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# Design of ET-Based Water Rights Administration System for Turpan Prefecture of Xinjiang China



## **Design of ET-based Water Rights Administration System For Turpan Prefecture of Xinjiang China**

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## Abbreviations and Acronyms

AAA	Analytical and Advisory Assistance
ARA	Authority, Responsibility, and Accountability
CU	Consumptive Use
DFID	Development for International Development (UK)
DRC	Development Research Center MWR
ET	Evapotranspiration
HWRC	Household Water Rights Certificate
IDD	Irrigation and Drainage District
IRBM	Integrated River Basin Management
IWM	Integrated Water Management
IWRM	Integrated Water Resources Management
JBIC	Japan Bank for International Cooperation
KM	Knowledge Management
KMI	Key Monitoring Indicators
KPI	Key Performance Indicators
MCA	Ministry of Civil Affairs
MER	Monitoring, Evaluation and Reporting
MES	Monitoring and Evaluation System
MIS	Management Information System
M&I	Municipal and Industrial (water uses)
MWR	Ministry of Water Resources
NDRC	National Development and Reform Committee
PAD	Project Appraisal Document
RIR	Rights, Interests and Responsibilities
RS	Remote Sensing
SIDD	Self-Managing Irrigation and Drainage District
SPI	Supporting Performance Indicators
TAC	Total Amount Control



TCC	Total Channel Control
TT	Task Team of the Project
WB	The World Bank
WPP	Water Partnership Program
WRAS	Water Rights Administration System
WRC	Water Rights Certificate
WSC	Water Supply Company
WSFPC	Water Supply and Fee Payment Contract
WUA	Water User Association
WWP	Water Withdrawal Permit
WWPS	Water Withdrawal Permit System
XTWCP	Xinjiang Turpan Water Conservation Project
XUAR	Xinjiang Uygur Autonomous Region

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## Executive Summary

1. China's increasingly serious water crisis threatens to become a potentially limiting factor of future economic growth and national development.<sup>1</sup> In addition, some regions of the country have been severely affected by natural disasters such as droughts, floods, and earthquakes of an unprecedented magnitude that have further challenged water security. As a result, this impending crisis is not simply about the adverse impact of nature and climate change - it is about water management issues that are more prominent in arid parts of the country. It is a multi-dimensional crisis concerning quantity and quality of surface and ground water, and the non-homogeneity of water in space (within a river basin and administrative areas) and time (seasonal and random). Advanced engineering capacity can often help address water problems on a national, basin or local level, but without a good water resources management, these solutions are often applied at the expense of the environment, with a corresponding adverse impact not only on physical and biological ecosystem but also on the social aspects of human population.

2. Turpan Prefecture, located in Xinjiang Uygur Autonomous Region, has a very arid climate. However, the naturally occurring scarce water resources have been exacerbated over the last decade by rapidly expanding commercial agriculture, particularly the irrigated agricultural development. This has led to a drastic overdraft of groundwater in Turpan's closed basin, threatening the sustainability of current water uses as well as the health of the ecosystem. Thus, the water crisis has become an increasingly serious challenge for the government's current water allocation and management system.

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<sup>1</sup> Economic development and growth being limited by water availability is not something new in the world. In the USA and particularly in Colorado and California, legislation has been adopted on "limits-to-growth" and/or requiring developers to provide proof of sufficient water (water rights) for their project needs, approved by the state water authority.



3. The World Bank (WB), at the request of local and national leaders, agreed to provide loan funds and technical assistance and oversight to implement a seven-year (2010-2016) Xinjiang Turpan Water Conservation Project (XTWCP) to address the water scarcity, security and management problems of Turpan Prefecture. The project will introduce a new approach to water resources management in water-stressed Turpan Prefecture - an evapotranspiration (ET) <sup>1</sup> - based integrated water management approach for its largest water user: irrigated agriculture.

4. There are five project components of the project. All five components are interdependent as explained in the project appraisal document.<sup>2</sup> The ET-based Integrated Water Management is one of the important components of the project, primarily for irrigated agriculture in the Turpan Basin, designed to implement measures for the management of consumptive water use on a basin-wide scale, and to establish a new and functional ET-based water rights administrative system (WRAS) consistent with China's 2002 Water Law for the allocation of water use based on consumptive use. Where necessary, it will establish compensation programs for retirement of farmlands from cultivation.

5. Eight special studies under the component complement and supplement the XTWCP with close linkages with each other, of which this research report is the seventh. The purpose of this report is to present the design, framework and pilot implementation of an ET-based water rights administration system (WRAS)

for this arid and critically water scarce area of Xinjiang. Nevertheless, this report is only a part of the integrated effort undertaken by the five components and eight special studies of the project, and thus will not answer all the questions or address all the complicated issues involved in implementing the project objectives.

6. In designing the framework of WRAS, the aim is to make the process of water rights administration in Turpan practical, functional and understandable, particularly for agricultural water use allocation based on evapotranspiration (ET) - commonly referred to as consumptive use (CU) <sup>3</sup>. The proposed ET-based WRAS consists of three sub-systems: (a) water rights allocation, (b) water rights reallocation / transfer, and (c) water rights supervision. The WRAS utilizes existing laws, organizations and instruments (e.g. water permit forms), with modifications as necessary.

*Why the current water rights system does not work; and why an "ET-Based WRAS" is needed for Turpan Prefecture.*

7. In 1988 China adopted a wide-ranging national water law that mandated water resources planning, development and management, but which was "unified" with the administrative boundaries of provincial to local governments - a water management concept that defied satisfactory implementation. It also introduced the water withdrawal permit system (WWPS) which allowed diversion of water only by permit holders for intended uses.<sup>4</sup> In

<sup>1</sup> ET is a term that is used for the consumptive use of water in agriculture. It describes the sum of the amount of water that is evaporated and transpired into atmosphere. Evaporation accounts for the movement of water from the ground surfaces to the atmosphere, including from the soil, canopy interception, and water bodies. Transpiration accounts for the movement of the water from plant leaves to the atmosphere.

<sup>2</sup> The project background, components, objectives and schedule are explained in the Project Appraisal Document (PAD), as well as the interdependency of each of these components and studies. Of the eight special studies, study number 7 is on the development of ET-based Water Rights.

<sup>3</sup> The concept and approach on ET and consumptive use of water have been addressed in the World Bank's AAA studies Volumes 1 and 2 of the "Study on Water Rights Administration in China", and also addressed in detail in the PAD of Xinjiang Turpan Water Conservation Project as well as relevant research papers on the subject published on the internet and newspapers.

<sup>4</sup> In the case of irrigated agriculture, government institutions called irrigation and drainage districts (IDDs) that are closely attached to provincial or lower level water resources departments or bureaus are the permit holders. Some permits are held by farmer water users who divert directly from rivers or from pumping groundwater and which are now often organized as water user associations (WUAs) promoted by the central government.



2002, a substantial revision to the Water Law strengthened how water resources are planned, managed, administered and supervised at the basin level through combined management of river basin and administrative boundaries.<sup>1</sup> The 2002 Water Law strengthened the WWPS and added the “user-pays” principle for surface and groundwater diversions.<sup>2</sup> The law requires that diverted water should be calculated based upon beneficial use requirements and the local conditions.<sup>3</sup> Subsequently, a number of important concepts and plans were proposed based on the revised Law. These included total amount control (TAC) of water resources; water allocation, allotment and quota planning and plans; clarified comprehensive and special master water plans at river basin at inter- and intra-provincial administrative levels; and promotion of water savings and creation of a water-saving society, etc.

8. However, with these universal legislative mandates the Turpan Prefecture water bureau has not solved the water allocation and management problems in this area but has arguably contributed to the problems. The technical, administrative and inter-agency jurisdictional issues have prevented the WWPS from being an effective tool to manage the water resources in this basin. This is because the allocation of water and subsequent

enforcement of the allocation based on diversion (or withdrawal) functions poorly. This leads to increased water consumption, thus causing over-use or misuse of water and declining groundwater tables. As a result, many rivers and lakes have dried up, seriously degrading the environment. In practice, the current system exacerbates the problems of overuse and misuse.

9. Under the current traditional approach for agricultural water management, the amount of water to be diverted under a permit is, in theory, based upon the needs of off-stream water uses (irrigation, municipal, industrial, etc.), and takes into account the spatial and temporal aspects of water at the point of diversion and conveyance losses. During the process of water use, every effort is made to “save” water by reducing conveyance losses, and then to divert this “saved” water to expand irrigated areas or to urban industrial and domestic uses based on the needs of off-stream water uses.

10. Under this traditional approach water is “saved” by reducing supply and application losses, for example by lining canals, using pipes and installing sprinkler or drip irrigation. This reduces the amount of water that is “lost” when measured at point of diversion to point of delivery, as well as field “losses”. Many people then consider these amounts to be water that is

<sup>1</sup> The 2002 revision of the water law made implementation possible of China’s 1994 White Paper endorsing the “Agenda 21” adopted at the 1992 UN Water Conference in Rio de Janeiro, Brazil that ushered in the integrated water resources management (IWRM) approach. China was the first nation to endorse the Agenda 21 proclamation including two important aspects: the “basin-management concept” and “integrated water resources planning and management (IWRM) at the basin level” or more correctly in China referred to as “integrated river basin management” (IRBM). Also in 1994, the World Bank introduced on a pilot basis under the Yangtze Basin Project, the self-financing/managing irrigation and drainage district (SIDD) concept that included farmer self-owned and operated water user associations (WUAs) and, where appropriate, water supply companies (WSCs). After more than a decade of piloting WUAs under many WB and DFID projects, the central government endorsed the WUA concept to promote farmer water user participation in local water management, particularly in adopting water savings practices.

<sup>2</sup> Water resources fees are to be paid by all water diverters (permit holders) while requiring the payment of water charges for costs involved in delivering water for use by a water supplier to be paid by the water users. Similar water permit systems are universal, but more often with water users being the permit holders; hence they are responsible for diversion and delivery of water to place of use often resulting in a higher rate of irrigation efficiency to insure greater beneficial use, prevention of waste and lower costs.

<sup>3</sup> Under the revised WWPS the State Council (SC) issued SC Decree 460 in 2006 entitled “Regulation for Water Drawing Permit and Collection and Management of Water Resources Fees” that provided details on implementing the permit system and supplemented by Ministry of Water Resources’ orders, regulations and forms. Accurate, timely and accessible water data and information is highlighted as being essential to water planning and management. Provincial governments quickly adopted implementing legislation for the new 2002 water law at their levels, and Xinjiang Uygur Autonomous Region (XUAR or “Xinjiang”) was amongst the first to adopt legislation to implement the water law, and supporting State Council decrees and MWR regulations, in accordance with their water resources, needs and environmental conditions.



available to expand irrigated areas or to transfer to domestic or industrial uses. However, this water is not totally lost nor are the savings "real". This is because most of the water that "escapes" returns to the water system through run-off or percolation, maintains water table levels, and sustains healthy ecosystems. During the last 10 years, most of this "saved" water has been diverted to expand irrigated areas in Turpan Prefecture and this has caused serious over-abstraction of groundwater and degradation of local ecosystems.

11. A special report on water in *The Economist* (May 20, 2010) noted, "In truth, though, such water is not all lost: much of it returns to the aquifers below, from where it can be pumped up again. This involves a cost, in energy and therefore cash, but not in water. The only water truly lost in a hydrologic system is through evapotranspiration (ET), since no one can make further use of it once it is in the atmosphere."

