportunities and reduced project impact and capacity building;	Concern now seen to be low level. The project and consultants have been able to provide separate training and project related activities to Wuwei and Jinchang. Wherever possible integration and joint training is provided.	<b>Risk not really realised.</b> However, co-operation between the two municipalities could be better.
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### 5.1.6 Case Study G3: Improved Water Management in Minqin

No risks are defined in the Project Memorandum Logframe.

Inception Report 'concern'	Status at project start	Final status / impact
G3.R1. The type and form of the WUAs supported in the execution of the concept of broader ownership of water management activities needs to be such as to facilitate the changes required.	This concern was justified and concerted efforts are being made to establish effective WUAs with good representation of farmers. Visits to the Pro Poor Rural Water Reform Project and use of training materials and consultants have been directed at maximizing cross fertilization of useful approaches. However, the low level of project investment in WUAs is seen as a project impediment locally.	<b>Not realised.</b> Much effort has been made by the project to address this issue. It is believed that many obstacles have been overcome and stakeholders see the need for a broader role for WUAs in water saving.  This risk has not been realised. (see SMR4*)
G3.R2. There has seen to be a focus on the part of the counterpart organisation on technological 'fixes'. Understandably, if these are seen to be the only solution then further support in this area is a natural request.	Concern was justified and discussions are currently taking place to try to resolve through the introduction of local funding to support case study activities.	<b>Risk not realised.</b> Technological "fixes" are still a local level focus. Provincial level extension activities and FA funding will provide some support in this area.  However, non-technological / structural interventions for water saving are now better understood and accepted by water managers.

### 5.1.7 Case Study L1: Chaoyang (Upper Daling) IWRM Planning

Project Memorandum identified Risk	Status at project start	Final status
L1.R1. Poor response to the proposals for the approval of a Stakeholder Consultation Plan.	Stakeholder Consultation Plan has been prepared in a consultative/ participative manner and approved. There is still a need to engage stakeholders through IWRM on a	<b>Low.</b> IWRM Plan delivery is delayed until April 2008 (Milestone 21). The original delivery expectation of July 2007 is considered not to reflect

sustainable regular basis.

due process (see SMR4\*).

Despite much effort stakeholder consultation is probably not being implemented at the level anticipated. The IWRM Plan has provided a focus for more consultation and improvements have been realised.

### 5.1.8 Case Study L2: Integrated abstraction-discharge permitting. Chaoyang.

Project Memorandum identified Risk	Status at project start	Final status
L2.R1. EPB might have conflicting priorities and lack in-house resources to enable the improvement of permit administration and enforcement.	Initial activities in achieving collaborative working between WAB and EPB have been seen as successful. However, all parties appreciate that continued efforts are required to ensure that this is a sustainable development.	<b>Medium.</b> Progress in this area in 2008 has been good but there are many factors that impact. Effluent discharge permitting is actually in it's infancy in Chaoyang and with the creation of the MEP, there seems to be additional complications affecting WAB-EPB co-operation. EPB do lack resources as well. (see L2.R2 below)

Inception Report 'concern'	Status at project start	Final status / impact
L2.R2. Data sharing not achieved between WAB and EPB. (For the establishment of a 'common' GIS between WAB and EPB there will need to be data sharing and an understanding of each organisation's needs and use for the data).	Data sharing has been achieved. Memoranda of Understanding have been signed by WAB and EPB, one of which relates to data sharing.  Concern is now seen at a low level.	<b>Low.</b> The risk of insufficient co-operation / data sharing between WAB and EPB has significantly reduced through the use of MoUs and high levels of encouragement by the project. The concern is whether the co-operation will continue after the end of the WRDMAP (see SMR3 and SMR4*).

### 5.1.9 Case Study L3: Water Tariff Reform and Water Savings. Beipiao

No risks are defined in the Project Memorandum Logframe.