12. To achieve genuine savings, measures should be taken to cut non-beneficial ET or reduce ET by reducing irrigated areas or producing food with less transpiration. Growing more crops over a wider irrigated area or an increase of cropping intensity over the same area raises the level of ET. In many water-scarce areas in the world similar to Turpan Prefecture, policies aimed at reducing the use or drawing of water have actually resulted in increased groundwater depletion. For example, in the Upper Rio Grande basin shared by the United States and Mexico, measures designed to make irrigation more efficient have increased crop yields upstream, which in turn have raised the level of ET. The most recent example was from Murry - Darling Basin of Australia, an increase in local "irrigation water use efficiency" - which is now being encouraged by government subsidies - resulted in an increased proportion of abstractions

being consumed (as evapotranspiration), with a detrimental impact on downstream availability recently. In many other water - scarce areas in the world that are similar to North China such as in Mexico, Egypt and Yemen and so on, policies aimed at the increased water use efficiency without restrictive conditions have actually increased groundwater depletion.

13. The WWPS remains focused on water diversions or withdrawals of surface water and groundwater to meet the demand for "off-stream" uses, with the permit held only by the party that withdraws the water. Consumptive uses or evapotranspiration (ET) targets are not quantified because the allocation criteria to determine the "beneficial use" needs of water uses and not all water users are included as the "owners" of the "water right" represented by an approved permit.<sup>1</sup> Although the WWPS may work in some areas of China, particularly the more humid and wet regions, it is not very successful in many of the more arid or water scarce regions due to increasing water demands, or water pollution. In areas such as in the Turpan and Tarim river basins limited surface water and receding groundwater tables, particularly the resulting degradation of ecosystems, have caused great concern to both water managers and water users. Although many new regulatory measures have been adopted by provincial governments the answer to the first question "why the current water rights system does not work?" is that water management problems persist because the amount of water allocation is focused on the withdrawal, rather than the consumptive use of water, and there is no direct water management or administrative link between the two.

14. This is the rationale to the second question "why an ET-based water rights administration system is needed in Turpan Prefecture?" For

<sup>1</sup> The law requires water use contracts between permit holders and farmer water users. However, this is not consistently followed and still does not insure a "right" in the water users (WUAs in most irrigated agricultural areas). Only where the water users are also included as permit holders is this most likely. From an egalitarian point of view, the intention of the policy is for the permit holder to preserve the interests of the water users, and many if not most, permit holders (IDDs) attempt to operate in the best interest of their water users.



irrigated agriculture, the most accurately expressed and proven approach is to determine and deliver the consumptive use or ET requirements, plus unavoidable conveyance losses. An inseparable link<sup>1</sup> must exist between the volumes of water diverted to meet the timely ET requirements in order to accomplish “real” water savings. If implemented and administered accordingly, this will greatly facilitate addressing the specific problems of water management in Turpan Prefecture’s closed basin.

15. To implement this ET approach in Turpan Prefecture, it is necessary to enrich the existing water permit system and ensure the approach is carried out through monitoring and supervision. Previously, the standard approach was to allocate water amounts for withdrawal as the criteria for permit approval, provided water saving technology was adopted regardless of the consequent over-use of water or expansion of consumptive uses. The ET-based approach links water consumptive use requirements to water withdrawal allocations<sup>2</sup>.

16. Several terms used in this report need brief explanation or clarification to place the ET-based WRAS in perspective. These are water rights, evapotranspiration and consumptive water

use. The term “water rights” is a relatively new concept in China and is being increasingly used by government and many disciplines. Universally, water rights are “usufructuary rights” or “rights to use water”.<sup>3</sup> Legally in China, a water right is limited to a right to divert water. After the 2002 Water Law was enacted, it became acceptable to refer to the rights to divert water under the WWPS as a “water right” that implicitly included the right to proper delivery and beneficial use<sup>4</sup>. However, under the new ET-based WRAS, the objective is to make the water diverters/suppliers and water users the joint holders of this “water right” as a transition with mutual and interdependent rights, responsibilities and accountabilities, taking into consideration the local and traditional conditions in China. “Consumptive water use” is defined as “water removed from available supplies without return to a water resources system (e.g., water consumed in manufacturing, agricultural processing, and food preparation that is not returned to a stream, river, and groundwater aquifer or water treatment plant).

17. Crop consumptive water use or evapotranspiration (ET) is the amount of water transpired during plant growth, plus the amount that evaporates from the soil surface and foliage in the crop area.<sup>5</sup> Experts use the terms “ET”

<sup>1</sup> This “link” refers to the connection between the total target ET at the basin level and the target ET at the field level for each of all water user groups after taking into consideration the other water needs for domestic and industrial uses and ecosystem restoration.

<sup>2</sup> The amount of water withdrawn from a local water source can be divided into two parts. (1) the amount of water consumptively used (ET), and (2) the amount of water that returns (or is recycled) via runoff or deep percolation to the local water system. When the water right (right to use water) is based (only) on the amount of water withdrawn, there is a built in incentive to consume as much as possible, and to minimize the amount of return flows.

<sup>3</sup> Partly because of the fugitive nature of water, this right to use water is different from property rights in land and personal assets that in most countries are considered “absolute rights”. Nonetheless, the water right is a real property right, a usufruct, and not a “lease” of water to use. In China, the state owns the water (like in Wyoming, USA and in many other countries) and holds it in “trust” for the benefit of the people. The State also has stewardship responsibility to make sure water is developed, used, managed and protected properly in the best interests of its society.

<sup>4</sup> These permits (water rights) for the vast majority of water used by irrigated agriculture are held by government or quasi-government entities (irrigation and drainage districts, village and township water committees, etc.) with no or limited rights in the water users. Likewise for city and urban water uses, permits are held by municipal entities and water is delivered to households and other municipal water users who (as customers) either pay for the use of water or its availability is terminated. Further, benefits from water conservation and savings by the users generally accrue to the permit holder and not the water users (except in marginally lower water charges) by making the “saved water” available for sale, transfer or reallocation. Some irrigation water users, especially for groundwater withdrawals, obtain WWP’s and thus are water right holders as diverter and user in a manner similar to most industrial water users.

<sup>5</sup> “Report for Congress: Agriculture: A Glossary of Terms, Programs, and Laws, 2005 Edition” by Jasper Womach found at <http://nconline.org/nle/crsreports/05jun/97-905.pdf>. Many states in the U.S. focus on water scarcity and the impacts of consumptive use, such as Florida, with consumptive use permits while Nevada and Wyoming are two arid states where demand requires careful water management of limited water supply. As noted in Water Consumption and Conservation-Water Uses and Sources in Wyoming compiled by Mike Manning, Karen VanDeburg, and Phil Cornella (2004) “Water usage can be thought of as either consumptive or non-consumptive. Consumptive water use refers to any water that is either evaporated, transpired, or incorporated into the growth of vegetables or other food products, the industrial and food processing, and the municipal water uses.” <http://www.angelfire.com/mi4/waterconsumption/index.html>



and “consumptive use” (CU) interchangeably. “ET is a term that is used for the consumptive use of water in agriculture. It describes ET as the sum of the amount of water that is evaporated, transpired and, to a small extent, incorporated into plant products. Evaporation accounts for the movement of water from the ground surfaces to the atmosphere, including from the soil, canopy interception, and water bodies. Transpiration accounts for the movement of the water from plant leaves to the atmosphere.”

18. Based on the results obtained from the World Bank’s Water Conservation Project (2000-2006), and GEF Hai Basin Integrated Water and Environment Management Project (2004-2011), recent improvements in technology enable ET to be measured relatively accurately from the basin level to a small area (30x30 meters) of irrigated agriculture. ET targets can be calculated that serve as the basis for allocation along with diversion of surface and ground waters. The target ET is the amount of water consumption, not water withdrawal. The target ET for irrigated agriculture will first be derived at the river basin level taking into consideration the balance among consumption for urban use, domestic use and ecological use (actual ET from ecological areas and elimination of groundwater overdraft), and then allocated to each of the WUAs and their water users at field level through local government authorities within the basin. The target ET allocated to a WUA will be converted into target withdrawal which the WUA could easily handle. Once a WUA receives its respective target ET, which would normally be much lower than its actual ET, it should reduce its actual ET to be lower than the target ET by carefully carrying out irrigation activities including cropping pattern adjustment, irrigations system design and improvements, and operations with irrigation scheduling while

increasing farmers' incomes, and even including reduction of irrigated areas, if necessary with compensation. This study proposes a design for the administrative system to help reach the above points that will be pilot tested consistent with the other pilot efforts of the project.<sup>1</sup>

19. The design of the strengthened “water rights administration system” based on ET or consumptive use of water was developed by the project’s task team (TT) working closely with the Development Research Center (DRC) of the Ministry of Water Resources (MWR). The design utilized the existing water withdrawal permit system and other features provided for under the 2002 Water Law, decrees and regulations, and compatible with or requiring slight changes or additions to Xinjiang and Turpan water legislation and implementing regulations. Every effort has been made to facilitate the understanding of the issues and design features by providing boxes, figures and text explanations or footnotes. It is hoped that this approach to water rights administration integrated with the other project activities will address and eventually resolve the acute water management problems of Turpan Prefecture and serve as a useful model for other regions of China.

<sup>1</sup> It is important to note that farmer water users and WUAs within the XTWCP area will have their internal distribution and on-farm water application systems improved thus enabling them to meet their crop water requirements based on the calculated ET allocations. The PAD for Turpan Water Conservation Project explains how the ET for the basin water balance to farmer household use level will be calculated, including reasonable conveyance and field losses and other sector water uses.





# Chapter I - Introduction

## 1.1 Study Background

1. China is facing a “looming water crisis” in the midst of unprecedented economic growth and national development for which water may become a limiting factor.<sup>1</sup> In addition, parts of the country have been affected by major natural disasters such as droughts, floods, and earthquakes that have a severe impact on water security. This “crisis” is not just about the adverse impacts of climate change, but also about water management issues that are more prominent in arid parts of the country. The challenge is a multi-dimensional crisis concerning the quantity and quality of surface and ground waters – and the non-homogeneity of water in space (within a river basin and administrative areas) and time (seasonal and random). Engineering advances can often help address water issues and problems at the national, basin and local, but this is often achieved at the expense of the corresponding environment. This also includes not only the physical and biological features but also the population of the local and national economies, especially the poorest water users.

2. Xinjiang, and Turpan Prefecture in particular, has a very arid climate with extremely scarce water resources. However, over the last decade water shortages have been exacerbated by rapidly expanding commercial irrigated agriculture, industry and municipal needs. This combination has led to a drastic overdraft of groundwater in the closed basin threatening current water uses and the ecosystem of the prefecture. This impending water crisis has already challenged

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<sup>1</sup> A limitation on economic development and growth because of water availability is not a new issue in the world. In the USA, especially in Colorado and California, legislation has been adopted on “limits-to-growth” and/or requiring developers to provide proof of sufficient water (water rights) for their project needs, approved by the state water authority.



the government's traditional water allocation and management system systematically applied under the 2002 Water Law. Urgent and effective action is necessary to prevent further widespread deterioration in all matters affected by water.

3. To manage water in a river basin in a comprehensive, integrated and realistic manner the sources, needs, diversions, uses and impacts on return flows and the environment must be accurately measured. The data and information must be accurate and timely to properly administer surface and groundwater in a comprehensive and integrated manner. This is especially important with the various types and areas of uses found in a closed river basin with a sound system of water allocation and accountability for dynamic decision-making.

4. The local and regional governments sought World Bank assistance in creating a project to address the water crisis of Turpan Prefecture. The Bank responded by designing a project directly oriented to the expressed needs and abilities of the Turpan Prefecture and its water bureaus, water suppliers and water users consistent with the existing water law and regulations.<sup>1</sup> This project built upon the World Bank's water management experiences in ET approach and technologies of the Hai Basin. It also incorporates the results from the Bank's AAA report on Study on Water Right Administration System, which focus on how to adjust to the administrative allocation and management of water within the existing water law provisions. Although beyond the scope of this special study, successful project implementation is contingent upon the interdependencies and coordination of this and

all other activities from the five components and other special studies.<sup>2</sup>

5. Essentially, this special report focuses on the design of a framework to implement the World Bank project's approach to improve the allocation and management of water in the closed basin of Turpan Prefecture's by concentrating on ET/CU as the basis for the water right with appropriate administrative modifications.

6. The report is structured into chapters and sub-topics to answer the questions of "where" (Turpan Prefecture), "what" (current status of water availability, needs and practices), "why" (because the current system of water allocation and management is not working), "how" (introducing and piloting the ET based water rights administration system consistent with other project activities) and "when" (over a project period of five years with notable progress to improving water management and ambient conditions that will be carried on through commitment of the government and water user stakeholders).

7. Thus, the six chapters of the report cover the following issues:

- Chapter 1 provides a background of the study and brief summary of its relations to the Xinjiang Turpan Water Conservation Project (XTWCP)
- Chapter 2 describes the water resources situation, developments and management with specific focus on the problems, constraints and weaknesses of the current water rights administration practices

<sup>1</sup> This project and this special study do not focus on any legal challenges that might arise from the proposed changes to water rights and water rights administration. However, every effort is being made to comply with existing national and provincial water legislation. In other words, the legal issues are secondary to implementing a water allocation system for all users and needs of water within the Turpan basin while achieving a basin-wide water balance. The project focuses on an effective and efficient "administrative system for water rights" and not necessarily a "defensible legal system for water rights". Legal issues that may arise will be addressed and appropriately resolved by the Turpan Prefecture government.

<sup>2</sup> To fully (assist with the) understanding of this report, it is suggested that readers review the Project Appraisal Document (PAD) to learn of the linkages between the five components and the eight special studies and how efforts have been made to integrate the innovative water management approach of water allocation base on evapotranspiration or consumptive use by the end user to relieve the financial burden through improvements to the delivery and on-farm water distribution systems and improved technologies.



- Chapter 3 explains why an ET based WRAS is appropriate to sustainably address the water management needs in Turpan Prefecture, the feasibility of the proposed approach drawing on similar experiences and legal/administrative conditions in the United States, and the benefits that are expected for Turpan Prefecture government, water users and the ecosystem
- Chapter 4 outlines the general and specific design of the proposed ET based WRAS framework with its three sub-systems set out in detail, and a discussion of legislative and administrative measures needed to support implementation of the proposed framework
- Chapter 5, describes the pilot plan to test the proposed WRAS and synchronize it with the other activities
- Chapter 6 concludes the report, including reasons why this ET based approach will work technically and administratively, and identification of various critical issues to ensure successful implementation of the project and the WRAS (these issues may or may not arise, depending on the progress of the project and the diligence and resourcefulness of the water bureau officials and water users in adopting and adapting the project activities)

## 1.2 Overview of Turpan Prefecture and Study Area

8. Turpan Prefecture is located in the east of Xinjiang Uygur Autonomous Region (XUAR) in the central part of Turpan Basin at the southern foot of Bogeda Mountain, an eastern branch range of Tianshan Mountain. It has a population of over 580,000 and covers a total area of 69,700 square kilometers accounting for 4.2 percent of the total area of XUAR. The prefecture is approximately 240 kilometers in length from

north to south and 300 kilometers across from east to west. High mountains slope down from the north with low lying areas in Turpan Basin. The central part of the basin is mostly below sea level with Lake Aiding (a saltwater lake) in the southeast of Turpan City being 154 meters below sea level—the lowest point of Turpan Basin, the lowest inland area of China, and second lowest area in the world. Turpan Prefecture consists of one city-county (Turpan City) and two counties (Tuokexun and Shanshan), with the three project areas and terrain features highlighted in the attached map for Xinjiang Turpan Water Conservation Project. Henceforth, reference will be made to the prefecture level and three county levels, except in direct reference to Turpan City.

9. Typical of warm temperate continental desert climates, the region is abundant in heat with plentiful sunlight, but extremely dry with little rainfall and strong and frequent winds. The annual average precipitation in the region is only 6.3-25.3 mm with annual evaporation as high as 2,751- 3,744 mm, making it one of the most extreme dry desert areas in China. The surface water sources are runoff from the Tianshan Mountain range through some 14 ravines, which converges on bowl shaped low-lying inhabited lands. Although this provides the source for surface water diversions for agricultural uses as well as groundwater table recharge, it also poses an additional concern due to the annual threat of flooding from the mountain flash storms or snowmelt.<sup>1</sup>

10. Currently, Turpan Prefecture implements a traditional/conventional water rights administration system as set out in the 2002 Water Law, under which the efficiency of irrigation water use and reuse has been increasing, but with constant declining groundwater tables and deteriorating environmental conditions.<sup>2</sup> This

<sup>1</sup> The PAD notes that in the flood disaster of 1996, thousands of people were made homeless with direct economic losses alone estimated at US\$67 million. Most of the basin's floodwater, instead of being stored and utilized, is largely wasted through evaporation as it flows to downstream low-lying deserts.

<sup>2</sup> XUAR and Turpan are applying a universal approach to water allocation in China based on the amount authorized for withdrawal in an approved permit and not with a focus on consumptive water use.



situation has caused most of the Karez systems<sup>1</sup> to dry up, and water shortages are becoming increasingly serious. Although water shortages are a natural characteristic of Turpan Prefecture with approximately the same amount of water being used now as was used in the 1980s, the increasing consumptive use of water combined with deteriorating environmental conditions are making these shortages very severe. One of the primary trends noted is that evapotranspiration in Turpan Prefecture from irrigated agriculture has continuously been rising.

### 1.3 Relation of This Study to Xinjiang Turpan Water Conservation Project

11. The development objective of the six-year (2010-2016) World Bank funded Xinjiang Turpan Water Conservation Project (XTWCP or “the project”) is to help the arid Turpan Basin fundamentally change its economic growth pattern from its current reliance on groundwater overexploitation (resulting in devastating effects on the fragile oasis ecosystems and important cultural heritage resources) to a more sustainable development pattern based on rational and integrated water resources planning and management. The project aims to improve agricultural water productivity, achieve real water saving, reduce flood risk, cut down groundwater overexploitation, increase industrial and domestic water supply, and boost farmers’ incomes from irrigated agriculture. The project will adopt an innovative but proven approach focused on ET water management to promote socio-economic development, protect the oasis ecosystem and preserve part of the ancient

Karez water supply systems through integrated water resources planning and reasonable water management.<sup>2</sup>

12. The project consists of five components:

- Component One directly focuses on “ET based integrated water management in Turpan Prefecture”, which is closely connected with water consumption targets of the prefecture, the counties, the townships and the WUAs. A new form of integrated water resources management plans and system of water rights administration will be developed and implemented to enable the prefecture government to improve water resources allocation, use and administration
- Component Two is designed to “increase upstream water storage capacity through one small-sized reservoir and two medium-sized reservoirs constructed on the narrow rivers in the northern mountains of Turpan, to increase the flood control capacity of the three major watersheds in Turpan Basin, improve downstream water supply and ensure minimum annual ecological flows in the river courses.”<sup>3</sup>
- Component Three focuses on “real water saving in irrigated agriculture” and irrigation management measures that will be carried out in Turpan Basin. In some areas, surface water will be supplied through construction or reconstruction of canals to substitute for groundwater use in order to close down some of the wells. In other areas, conjunctive use of ground and surface water will be promoted to optimize available water resources

<sup>1</sup> A typical Karez system in Turpan Prefecture is described in the PAD, p. 2, footnote 1, as an ancient means to convey groundwater through an underground channel system by gravity flow for surface water use, which greatly reduces ET (and conveyance losses which a surface water delivery system will experience unless lined canals are used).

<sup>2</sup> To address and mitigate the water shortage caused by over-use and extraction of groundwater, it was necessary to reduce the non-beneficial evapotranspiration in conjunction with other activities. This should result in real water saving in the entire region, but has to be carefully integrated with the physical, engineering, economic, legal, administrative and other local conditions and measures. To accomplish an ET-based water management approach, it is necessary to design, refine and sustainably implement a “tailored” water rights administration system in Turpan Prefecture with allocation of water at the basin to user levels based on consumptive use or ET.

<sup>3</sup> The XTWCP will attempt to redress the flooding problem through the construction of these strategically placed dams in the mountain foothills as measures to meet the first two key performance indicators of the project of reducing flooding that causes loss of life and economic losses.



- Component Four calls for “Karez system rehabilitation”. One of the 300 Karez systems that are still in use in Turpan Basin will be reconstructed to meet the requirements of prefecture cultural relic’s protection bureau and the World Bank, and to provide a demonstration model for later rehabilitation of the other Karez systems in use
  - Component Five aims at “institutional capacity building and project management” by carrying out training, workshops and domestic and international study tours; procurement of office equipment; implementation of measures under the new water rights administration system; and providing technical assistance and support for overall project management.
13. Component 1 will be facilitated through parallel research and testing by the eight special studies activities listed in box 1.
14. The purpose of this study is to outline the design for an ET-based WRAS framework<sup>1</sup> for Turpan Prefecture. This framework will consist of the following three sub-components:
- Water rights allocation sub-system;
  - Water rights reallocation/transfer sub-system, and
  - Water rights supervision and management sub-system.

#### Box 1: The Eight Special Study Activities of Component 1

- |   |   |
|---|---|
| <ol style="list-style-type: none"> <li>1. Measurement and monitoring of ET within Turpan Prefecture by means of remote-sensing</li> <li>2. Development of a knowledge management (KM) system for water resources planning and management</li> <li>3. Conversion of water consumption targets into water withdrawal targets linked with conjunctive use of surface water and groundwater</li> <li>4. Supplementary development plan for water saving in irrigated agriculture</li> </ol> | <ol style="list-style-type: none"> <li>5. Quota control by WUAs</li> <li>6. Support for WUA ET management</li> <li>7. Design of ET based water rights administration system in Turpan Prefecture</li> <li>8. Studies of compensation mechanisms for those returning farmland for water</li> </ol> |
|---|---|

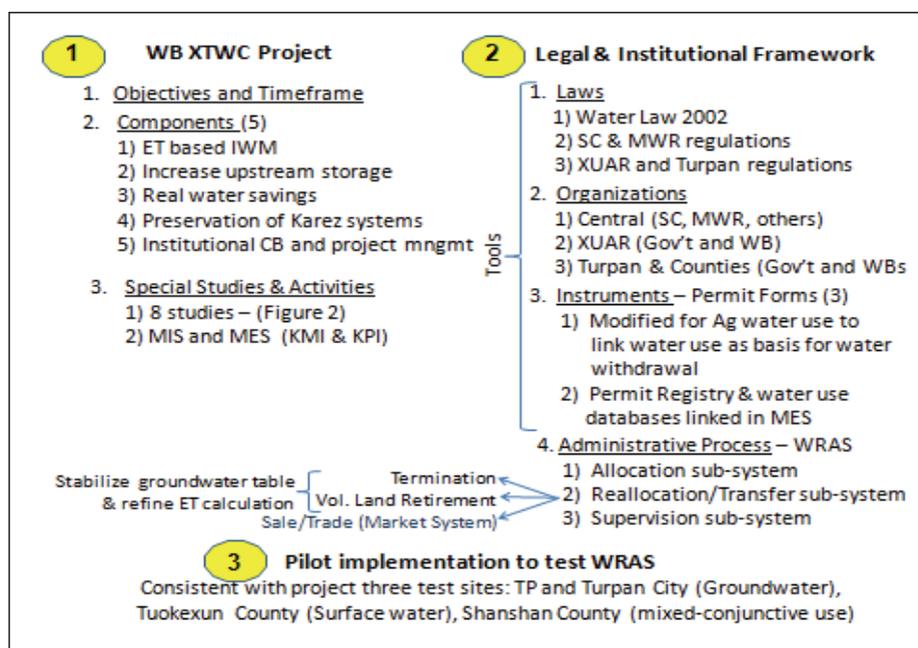
<sup>1</sup> Clearly, attempting to make a significant change to the system of water rights as an integral part of this project is difficult. However, this approach must be attempted because the existing water management supported by the traditional water withdrawal permit system in Turpan Prefecture has resulted in serious overdraft of groundwater and degradation to the ecosystem. For example, many trees and grass areas have died, rivers and lakes have dried up and many green lands have become deserts. Although the proposed approach may not be ideal, it is the best achievable within the political and social context of China and Xinjiang’s Turpan Prefecture to maintain the special balances that are needed.