Inception Report ‘concern’	Status at project start	Final status
L3.R1. Resistance by WSC to presenting the required financial information pertaining to the operation of the organisation.	Financial information has been forthcoming, and more anticipated. Concern is now seen to be low level.	<b>Risk not realised.</b> There has been some data deficiency but this has not seriously affected the outcome.
L3.R2. Any new tariff structure designed may either be rejected by the price bureau, but even if accepted it may be difficult to introduce during the project lifetime.	Too early to assess the appropriateness of this concern.	<b>Risk not realised.</b> Tariff increases have been made during the course of the project. It is believed a new stepped tariff has been approved.
L3.R3. Operating within and upgrading the system left by the mine may render it impossible to make the Beipiao Water Supply Company (WSC) cost-effective in any meaningful way.	Too early to assess the appropriateness of this concern.	<b>High risk.</b> The fact that government financial support is there makes it difficult to realise best commercial practice financial management.
L3.R4. Unrealistic expectations within the three urban communities of what can be expected from project delivery and implementation.	This concern was justified and every effort is being made to establish meaningful dialogue on this issue with the local community involved.	<b>High risk.</b> Unrealistic expectations have now, with time, changed to a positive acceptance of reality. (It is not believed the project activities have delivered what was expected. This is believed to rest primarily with the inertia of the WSC).
L3.R5. Availability of financial resources and budget allocations within the WSC to fund the leak repairs that would maximise the effectiveness of the leak detection and remediation programme	All parties have been made aware of this project ‘concern’. Reassurances have been given that no problem exists. The next six months of project activity will be testimony to this.	<b>High risk.</b> The WSC has mobilised financial resources to repair leaks in the main pipe distribution system – but to a very limited extent. There has been a reluctance to repair leaks in apartments (not a WSC responsibility?) and a desire to increase the scope of FA investment

\* SMR3 and SMR4 show risks that were identified in the 3<sup>rd</sup> and 4<sup>th</sup> Six Monthly Progress Reports.

### 5.2 Changes in risks

The project memorandum listed some risks, and a few more were identified in the inception phase and subsequently. No major new risks have been identified during the final year, and a number of existing risks have reduced as the case studies have come to completion. However, some of the risk will continue to apply for the continued implementation of activities initiated through the project.

The analysis in the tables above shows that there is a growing appreciation by government agencies of the need for demand management and more recognition of the need to mitigate the impact of this on poor people.

Expectations of what the project can do / could have done in a number of areas are now more realistic.

The risk of not getting sufficient counterpart involvement in the production of project outputs remained critical throughout the project. The risk was mitigated in 2007 by the assignment of two additional staff to the CCS and the addition to the team of a national expert from the international consultant's firm, but new problems emerged in 2008.

Early in 2008, the Sichuan earthquake was a priority issue that diverted counterpart staff from project work. Early in 2009 the government's proposed massive investment programme in infrastructure in response to the global recession seems likely to absorb a considerable amount of time from project activities – notwithstanding that some of the proposed investments may be aimed at improving the use of limited water resources. This initiative has affected the availabilities of both counterparts and national level consultants.

An associated risk is that with the involvement of local experts being more problematic, more of the CCS Documentation is being prepared by the international consultants than was originally envisaged. This has impacts on the quality and style of the documents after translation into Chinese. The intention was for the international, the Beijing based consultants and the CCS counterparts to work together to prepare the CCS documentation. Despite all efforts to avoid this, most documents have been prepared initially by international consultants, but with as much involvement by national consultants as is possible to ensure that the style and quality of the documents will match the needs of local professionals at the provincial, municipality and county levels.

A risk that emerged during the project was the currency exchange rate between the £ Sterling and the Chinese RMB. The project budgets and support consultancy are denominated in £ Sterling, the adverse changes in the exchange rate means that there is some 30% to 35% less monies available when denominated in Chinese RMB. This has affected both the FA Budget and local activities of the Consultants. This impacts on the involvement of the Beijing based consultants, aggravating the problems already mentioned above.

## 6 Overall Conclusions and Recommendations

### 6.1 Conclusions

#### 6.1.1 Provincial case studies

Project achievements at the provincial case study level are considered to be good by most accounts. There has been very positive achievements demonstrated and encouraging feedback particularly related to technologically based capacity building activities. This has clearly been a successful route for the introduction of the concepts and messages associated **with integrated water resources management (IWRM) and water resources demand management (WRDM).**

A more comprehensive analysis of the achievements and conclusions of the provincial case studies was presented in the 2009 M&E report. This section briefly lists some of the main areas where good achievements were made at provincial level. These include:

- water resources modelling work and GIS. The project has introduced Water Resources Simulation Modelling, Water Allocation Modelling, Water Quality Modelling and PipeNetwork Modelling into counterpart offices effectively in different part of the project area, although there is still scope to use GIS more extensively for improved water resources management.
- Improvements in groundwater monitoring and the understanding of various aspects of groundwater management have also shown good progress. This has been an area where there was previously much less knowledge as compared to surface water resources management.
- inter-sectoral co-operation through data sharing, mainly through the use of Memorandums of understanding to enable data sharing for specific instances.
- establishing a working relationship between the Environmental Protection Bureau (EPB) and the Water Affairs Bureau (WAB) in Chaoyang Municipality (Liaoning Province), in relation abstraction permit information and effluent discharge information and establishment of a shared GIS and water quality model for parts of the Daling River and tributaries.
- increased stakeholder consultation and participation in improving water resources management
- Addressing water saving activities through the pilot demonstration areas in Gansu (Case Studies G2A and G2B) and Liaoning (Case Study L3). Although relatively little success was achieved in terms of actual water saving, given the constraints of the project, the opportunities for water savings have been demonstrated and the knowledge, skills and equipment left behind by the project can be used to good effect.
- In the context of water saving in agriculture, the project has invested considerable time and effort in providing support to WUAs, including development of training activities as well as improving institutional arrangements. These have led to more effective WUAs as well as enhancing their role in water saving. Training materials prepared under the project have been used in adjacent areas and could be adopted more widely.
- The Project had considerable involvement in the issue of water rights, water abstraction permits and water allocation in the Shiyang River Basin. The project has been involved in detailing this entire process and has in addition assessed the socio-economic impacts and implications of what is taking place. The project is assisting in the development of management guidelines for the whole process. It is believed that this level of 'complete' water resources management is seen to be at the leading edge in China.

- The project has supported an innovative approach using simulation modelling and the formulation of flexible water allocation rules to improve the practice of conjunctive use of surface water and groundwater is being implemented in a concerted approach of optimising the use of water in the water stressed area of Minqin County.
- Drought management planning in Chaoyang in Liaoning Province has been significantly supported by the project and specific plan for the municipality has now been approved by government
- The project has made good progress in relation to analysing the use of economic tools and recommending improvements Water Resources Fees, Irrigation Service Charges and Urban Water Utility Water Tariff Design

Overall, the provincial case studies achieved most of their targets and objectives, within the limitations imposed by the amount of time counterpart staff could devote to these tasks, given their current workloads.

These conclusions provided a good basis for the establishment of the messages for the dissemination programme of the Central Case Study.

### **6.1.2 Central case study**

Good progress was achieved by the Central Case Study through the preparation of Thematic Papers Advisory Notes on different water resources management topics, both based on studies of Chinese practices and international practices. These have been summarised into two major overview documents (OV1 - IWRM best practice, and OV2 - water demand management: an international perspective), and a further set of three books prepared by Tsinghua University on demand management (covering policy level recommendations, practical techniques, and public awareness).

The production of the documentation has been limited by the overall workload in the Water Sector in China, which has severely limited the availability of both counterpart staff and consultants. Despite these constraints (as well as budgetary restrictions) all documents have been completed on schedule.

It was not possible to make as much progress on some regulatory and legislation issues as was envisaged under the water law promotion programme. Nonetheless, it is believed that some aspects of the provincial activities have influenced policy and decision making even at the central level. For example, the work the project has produced on water charges and resources fees may have influenced the recent Ministry document on water resources fee management ('Measures for Water Resources fee Collection and Management' MWR 2008 No 79).

The series of nine conferences held in March-May 2010 were a very successful in disseminating key findings of the project and draft copies of CCS documentation to representatives of all mainland provinces and autonomous regions, and all river basin commissions. Feedback from these conferences enabled minor final adjustments to the documentation, which will be issued in final form at the project completion conference in June and made available in electronic form on the MWR website.

Informal KAP surveys at the early conferences and collation of feedback from all conferences indicated that almost all participants found the conferences and guidance material useful and enhanced their knowledge of the subject in ways in which they would be able to put into practice.

Although the outputs were believed to be very useful, a major concern expressed at the conferences was the availability of the resources needed to build capacity and improve ways of working to make them more effective for water resources management rather than development. The material produced by the project is, however, strongly aligned with the Minister's speech highlighting the need for demand management. The documentation should help in implementation of this.