15. Figure 1 illustrates the “roadmap” to the design, integration, and pilot implementation of this WRAS. Essentially, the WRAS will provide rules for the project and its other seven activities.

It will provide water administration and management rules and establish the institutional foundation for the achievement of real water saving in Turpan Prefecture.

Figure 1: Roadmap to WRAS Design and Framework

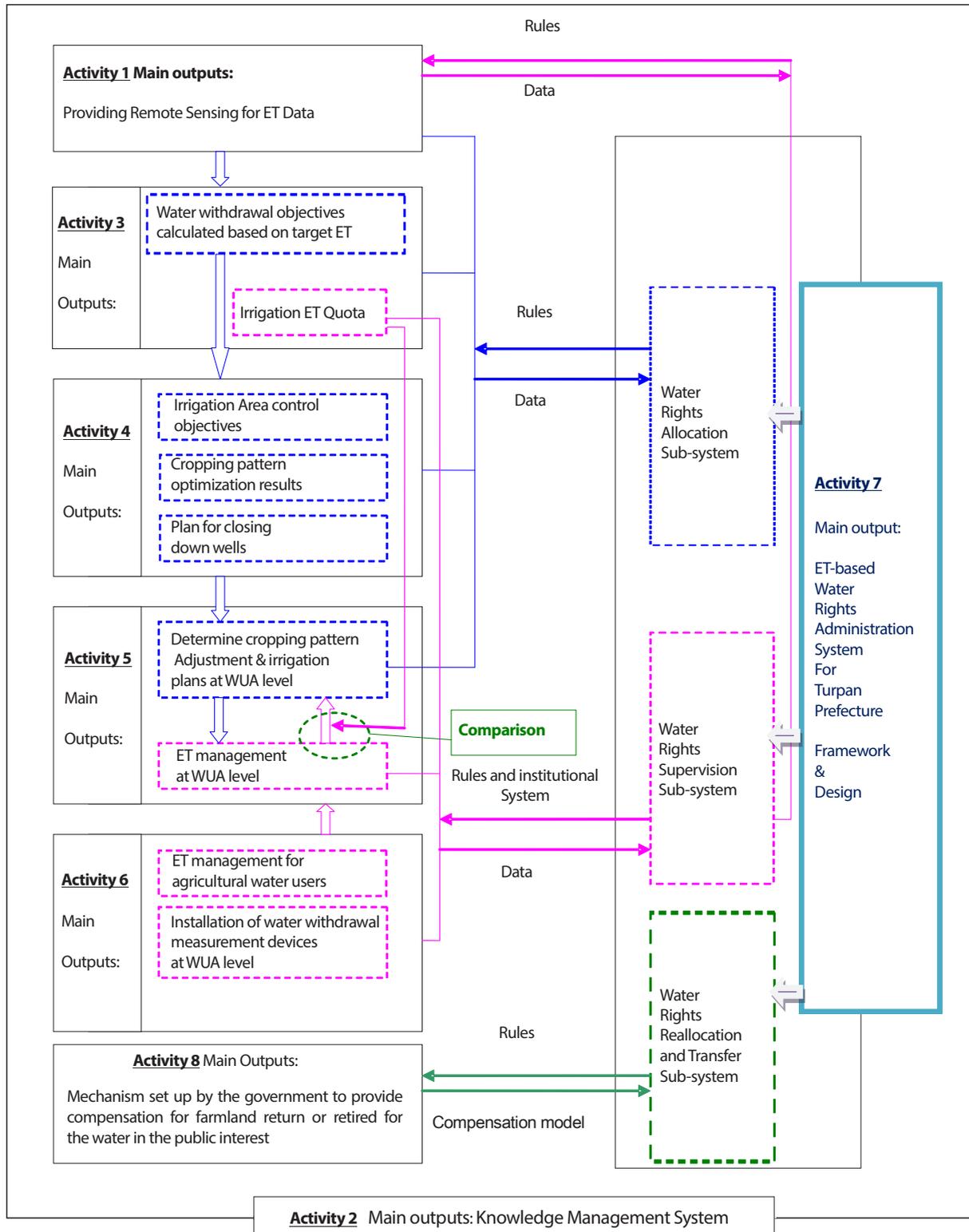


16. The interdependent relationship between this study and the other seven studies makes this project feasible and functional.<sup>1</sup> Figure 2 illustrates the links and exchanges of the eight activities. This study on the ET-based WRAS will be completed at the initial stages of the project, whereas the other seven activities will continue throughout the life of the project. Activity 2 on the Knowledge Management System (KMS) will include the MIS, MES and findings of all project activities, including these special studies. The fundamental purpose of setting up this KMS is to ensure ownership and sustainability of the project objectives, activities and outputs

beyond the five-year life of the project. The approach of applying consumptive use or ET for irrigated agriculture and inseparably linking the rights, interests and responsibilities of water withdrawers and water users under the water withdrawal permit system is relatively new in China. Therefore, assessments of pilot activities as well as project performance are critical to refine the approach where necessary, expand the approach to other areas in Xinjiang as well as other provinces, and to make changes in legislation which mandate that this approach be applied where appropriate.

<sup>1</sup> The primary focus of this study is on water rights administration applying the ET-based approach. Some of the other studies will focus on adjustments in the farmers' agricultural and marketing systems – for example Study No. 4.

Figure 2: Relationship of This Study Activity (No. 7) to Other Seven Study Activities



17. Support of the other activities is indispensable to this study. The first activity provides ET data monitored by remote-sensing; the second establishes the KM system, which provides long-term data support for water consumption analysis and ET management and control and also provides a platform for the management of water rights, water charges, wells and WUAs; the third calculates water withdrawal targets based on ET targets and supplies irrigation quotas; the fourth provides irrigation area control targets, cropping pattern optimization options and a plan for closing down wells; the fifth works out cropping pattern adjustment and irrigation plans and ET management at the WUA level; the sixth deals with ET management of agricultural water users and water withdrawal measurement device installation at the WUA level; and the eighth provides the compensation mechanism to be established by the government for social equitability for retiring farmland from irrigated agriculture to release water allocations for cancellation or transfer.

18. Crucial to this WRAS study are the six key performance indicators (KPIs) for project outcomes, which are listed in box 2.<sup>1</sup> These KPIs are determined from constant monitoring

and periodic direct data gathering, including aggregation of data from the key monitoring indicators (KMIs) of the project. This is the primary responsibility of the project M&E System (MES), which is linked to the computerized project monitoring information system (MIS)<sup>2</sup>. KPIs and KMIs will require an array of supporting indicators (SPIs) in order to measure project progress.

19. It is expected that results from this project will be as follows: the construction of the three reservoirs will reduce the risk of flooding and related economic losses, a more reliable water supply will be ensured, agricultural production per unit water consumption will be increased through improved irrigation efficiency and water productivity, groundwater overexploitation will be halted, the ecosystem of the Karez cultural heritage will be preserved, and economic growth will be empowered within a more eco-friendly environment.

20. It is also anticipated that the project will result in considerable economic and social benefits to Turpan given the local governments would strongly support the necessary legal and institutional needs.

#### Box 2: Project Objectives and Key Performance Indicators

- |   |  |
|---|--|
| 1. Increase the number of people protected from flooding;                                 | 5. Improve water productivity in irrigated agriculture by measuring ET in the project areas; and |
| 2. Reduce economic losses from flooding;  | 6. Raise farmers' yields and incomes in the irrigated areas of the project.                      |
| 3. Cut down groundwater overdraft in the irrigated areas of the project and in the basin; |  |
| 4. Increase water supply capacity for industrial and                                      |  |

<sup>1</sup> KPI number 5 examines the outcome of the ET based WRAS to determine if ET (or CU) of water has been increased or reduced. If the indicator shows that the ET (or CU) has increased in a field even though the farmer has reduced the amount of water made available, perhaps through advanced technologies like drip or sprinkler irrigation, the farmer would be requested to take even less water based on ET requirements.

<sup>2</sup> The MIS for the project has been developed to track expenditures and project achievements consistent with the project requirements set out in its PAD. The baseline data for the MIS will require knowledge and data of the Turpan conditions at the time of project start-up. The MIS will terminate when the project is completed, but some of the indicators (KPIs and KMIs) may be transferred to the MES.





## Chapter II - Water Resources Situation in Turpan Prefecture

### 2.1 Turpan Water Resources Development, Utilization and Management

#### 2.1.1 Sources of Water Resources

21. In considering the total water resources of Turpan Prefecture<sup>1</sup>, it is important to note that Turpan lies in a basin surrounded by high mountains. Lake Aiding, 154 meters below sea level and dry most of the year, is in the middle of this basin<sup>2</sup>. Due to the unique topography of the area, the mild and moist air currents from the west and the north are blocked by massive mountains in the northwest before they reach the basin. Consequently, only very little mild and moist air currents are brought into the mountainous areas in the northwestern part of the basin by the high altitude zonal circulation to produce precipitation. As a result, the water resources for Turpan are mainly formed in the upper and middle parts of the Tianshan mountain passes above the timberline from which flow seasonal rivers in the spring and early summer. There is very little precipitation in the plains below the mountain passes, which means there is almost no recharge to the surface water and groundwater systems of the basin, and this constitutes an area of water loss through evaporation. The total amount of water resources in Turpan Prefecture consists of surface water and natural recharge to the groundwater.

<sup>1</sup> The following summarized discussion on water resources was extracted from the “11th Five Year Plan of Water Resources Development of Turpan Prefecture”.

<sup>2</sup> This would imply that Lake Aiding and the groundwater of Turpan Prefecture are hydrologically connected, given that the lake is already 150 meters below sea level and the surrounding low-lying lands are used by cities, industries and agriculture.



22. Turpan Prefecture has nine intra-prefecture rivers—Dahyan River, Tarlang River, Meiyaogou River, Heigou River, Qialekan River, Ertanggou River, Kekeya River, Kanerqi River and Kerjiangou River. These all rise in the northern mountainous areas of Tianshan Mountain. In addition, there are five inter-prefecture rivers that begin outside the Prefecture and flow into it—Baiyang River, Alagou Ravine, Yurgou Ravine, Wusitong Ravine and Zulumutu Ravine. In total, 14 rivers and ravines provide surface runoff water source for the Prefecture. In the mountainous area, annual precipitation ranges from 100 to 500 mm in the hinterland reaching 800 or 900 mm in the highest parts. At the mountain peaks, permanent snow cover or glaciers serve as natural reservoirs with rich water flows. In summer, precipitation contributes 50 – 80 percent of the annual runoff. During this time the combination of rainfall plus melting snow can cause floods.

23. Given the river distribution of the basin, the amount of water resources in the two river basins of Tuokexun County, five river basins of Turpan City, and three river basins of Shanshan County can only be calculated according to the water locally generated in the respective areas. In general, the water resources generated within Turpan Basin are very unevenly distributed. The seven river basins of Turpan and Shanshan produce 455.07 million  $m^3$ /year of water including the runoff areas and the surface water areas in the plains. This accounts for 92 percent of the total runoff of 493.668 million  $m^3$ / year in Turpan Prefecture, and as a result these seven river basins of Turpan City and Shanshan County produce most of the surface water in Turpan Prefecture.

24. The inflows of Baiyang River and Alagou River, of all the inter-prefecture rivers, make up 63 percent of the total foreign or inflow surface water of 407.92 million  $m^3$ / year for Turpan Prefecture. The surface water inflows are basically limited to these two river basins of Tuokexun

County in the western part. There is no inflow in the eastern area, and there is no outflow of surface water to neighboring prefectures or provinces. Thus, surface water resources generated in the basin, plus inflows, equal the total river runoff of 903.048 million  $m^3$ / year for Turpan Prefecture. Currently the 14 perennial rivers with runoff water available provide a total quantity of 865.18 million  $m^3$ / year, constituting approximately 95.8 percent of the total runoff within the basin.