## **6.2 Recommendations**

As the project is now essentially complete, this section makes recommendations for use of the project outputs and ensuring the sustainable application of the approaches recommended by project, rather than for further activities within the project. These recommendations are based on the project experiences, and reflect particularly observations made by participants during the final conferences.

The guidelines presented in the CCS documentation are, in general, all in line with the current national priorities for water resource management, and it is recommended that they should continue to be disseminated widely and their use encouraged, particularly at Province, Municipality and County levels.

There is considerable enthusiasm for enhanced skills and equipment in advanced techniques, computer applications, etc related to water resources management. This matches national priorities for technologically advanced management, and it is recommended that sufficient time and resources are allocated for capacity-building in the use of these techniques. Where pilot projects are set up, they should be used as a basis for dissemination of practical applications, rather just demonstration of the ideal.

New organisations, such as WUAs, need far more support than is normally provided. Although this is perceived to be too expensive, it is much cheaper than the cost of infrastructure. The comprehensive approach recommended through this project is likely to make WUAs much more sustainable and effective.

There should continue to be rigorous assessment of the true implications of all new management measures, in terms of the resources (and incentives) needed to implement. Water rights, abstraction permits etc, for example, require a lot of administration and need to be based on sound data. It should not be assumed that the existing institutional arrangements are fully adequate to cope with all changes envisaged. Procedures should continue to be simplified and adapted to suit requirements, but without compromising the core objectives.

A lot of material was produced initially by international consultants and then translated and adapted by national consultants. It is possible that the key messages could be presented in interesting or informative ways. This may require continued adaptation and updating of some of the documents, and it is recommended that this is done as needed. This must be driven by the Ministry of Water Resources, and is likely to increase the acceptability and usefulness of the documents. The use of a well designed web-site is recommended as the main route for dissemination and for keeping the materials accessible and up-to-date. This could be linked to the use of the MWR Weekly Newspaper 'China Water Resources News' [[www.chinawater.com.cn](http://www.chinawater.com.cn)] could be a useful route.

In addition to the formal CCS documentation, a large body of training material has been prepared under the project. This should also be used and adapted for use at all levels, as needed. Those who have been trained as trainers under this project should be considered for provision of similar training, or training of trainers in other areas. This project has gained considerably from visits to other areas, and the case study areas can in turn be useful locations for further visits.

## Appendix A Checklist for the KAP Survey 2010

Name: \_\_\_\_\_ Organisation: \_\_\_\_\_ Position: \_\_\_\_\_

Awareness about WRDMAP

Date:

Do you know about WRDMAP? If so, what has it been doing?

What do you know?

Did you know about IWRM before?

Have you learned more as a result of WRDMAP?

If yes: What have you learned as a result of WRDMAP?

Do you think you now have a good understanding of IWRM?

If not, to what do you not fully understand?

Did you know about WDM before?

Have you learned more as a result of WRDMAP?

If yes: What have you learned as a result of WRDMAP?

Do you think you now have a good understanding of WDM?

If not, to what do you not fully understand?

Since WRDMAP started, have you also found out about IWRM or WDM from other sources apart from WRDMAP? If so, what sources? What have you found out?

Do you make use of this knowledge?

Do you now use what you have learned about IWRM / WDM in your work? If yes, please give examples.

How useful is this? What have been the benefits?

Do you expect to make more use of it in future? If so, please give examples.

If you do not now use IWRM /WDM in your work, do you expect to use it in future? If yes, please give examples.

Limitations on what you have learned

Are there any factors that limit your use of what you have learned? If so what are these?

Do you think the idea of IWRM has limited potential (i.e. not all IWRM tools are useful) for application in your department or in China as whole? If so, which aspects of IWRM has limited potential and why is this?

Do you think the idea of WDM (i.e. not all WDM tools are useful) has limited potential for application in your department or in China as whole? If so, what aspects of WDM has limited potential and why is this?

**Effectiveness WRDMAP approaches in transferring knowledge**

How did WRDMAP provide you with information to improve your knowledge on water management issues?

	Extent that attended these events or saw docs.	How useful was this as a means of getting information?
Training courses		
Workshop or meeting		
Written guidelines and other documents		
Website		

Rating of different aspects of improved water management in terms of importance

	Rating 1 to 5 (1 = low, 5 = high)	
Participation by a range of different stakeholders		
Multi-sector approach		
Demand management		
River basin planning		
Cooperation between different agencies.		
Take account of needs of water users		