25. Lake Aiding is the only lake in the prefecture. It is a saltwater lake covering 124  $km^2$  below sea-level located in the southeastern part of the basin. The lake is primarily supplied by groundwater, with very little surface water coming from the Baiyang River, the Alagou Ravine, the Meiyaogou Ravine or other surface water systems.

26. Typical of closed inland arid basins, Turpan Basin has a relatively independent groundwater system. Water flows from all directions to the lowest point of Lake Aiding. According to the *“Intermediate Report on Studies of Sustainable Groundwater Utilization in Turpan Basin Xinjiang”* financed by JBIC, the mean annual recharge to groundwater resources in the oases of Turpan Prefecture is 661 million  $m^3$ .

27. A total surface water resource in Turpan Prefecture is estimated at 956.6 million  $m^3$ . With very uneven geographical distribution of river runoff in Turpan Prefecture, water availability decreases gradually from the west to the east and from the north to the south. In terms of temporal distribution, it varies considerably from season to season but with little changes between years, with maximum annual runoff being 2.5 to 3.5 times more than minimum annual runoff. Thus, the total water resources available in Turpan amount to 865.18 million  $m^3$ / year. This comes from the runoff of its 14 rivers, plus 661 million  $m^3$  of groundwater recharge.



### 2.1.2 Supply of Water Resources

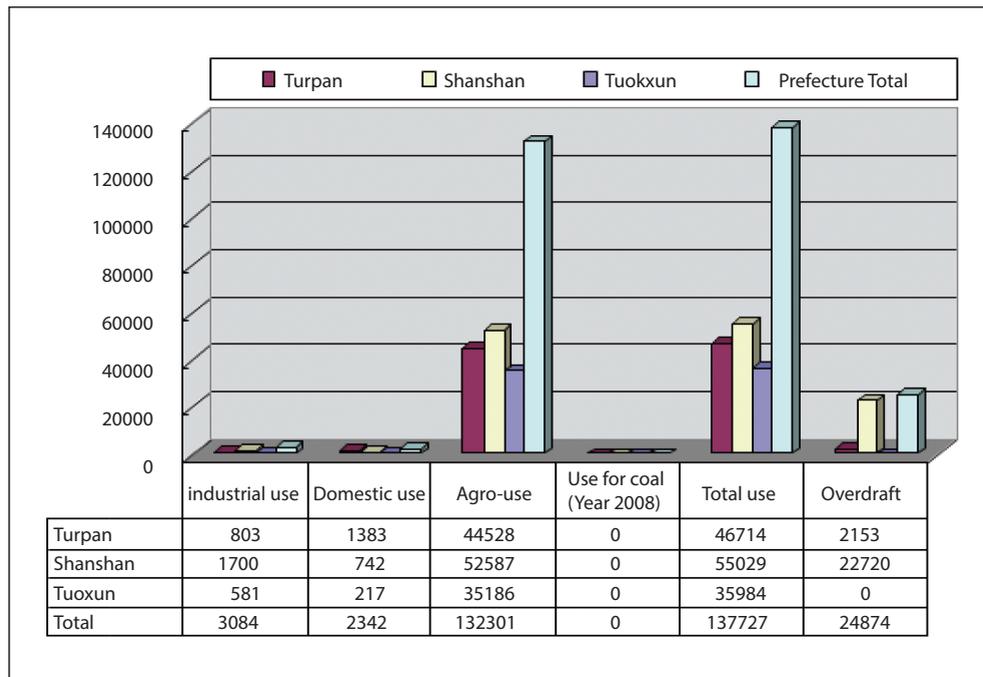
28. The 17 reservoirs in Turpan Prefecture have a total designed storage capacity of 103.69 million  $m^3$ . These include four medium-scale reservoirs with a total storage capacity of 86.82 million  $m^3$  (designed storage capacity of Putao Reservoir is 11 million  $m^3$ , Kekeya Reservoir is 10.52 million  $m^3$ , Kan'erqi Reservoir is 11.8 million  $m^3$  and Hongshan Reservoir is 53.5 million  $m^3$ ) and 13 small-scale reservoirs which have a total storage capacity of 16.87 million  $m^3$ . There are 6,334 constructed pump wells plus 5,841 supplementary pump wells. Total water withdrawal in the Prefecture is 1.558 billion  $m^3$ , consisting of 550 million  $m^3$  of surface water and 1.03 billion  $m^3$  of groundwater. The latter includes 145 million  $m^3$  of water from springs, 645 million  $m^3$  by pump wells and 240 million  $m^3$  from Karezes. These diversions have resulted

in groundwater overdraft and a constantly declining water table. This situation is a serious threat to the health and productivity of the local people and to the environment and has become the main constraint on the sustainable development of Turpan.

### 2.1.3 Water Use in Turpan

29. Turpan Prefecture has one county-level city (Turpan City) and two counties (Shanshan County and Tuokexun County). In 2008, the total water use of the prefecture was 1.377 billion  $m^3$ . Agricultural water use was 1.323 billion  $m^3$  (96.06 percent of the total), industrial use was 30.84 million  $m^3$  (2.24 percent), and domestic use was 23.42 million  $m^3$  (about 1.7 percent). Figure 3 illustrates the major water sector uses for the city and counties, and Figure 4 shows the percentages of water use for those sectors.

Figure 3: Volume of Water Use of the Turpan Prefecture in 2008

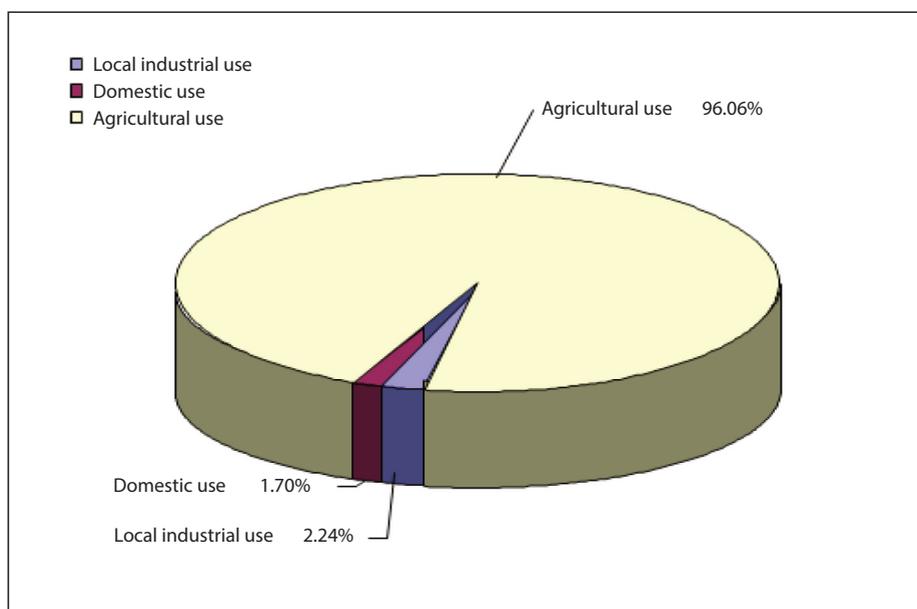


30. As is typical in arid oases, agricultural production in Turpan Prefecture relies entirely on irrigation. With advances in irrigation technology and implementation of government policy on land reclamation for agricultural development, agriculture has developed rapidly while industry has developed more slowly. As a result, increased water use for irrigation leaves little water available for the industrial sector, thus restricting the sustainable economic and social development of the prefecture. In 2008, the GDP of the prefecture's primary industries was approximately RMB 1.83 billion, about 9 percent of GDP total, but irrigated agricultural water use accounted for more than 96 percent, with an average output value of 1.38 RMB/m<sup>3</sup>. The GDP of the prefecture's secondary and tertiary industries reached RMB 14.34 billion and RMB 4.5 billion respectively, which constituted 91 percent of the total, but their water use was less than 4 percent of the total, with the per cubic meter water output value being significantly higher than that of the primary industry.

#### 2.1.4 Current versus 1980s Water Resources Development and Utilization

31. The present total amount of water resources in Turpan Prefecture is approximately equal to the amount in the 1980s. Over the past 30 years, industrial and domestic water use has slightly increased but has always been a very small percentage of total water use. However, in contrast, the irrigated area in Turpan has dramatically expanded from 60,000 ha in 1970 to 113,000 ha in 2008, as shown by remote-sensing information, although statistics indicate around 87,000 ha of irrigated farmland in 2008. This represents a two-fold increase in the irrigated area. This is primarily due to construction of reservoirs, canals and improvement in irrigation technology, especially in well drilling for groundwater abstractions. Most of the expanded areas are reclaimed wasteland, which have resulted from implementation of the 1995 government policy on land reclamation for agricultural development. These lands do not belong to the 30-year land tenure under the household contract responsibility system and are mainly used for growing cash crops.

Figure 4: Percentage of Water Use of Turpan Prefecture in 2008



32. Although total water withdrawal in Turpan Prefecture has not increased, the irrigated area has nearly doubled through improved irrigation efficiency. This has substantially boosted agricultural production. During this period, however, the water table has declined by an average of 1.5 to 2 meters a year. In some regions, it has dropped by 180 meters. Most of the Karez systems have dried up—the number of the systems with running water has decreased from 1,237 in 1957 to less than 300 currently. A serious consequence is that Lake Aiding is dry in most years.

### 2.1.5 Water Resources Management in Turpan Prefecture

33. At present, the agencies concerned with water resources management in Turpan Prefecture are the bureaus of water, environmental protection,

construction, land and resource administration, civil affairs and other bureaus. The water bureau is the main water manager and the other bureaus collaborate. The water administration department of Turpan is in the prefecture water bureau and there are also county water bureaus. Additionally, the Central Government's Production and Construction Group No. 221 has its own water management agency. The primary duties and responsibilities of the prefecture bureaus for water, construction, environmental protection, and land and resources administration are set out in boxes 3,4,5 and 6. Water bureaus authority and the responsibilities for water administration are specified in both Xinjiang and Turpan legislation. The civil affairs bureau is primarily concerned with expedited registration and institutional operations of WUAs, as well as ensuring compliance with the licensing laws of China.

#### Box 3: Main Responsibilities of Turpan Water Bureau

- |  |  |
|--|--|
| <ol style="list-style-type: none"> <li>1. Organize the formulation of the prefecture's strategic water plans, medium and long term plans and annual plans for water, hydropower and water industrial development and plans for river and lake basins, and supervise their implementation upon their approval;</li> <li>2. Manage the prefecture's water resources in a unified manner, organize water resources surveys, evaluation and supervision jointly with relevant departments, formulate the prefecture's medium and long-term water demand and supply plans, sector quotas, water allocation plans and allotments; implementation of water withdrawal permit system and justification reports and the collection and management of water resources fee and water resources compensation fee, establish the functions zones in cooperation with other bureaus, manage the prefecture's water saving society work through the relevant section, and implement the supervision and management of water resources conservation; coordinate the resolution of water disputes between departments and water users, between administrative regions and the production and construction group, the railway system and the petroleum corporation; and implement the supervision and enforcement of the water laws and regulations;</li> <li>3. In charge of production safety and flood control facilities in river courses, the lake, reservoirs, man-made waterways and other water bodies in the prefecture and be responsible for comprehensive improvement, development and utilization of the main rivers and reservoirs within the prefecture;</li> <li>4. Carry out sector administration and management of the</li> </ol> | <p>prefecture's water works construction, be responsible for organizing the construction and management of important water works primarily financed by the state, and carry out administration and management of water conservancy, hydropower, aquaculture and water economy; be responsible for the prefecture's municipal water works such as surface water and groundwater resources development, water environment protection and so on, manage the prefecture's rural water works, township water supply and drinking water supplies, and be in charge of the prefecture's capital construction of on-farm water works;</p> <ol style="list-style-type: none"> <li>5. Organize the construction and management of small hydropower works;</li> <li>6. Formulate price, taxation, credit and other economic regulation measures concerning water conservancy, hydropower, water industry and water economy through cooperation with other relevant departments and organize their implementation; administer and supervise the value preservation and appreciation of state-owned assets under the water department and supervise and audit use of earmarked water funds;</li> <li>7. In charge of the prefecture's flood control and drought mitigation work and the prefecture's water conservation work and responsible for the routine work of the office of the prefecture flood control and drought mitigation headquarters; and,</li> <li>8. Responsible for the administration and management of education and foreign cooperation and exchange concerning water resources, hydropower and water industry.</li> </ol> |
|--|--|



#### Box 4: Main Responsibilities of the Construction Bureau

Guide and administer the prefecture's urban and township and village construction, and be responsible for urban water supply and drainage, water saving, fuel gas and heat supply, municipal utilities, in-city public transport, landscaping, townscape, city sanitation, and

other sector administration work; be responsible for supervising the protection of the famous scenic sites within the prefecture; provide guidance on townscape and environmental improvement and urban construction supervision.

#### Box 5: Main Responsibilities of the Environmental Protection Bureau

1. Responsible for environmental protection of the atmosphere, water body, soil and so on within the prefecture; responsible for supervising and administering prevention and control of waste gas and water and other pollution within the prefecture; supervise and administer the construction of heavy pollution projects that are prohibited (or strictly restricted) by the state on the catalogue; responsible for coordinating resolution of pollution disputes and for investigating and handling environmental pollution accidents, ecological damage events, and so on within the prefecture;
2. Supervise resources development activities that affect eco-environment within the prefecture;
3. Organize the registration of pollutant discharge applications, the implementation of pollutant discharge permit system, pollutant discharge fee collection, environmental impact assessment, "three

- simultaneous" and other environmental management rules and regulations; review and approve the environmental impact assessment reports of all construction projects, technical transformation projects, and regional development and construction projects within the quota limits of the prefecture; provide guidance on the comprehensive urban environmental improvement and responsible for quantified examination of the comprehensive urban environmental improvement; responsible for organization and coordination of the prefecture's environmental targets responsibility system; designate MEP function zones; and,
4. Administer the prefecture's environmental monitoring work, supervise the implementation of the environmental monitoring system, and provide guidance on measurement certification and quality assurance of the environmental monitoring stations.

#### Box 6: Main Responsibilities of the Land and Resources Administration Bureau

Responsible for protection and administration of the geo-environment and geological relics, organize the monitoring of geo-environment and geologic hazards, and prevent and control geologic hazards; administer the surveys and assessments of hydrogeology, engineering geology and environmental geology in accordance with the law; responsible for unified administration of

the prefecture's geo-environment monitoring stations and network, monitor, supervise, prevent and control groundwater overexploitation and pollution; protect the paleontological fossils of scientific research and ornamental value, their origins and their geologic profile and other geologic relics.



34. The existing water allocation, water withdrawal permit system and water pricing policies, laws and regulations relevant for Turpan Prefecture are set out in box 7.

**Box 7: National, Regional and Turpan Water Policies, Laws and Regulations**

**National level:**

1. Water Law of the People's Republic of China (2002)
2. Regulations for Administration of Water Withdrawal Permission and Water Resources Fee Collection, State Council Decree 460 (2006)
3. Recommendations on Strengthening the Development of Farmer Water User Associations, issued jointly by MWR, NDRC and MCA, Document 502 (2005).

**Regional level:**

1. XUAR Measures for Implementation of Water Law of the People's Republic of China (2003)
2. XUAR Detailed Rules for Implementation of Water Withdrawal Permit System (1994)
3. XUAR Groundwater Resources Management Regulations (2002)
4. XUAR Measures for Well Construction Administration (2002)
5. XUAR Measures for Water Resources Fee Collection and Administration (2004)

**Turpan Prefecture:**

1. Recommendations for Further Intensifying Administration of Soil and Water Development and Well Construction in Turpan Prefecture, (2005)
2. Provisions of Turpan Prefecture for Well Construction Administration, (2005)
3. Recommendations of Prefecture Water Bureau for Closing Down Self-Provided Wells in Planned Urban Areas of Turpan Prefecture, (2005)
4. Circular of Turpan Prefecture On Price Adjustment of Water Supplied Through Water Works on the Major Rivers, (2005)
5. Circular of Turpan Prefectural Administrative Office Concerning Issuance of Measures of Turpan Prefecture for Collection and Administration of Groundwater Resources Fee, (2007)
6. Circular Concerning Issuance of Implementation Measures of Turpan Prefecture for Groundwater Resources Management, (2009)

35. Merely listing various water policies, laws and regulations that are relevant to Turpan Prefecture is not sufficient to understand the breadth and scope of existing water and related legislation applicable throughout the central and provincial (autonomous region) governments.<sup>1</sup> However, important provisions in five of these laws and regulations relate directly to the design and implementation of this ET-based water rights administration system. These require brief explanation and are attached as annexes to this report.

36. In 2002, the National People's Congress of the PRC adopted a new water law to revise and replace the 1988 Water Law (annex 1). Important mandates in the new law established the systems for water withdrawal permits to allocate water and the water resources fee collection under the user-pays principle with progressively higher rates for withdrawal and use beyond prescribed limits. It also mandated total amount control, comprehensive and special basin plans, water allocation and allotment plans, water quotas, functional zones, groundwater protection

<sup>1</sup> There are numerous reports by MWR (mostly in Chinese) and by World Bank and DFID funded consultants (mostly in English) that set out the details and analysis of the central laws and regulations. China has a wealth of legislation, but implementation varies widely throughout the country.



measures to prevent overdrafts and inspection and supervision measures to ensure proper implementation of the water law. MWR was designated to oversee implementation of the water law at all levels of government throughout China.

37. The State Council issued SC Decree 460 in 2006 providing substantial measures and guidance for provinces to counties on the water withdrawal permit system and water resources fee collection and use (annex 2). MWR quickly issued revised water permits and certificate forms that were to be adjusted at provincial and local levels according to their local conditions.<sup>1</sup>

38. In 2005, MWR, MCA and NDRC jointly issued Document No. 502 entitled ***Recommendations on Strengthening Farmer Water Users Associations*** (annex 3) promoting WUA establishment and registration as legal entities, requiring water supply and fee payment contracts between water suppliers and water users (WUAs), and encouraging adoption of water savings measures<sup>2</sup>. Document 502 pertains to this project's existing WUAs and those to be established under it.

39. Each province and autonomous region has adopted legislation and regulations within their jurisdiction to implement the central law and regulations taking into account local conditions. Xinjiang was one of the first to adopt measures to implement the 2002 water law and regulations to ensure compliance and to prepare comprehensive basin master and special plans and water allocation and allotment

plans according to adopted quotas in order to implement and administer the water withdrawal permit system (Annex 4). Additional Xinjiang legislation pertains to implementation of the WWPS and groundwater management.

40. Among the many important water measures adopted by Turpan Prefecture was the 2009 ***Implementation Measures of Turpan Prefecture for Groundwater Resources Management*** (Annex 5). It is vitally important to this project. Even though it does not specifically refer to the ET or consumptive use approach to be applied for allocation, diversion and use of water for irrigated agriculture, these measures mandate accelerated extension of water-saving techniques like the ET approach of the project, and optimize water allocation among various sectors. In addition, it mandates reduction of agricultural water use by 20 percent, reduction of groundwater exploitation by 260 million m<sup>3</sup>, and limits the agricultural area to one million mu (about 66,700 hectares). Four principles are to be followed:

- Strengthen unified management of surface water and groundwater;
- Intensify adjustments to cropping patterns;
- Intensify adjustment of water use structures in all sectors to achieve water savings; and
- Reduce the number of pump wells to reduce groundwater over exploitation.

41. As illustrated in figure 2, the provisions in these key laws and regulations (box 7) are the main tools of the roadmap for the design of the ET-based water rights management system proposed in chapter 4.

<sup>1</sup> Xinjiang and Turpan are currently using adjusted forms. Turpan Prefecture's will have to be further refined to successfully implement the new WRAS under the project, for example, to add ET targets.

<sup>2</sup> MCA had already issued Circular 148 in late 2003 that acknowledged the importance of Rural Specialized Economic Associations (WUAs) for farmers and expedited their registration at a minimal charge as legal entities for non-profit. MCA was convinced that WUAs, owned and operated by farmers, would make a difference in on-farm water use management and the improved livelihood of farmer households.



## 2.2 Constraints in Current Water Rights Administration

42. The present system of water allocation, management and administration by using water withdrawal permits has not succeeded in Turpan. This is due to a fundamental flaw in the process of allocating water for diversion and use, and the inability to make the appropriate permit modifications.<sup>1</sup> However, in general for China, it is not a failure of the WRA system under sufficient water conditions. It is the particular conditions and problems in Turpan's closed basin that have given rise to the constraints and weaknesses. These already exist in other parts of China or are emerging due to natural conditions or demand or water pollution that has increased the "scarcity" of water and hence made "water security" a concern. The new system is necessary because the water situation with serious groundwater overdraft cannot be corrected even if the present WWPS were fully implemented - it requires radical remedial scientific and administrative measures in order to be corrected. It is necessary to adopt the more stringent ET (CU) - based shift in the water rights allocation concept, linking water use to authorized withdrawals. The basic framework for the new system exists under the current legislation, but will need some updating (additions or modifications) to ensure intended results and sustainability of water management in Turpan Prefecture.

43. For example, article 25 of *Xinjiang Uygur Autonomous Region Measures for Implementation of the Water Law of the People's Republic of China* provides that "regulation and storage of runoff shall be in conformity with the basin master plan and the middle and long-term water demand and supply master plans. Water allocation plans shall be formulated with basins as the units". However, to date, Turpan Prefecture has not promulgated adequate water

allocation measures. Current plans for river runoff allocation have naturally come into being through history. In the 1950s and 1960s, villages and water users gradually came up with their own water allocation plans, and these were followed into the 1980s. However, after the establishment of water management organizations in the government, the responsibility for water allocation was assumed by the government with a focus on withdrawals, leaving the village water managers and water users only in charge of distributing irrigation water supply and water charge collection based on water allocation plans prepared by agency water managers. Further, Turpan Prefecture has not implemented effective groundwater allocation and control measures and as a result the groundwater table in the prefecture is continuing to drop. This project expects to gradually reverse this situation, but it can only be achieved under the new ET/CU approach, which will require adjustments to the WRAS as proposed in both the project and this report.

44. In accordance with relevant state, XUAR, and Turpan policies and regulations, the Turpan Prefecture Water Bureau is responsible for organizing the implementation, supervision and administration of the water withdrawal permit system. Surface water permitting has not been a serious problem in irrigation districts—the primary concern is groundwater withdrawals. In order to control groundwater overexploitation, Turpan Prefecture regulations provide that any unit or individual who intends to develop or utilize groundwater resources must first apply to the local water bureau for a water withdrawal permit. In 2006 Shanshan County and Turpan City were identified as serious and common groundwater overdraft areas, respectively. The outlook on groundwater exploitation in Tuokexun County is also serious. Turpan Prefecture legislation also states that any unit or individual intending to construct

<sup>1</sup> Volume 2 of the AAA reports identified five related problems under present water law implementation.



a well for groundwater abstraction within the administrative areas of Turpan City and Shanshan County must file an application with the local water bureau and submit it to the prefecture water bureau for approval before the well is constructed and water withdrawn. However, to implement these measures requires knowledge of the basin and local water balance, for which data and information is not currently available.

45. Turpan Prefecture is attempting to implement the water withdrawal permit system required by law by utilizing total amount control and the quota system to mitigate the problem of groundwater overdraft. However, due to the problems, constraints and weaknesses that exist in the water rights administration in Turpan, along with lack of personnel capacity, scientific measuring and control devices, and political pressure, the prefecture has not been able to meet the requirements of the water law and achieve sustainable economic and social development. There are three basic reasons for this situation:

- Lack of water consumption and return flow management has exacerbated the water shortage resulting in harm to society and the interests of other water users. Turpan Prefecture attempted to use the WWPS and water resources fee system as instruments under traditional water rights administration, in essence, focusing on water withdrawal management and control, but neglecting water consumption management and water return flows or recharge. However, under Turpan's conditions, water rights management should deal with managing the entire water use cycle, e.g., water rights administration should manage water withdrawals, uses, consumption, drainage of return flows and percolation into the groundwater aquifers, and other relevant factors. If water

management only concentrates on water withdrawal, then water consumption will not be controlled. This means that effective water rights administration cannot be achieved.

- The increase of irrigation efficiency and expansion of irrigated areas in Turpan Prefecture have actually increased evapotranspiration while reducing return flows and recharge of groundwater resulting in declining groundwater tables. As a matter of fact, the larger scale farmer households and commercial agriculture operations have expanded the irrigated areas.<sup>1</sup> These operations do not normally have the "thirty year contract for responsibility farmland." These "farming enterprises" use the profits made from large-scale farming to improve their irrigation efficiency. However, without paying for use of more water resources they have expanded irrigated areas to generate higher profits and thus have become a primary factor in the declining groundwater tables. Consequently, urban and rural residents, factories, farmers and other water users have to pay higher costs for withdrawing groundwater from greater depths. This problem adversely affects the environment and interests of the entire society.
- Lack of total amount control prohibits control of the groundwater overdraft. The Turpan Prefecture water bureau has not statistically assessed the total permitted water withdrawal for the prefecture. Only in serious situations of groundwater overexploitation is well construction strictly controlled and authority to review and approve well construction resumed by the prefecture water bureau. However, permits for industrial and domestic water use can still be obtained if they can be justified. This is referred to as "demand-based supply" under strict control. Under this approach, groundwater overdraft cannot be

<sup>1</sup> Although the commercial farm enterprises have been innovative in terms of applying water-savings technologies, they have not actually saved water but are actually consuming more water on expanded reclaimed land to irrigation. As noted, this has been a major factor in causing the groundwater overdraft and degradation of the ecosystems.



completely controlled, even though arbitrary groundwater exploitation has been curtailed.

- Lack of and inaccurate water measurement prevents proper diversion and delivery of water and volumetric water charging required by the laws and regulations. Although Turpan Prefecture has attempted to implement the water withdrawal permit system, it mainly focuses on the control of groundwater and surface water withdrawal, and water measurement to control water withdrawal, is inadequate, especially for irrigation water uses. Even if measures for groundwater management through implementation of water control based on electricity uses are carried out, water management will still be difficult because many wells have limited and non-functioning water measurement instruments. Water measurements at household levels are more difficult because most farmer households have numerous small plots of irrigated land scattered throughout the irrigation system.

46. Three major deficiencies in implementing the water law and WWPS have been identified:

- At present, Turpan Prefecture Water Bureau is not able to quantify the total amount of water withdrawn under the WWPS. For permits actually issued, there may be no reliable record of permitted withdrawals and actual withdrawals reported by the permit holder.<sup>1</sup> Preparation and revision of the Comprehensive Water Resources Master Plan was started in 2010. Statistical work on sector water uses of domestic, industry, agriculture (including large households), and the petroleum company of the two counties and city has not yet been finished.
- The review and approval of water withdrawal permits in Turpan Prefecture mostly deal with

development and utilization of groundwater resources, but permits for river runoff are weak.

- Water measurement devices at points of diversion and delivery are not adequately established and even installed devices are normally old and seriously damaged and use outdated technology. At the field level, there are many problems with water measurement for agricultural water use, especially on the internal distribution to farmer households.

47. Turpan Prefecture has attempted to implement total amount control (TAC) and quota management of water withdrawal according to the law. The intent is that water consumption is to be monitored and approved by applying advanced national standards, and water is to be reasonably allocated by water use quotas and water supply allotments or rations. The annual water allocation plans and annual water withdrawal plans are to serve as the basis for control of annual total withdrawal. The water bureau is to issue annual water withdrawal plans to all the water withdrawal units and is to approve their annual water withdrawal sharing arrangements. Water withdrawers (permit holders) are to strictly follow their approved water withdrawal plans and each year they are to submit to the relevant water administration department in the first month of the year summary reports on their water withdrawals and use for the past year and their annual water use plans for the following year. In addition, Turpan Prefecture provides that water-saving irrigation is to be the responsibility of thirty year contract farmland holders. On the large and commercial irrigated lands, water saving irrigation is required, and water is not to be withdrawn and used without water saving practices and technologies applied. The constraint or weakness is the lack of data and information as well as capacity of the water bureaus to implement these measures. Consequently, it is exceedingly difficult

<sup>1</sup> Even if not computerized, copies of permits should be available. Shanshan County has a manual database record of approved permits, but it fails to include the quantity of authorized water withdrawal.



to manage the surface and underground waters, and to effectively implement the conjunctive use of surface and ground water.

48. In Turpan Prefecture, the prefecture water bureau is responsible for collection and administration of the water resources fee and groundwater overdraft compensation fee. In 2006, Turpan Prefecture adjusted the price of water supplied through surface water works on the major rivers to basically twice the price set in 1996. In groundwater overdraft areas (Shanshan County and Turpan City), rates of water resources and groundwater compensation fees have also doubled.

49. In Turpan Prefecture, water use for agricultural production is charged differently for the “thirty-year responsibility farmland contract” land than for other large or commercial farmlands<sup>1</sup>. For the former, water resources fees and groundwater compensation fees are waived if the water withdrawal is below the quota; for the latter, both water resources fees and groundwater compensation fees are levied, and if water withdrawals exceed the planned amounts, the system of progressive block tariffs is to be imposed on the assessment of both fees.

50. All industrial groundwater withdrawers must have their water withdrawal permits examined annually and apply for water withdrawal plans each year. This submitted data and information is to be reviewed and analyzed to determine total amount control and quota management, and ratified by the groundwater management bureau stations. Water resources fees for industrial water diversion are higher than fees for water diverted for agricultural use. The industrial water resources fees for self-provided wells within the coverage of urban water

supply pipeline networks are twice the standard industrial water resources fees. Established factories, enterprises and those with self-provided wells must pay groundwater compensation fees in addition to the water resources fees. Progressive block tariffs are imposed for both fees if groundwater withdrawals exceed allocation plans or quotas.

51. Turpan Prefecture has adopted specific regulations to monitor water use according to electricity use in order to ensure compliance with the water quota for controlling groundwater exploitation. The water quota is converted into the amount of electricity needed, and therefore controlling electricity use limits groundwater abstractions. All groundwater withdrawers are to install water and electricity measurement devices. Electricity usage is restricted when the water withdrawal quota is reached. Purchase of electricity for progressive block tariff beyond the quota is limited and not more than 50 percent of the original season/annual quota can be purchased.

52. To rectify these problems, constraints and weaknesses in the current water rights administration and accomplish the effective implementation of the water withdrawal permit system, the WRAS and WWPS needs to be strengthened and refined in accordance with current and modified policies and regulations and the project ET or consumptive use approach to water management. This will allow the determination of the amount of water to be allocated for consumptive use within command areas of water users and their households, and the aggregate linked to serve as the basis for withdrawals of surface water and groundwater under approved permits.<sup>2</sup>

<sup>1</sup> The 30-year contract lands are cropped by local indigenous farmers whereas the large commercial irrigated lands are generally farmed by non-local people who can afford investments in water savings technology.

<sup>2</sup> There are many problems and constraints in managing water in Turpan Prefecture, including various water management plans, adequate measuring devices, and personnel capacity that go beyond the focus of this report on improving the water right administrative system, but which will be addressed by the other special studies or under one of the other project components. To ensure coordination of all project activities, the World Bank will periodically conduct supervision missions and prepare recommendations on how to resolve any issues or problems that are identified.





## Chapter III - A Need for Change

### 3.1 Why an ET-Based Water Rights Administration System for Turpan Prefecture?

53. Strong consideration was given to correcting the problems, constraints, and weaknesses outlined in Section 2.2 to determine if the current WRAS could be applied. However, because the current system has been demonstrated to be inadequate (from the last ten years in Turpan),<sup>1</sup> a new and innovative approach was considered, discussed and accepted by the Xinjiang and Turpan governments. There are four primary reasons why it was suggested that Turpan Prefecture adopt an ET-Based WRAS.<sup>2</sup> These reasons are set out in box 8.

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<sup>1</sup> By strictly following the current permit system, the commercial farm enterprises in Turpan did not violate the permit provisions set by the approving water bureau in terms of the amount of water withdrawn (mostly from groundwater). However, their annual consumptive use increased sharply as they used advanced irrigation technologies to increase their efficiency and expand irrigated areas, resulting in a significant groundwater overdraft. Further, in reviewing global experiences, such as Australia's modernized use of Total Channel Control (TCC) in the Murray-Darling Basin where irrigation efficiency is very high (90%+) it was found there was little difference between withdrawal control and consumptive use control because the system was closely managed in a defined area. This is markedly different from China on matters of governance and the ability of farmers to comply with TCC. Conversely, a more direct and simpler approach of ET measurement and control would address the issues and problems of Turpan Prefecture as illustrated by the outcomes of the Hai Basin project.

<sup>2</sup> The primary reason the current permit system in Turpan has failed is because control only of water withdrawal does not control the consumptive use of water. For a fixed allocation of use, a water user with higher irrigation efficiency will consume more of the allocated water than a water user with lower irrigation efficiency. This may not create a problem if the supply of water in the area is sufficient or abundant. However, experiences in China indicate that groundwater can be seriously over-exploited even if the water users strictly follow the current water permit system and withdrawals do not exceed the amount allowed under the permit. Although applying water savings technologies such as lining canals, using sprinkler or drip irrigation and others may reduce conveyance and application losses, these are not "real" water savings and nor are they reductions of lost water as most of this water returns to surface or ground waters and can be reused again.



#### Box 8: Reasons for Adoption of an ET-Based Water Rights Administration System

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|--|--|
| 1. Effective solution to over use water resources arising under traditional water rights administration; | 3. Instrumental in achieving real water saving and sustainable water resources development and utilization; and, |
| 2. Instrumental to restructuring and optimized allocation of water resources based on consumptive use;   | 4. Instrumental to establish and safeguard the legitimate rights and interests of all water users.               |

54. This system of water rights administration has six advantages compared with the existing water rights system in China (see box 9).

#### Box 9: Advantages of an ET-Based Water Rights Administration System

- |  |  |
|--|--|
| 1. Defines the rights and obligations of water users in a more comprehensive manner in terms of water withdrawal, use and consumption, and return flows, and controls and restrains to some extent the behavior of the government and water users/water use organizations while protecting the future interests and sustainability of water resources;                           | water resources saving while addressing unfairness in water resources allocation;  |
| 2. Specifies the structure of property right in water resources through provisions for water withdrawal, use and return flows, which links the rights and obligations of water withdrawers (suppliers) and users by requiring water withdrawals to approved water uses under that permit and from that withdrawal structure, and facilitates the establishment of the standards; | 4. Includes water return flows in the water rights system to better standardize and control water drainage behavior and control the quantity and quality of returned water to rivers and aquifers, which in theory should help to promote the linkage and integration of the water withdrawal permit system and the pollutant discharge permit system; |
| 3. Focuses on consumption of water quantities in the water rights system that ensures sustainable utilization of water resources and achievement of  | 5. Regulates the impacts of land use changes on the water cycle through regional ET monitoring and management to ensure sustainable water utilization; and,  |
|  | 6. Utilizes target ET allocation with actual ET in determining the basin water balance to achieve the infusion of "top-down" allocation and management measures with "bottom-up" conditions and needs.   |

### 3.2 Feasibility of Implementing the Proposed New System

55. A "water rights system" is essential for modern water resources management and requires proper administration to be effective. Water rights administration involves all aspects of water withdrawal, use, consumption, return flow control and drainage. Currently, water

rights administration in China is largely based on withdrawals under the water withdrawal permit system (WWPS). Although water allocation plans specify the quota and rationing of consumable water, the consumptive use of water is still not effectively controlled when the relationship between the water withdrawal, consumption and return flow changes because the water withdrawal permit only specifies the quantity of water



withdrawal.<sup>1</sup> This causes significant problems for water resources management. For example, in the Hai River Basin the water withdrawal permit system has been strictly complied with for water management since the year 2000. Irrigated agricultural water savings appear to have progressed well, with decreases in canal losses and increases in water resources reuses. Nonetheless, groundwater tables have been declining and runoff to rivers have also been reduced.

56. Under the GEF-financed Hai Basin Integrated Water and Environment Management Project (hereafter referred to as the “GEF Hai Basin Project”), the World Bank developed the concept of “water resources savings” based on the principle of a water balance to address the problems in the Hai River Basin. The WB concluded that only when evapotranspiration (ET) is reduced through adoption of various measures can water resources be actually saved.<sup>2</sup> In the Hai River Basin and other water scarce regions, control and reduction of non-beneficial ET is the key solution to sustainable water resources utilization. In order to achieve ET management and control, the GEF Hai Basin Project has combined the concept of “water resources savings” with the water rights (water withdrawal permit) system, resulting in the concept of a consumptive use or ET-based system of water rights.<sup>3</sup>

57. Under this model, water rights administration may become more complicated. But with the continued advancement of remote-sensing and

GIS technologies, the development of various hydrological models, constant improvement in various water use monitoring systems, and diligent water administration and management, implementation of ET-based water rights administration in Turpan Prefecture is technically achievable. During the implementation of the “GEF Hai Basin Project”, considerable progress was made in the practical aspects of an ET-based WRAS. Guantao County and Cheng’an County in Hebei Province have implemented ET-based water rights allocations and developed a reasonably successful water rights administration system. They have explored and piloted ET management and established a series of ET management methods and rules with notable achievements in ET target determination, ET allocations, and ET monitoring.

58. ET management is a relatively new concept of water management in China and there are limited experiences and case studies to draw upon. Many technical and managerial problems need to be addressed and resolved. How to establish and refine the ET-based WRAS at basin, province, municipality, and water users levels to achieve sustainable ET-based water rights management will require close monitoring and evaluation and in-depth analyses during pilot implementation. The ET-based water rights administration is an effective solution to water resources management problems arising from traditional water rights administration, especially in areas of water scarcity like Turpan Prefecture.<sup>4</sup>

<sup>1</sup> Although the permit states the maximum amount of water authorized to be withdrawn, the water law requires that the use be beneficial and any changes occurring in a year should be included in the annual use report.

<sup>2</sup> ET-based water rights administration is a combined concept of “real water savings” with the development of water rights system which applies ET as the basis for water rights allocation and management. Thus, there should be three indicators (three elements of water right) that stand for a water right: 1) amount of withdrawal water, 2) amount of consumable water (ET) and 3) amount of return water of certain required quality.

<sup>3</sup> Some useful practices show that using water savings technologies and policies aimed at reducing water conveyance and application losses can actually increase groundwater depletion. The attractiveness of water demand management in China was increased leading to the promotion of water conservation focused on reducing consumptive use or ET in irrigated agriculture by the farmers through their WUAs while increasing their incomes in the World Bank’s financed and MWR implemented WCP in the Hai Basin. The project’s monitoring data at the end of the WCP in 2006 indicate that farmer’s annual per capita income increased by 193 percent and water productivity increased by 82 percent, while consumptive use or ET decreased by 27 percent.

<sup>4</sup> Even though Turpan has not successfully or completely implemented the current permit system, this new ET approach is intended to hasten water savings to address the severe problems of water scarcity and receding groundwater tables by modifying, adding to, and hopefully simplifying the existing process in a doable manner. However, the universal rule for successful water management still applies – you must measure it to manage it.



59. Evapotranspiration or consumptive water use must be controlled within the closed basin of Turpan to limit groundwater overdraft and gradually recover groundwater tables. This requires a change in the traditional water rights system which currently focuses on the management of water withdrawal, resulting in smaller diversions and less use of water. Implementation of an ET-based water rights administration system requires management of water withdrawal, consumption and return flows. The results are real water saving through water consumption control.

60. As shown in Section 2.1.3, the current allocation of water resources in Turpan Prefecture shows that agriculture uses more than 96 percent of the total water resources, with a contribution to GDP of less than four percent. Economic and social development demands industrial expansion, which in water scarce Turpan must be based on optimized water resources allocation and use. If the current pattern of water utilization is not changed to reduce consumption of available water resources and allow water resources to flow from a high consumption-low economic value sector to low consumption-high economic value sectors, no other sources of water will be available to support the economic and social development. Optimizing water resources allocations requires control of water withdrawals, consumptions and return flows. Optimized water use consumption in irrigated agriculture requires implementation of an ET-based WRAS to complement the more technical and realistic integrated water resources management efforts. It is not possible to achieve real optimization of water resources by allocating water use based on withdrawal alone.

61. Constantly declining groundwater tables in Turpan have resulted partly from land reclamation

by large farming operations that have expanded irrigated areas through improved technologies with increased water use efficiencies. Technically this is an expected development—more land under cultivation with the same amount of water diverted. However, the reduction of return flows from more efficient irrigation makes groundwater recharge impossible. In addition, the declining groundwater tables have also caused a series of environmental problems, such as degradation of ecological oases, and the reduction of Karez systems. This has resulted in adverse social effects for public and at the same time increased water costs for other users, thus harming their legitimate rights and interests. Therefore, it is necessary to fully implement an ET-based water rights administration to clearly specify the quantities of consumable water and safeguard the legitimate rights and interests of other water users by water consumption control.<sup>1</sup>

62. The recent study report on implementation of an ET-based WRAS notes that “Of course, it is true that technical feasibility does not mean practical possibility. ET-based water rights management can be put into real implementation only when it is integrated into the current water administration system, when the functions and responsibilities of governments at different levels, relevant departments and basin agencies are clearly defined, when water rights are scientifically allocated and effectively supervised and rational water rights flow is enhanced.”<sup>2</sup> Thus, despite (and in some cases because of) the problems, constraints and weaknesses that currently exist in the Turpan Prefecture water management and administration (as set out in section 2.2), preliminary findings indicate there are at least four sound reasons that the new ET approach is feasible and doable in and by the prefecture.<sup>3</sup> These reasons are listed in Box 10 and described in the text that follows.

<sup>1</sup> Control over consumptive water use under the new system will also apply to other types of water uses, such as municipal and industrial uses.

<sup>2</sup> Study on Water Rights Administration System, AAA / World Bank [2010].

<sup>3</sup> It was anticipated Turpan Prefecture would have insufficient technical capacity to implement this major paradigm shift in water management and accordingly efforts will be made to strengthen capacity through extensive training programs and workshops. Already, the prefecture water bureau has mobilized its staff to carry out field surveys and use GPS computer programs to obtain and analyze the necessary data and information for the integrated river basin management of all waters in Turpan Prefecture.



## Box 10: Reasons Why the ET Approach Is Feasible and Practical in Turpan Prefecture

- |  |  |
|--|--|
| 1. Natural conditions of water resources available, i.e., arid area with demand exceeding supply | 3. Potential for real water saving, i.e., low water delivery and irrigation efficiencies |
| 2. Foundations for administration, i.e., existing structure and operations of water bureaus      | 4. Technical conditions, i.e., competent remote sensing and ET measurement capabilities  |

63. In 2008, per capita water sharing in Turpan Prefecture was 2,200 m<sup>3</sup>, slightly higher than the national average of 2,071 m<sup>3</sup>. This is despite very low precipitation, very high evaporation, and a small population. Therefore, in general, the water resources available in Turpan are sufficient to support sustainable economic and social development when compared to the national average.

64. Turpan Prefecture has established a traditional water rights administration system under which the prefecture water bureau exercises unified administration of water resources through the county water bureaus. The prefecture water bureau adopts relevant policies and regulations; attempts to implement the water withdrawal permit system; collects water charges, water resources fees and water resources compensation fees; and carries out well construction administration. The water bureau has issued a series of official documents (circulars) to strengthen groundwater management in the prefecture, including strict implementation of the policy of “four prohibitions”. These are the prohibition of land reclamation and abandoned land re-cultivation, the prohibition of well construction for farming, the prohibition of water saving for the purpose of farmland expansion, and the prohibition of afforestation in desert areas. The prefecture and county water bureaus have established the

foundation for implementation of an ET-based WRAS. Further, prefecture leaders pay close attention to the severe water shortage, and this has created a sound political and administrative environment in which to establish an ET-based WRAS.

65. The total effective irrigation area in Turpan Prefecture is 113,000 ha. The annual water withdrawal and use is approximately 1.3 billion m<sup>3</sup> and the annual groundwater overdraft is 250 million m<sup>3</sup>. If the government policy of retiring farmland from irrigation to release allocations of water is achieved, nearly 40 percent of water withdrawal, i.e. about 500 million m<sup>3</sup> of water will be reduced each year<sup>1</sup>. Even without the benefit of return flows to the groundwater tables, there would be sufficient water to stabilize and gradually reverse the current overexploitation of local groundwater.

66. Although the technical requirements to implement the ET-based WRAS are very demanding, the Geographical Institute of Chinese Academy of Sciences has finished developing the remote-sensing information system for Turpan Prefecture. This allows them to provide data on real-time monitoring of water consumption from basin to field levels and provides the main technical conditions for ET-based water rights administration.

<sup>1</sup> This assumes that areas of farmland other than the farmer household responsibility land of thirty year contract are retired from irrigation, i.e., the large tracts of newly reclaimed land generally held by “non-household farmers”.



67. An ET-based WRAS is technically and administratively possible as seen in the applications of this approach in other parts of China as well as in many states in the United States. However, as noted in the PAD, this is not an instant solution to the water problems of Turpan Prefecture. During the life of the project, the groundwater table will still drop, but at a slower rate, and perhaps it will be another decade or more before the groundwater table begins to stabilize and recover. Strict water management and control through careful supervision will be required, and transfers of water should be limited to land that has been taken out of production or administrative termination of operating permits. Ultimately, transfers must be restricted to the historical consumptive use amount of water. It is the interdependent relationship between this study and the other seven studies with all the project activities and components along with strong stakeholder support that makes this project viable.

### 3.3 Benefits to Turpan Prefecture

68. A major concern whenever introducing a new approach or technology to address a problem in the form of a paradigm shift, is whether the incentives are recognized by the key stakeholders and that they adjust to the changes needed to be successful. In Turpan, the local government and water bureaus will benefit from improved water management as an incentive to support the WUAs in reducing their water consumption to the prescribed ET levels.

69. The WUAs and their farmer water users will have the benefit of technological improvements in their distribution and application systems as incentives to strictly apply the ET allocation. These enhanced management

practices will result in increased productivity and income and as a result, their incentives will include: (a) rehabilitation of their on-farm water distribution system and water savings technologies; (b) free technical services and training programs; and (c) lower water charges payments (or lower power costs for pumping) as a result of using less water. These are significant incentives for WUAs and farmers to adopt the ET approach. Water suppliers also enjoy the benefits of main and delivery system rehabilitation, which will reduce their conveyance losses. The big farming enterprises located outside the project areas will have to adjust to stricter measures of ET management, enforced if necessary through surcharges for groundwater overdraft. It is anticipated that this will compel many big enterprises to reduce or relinquish irrigated lands, for which compensation may be paid.<sup>1</sup>

70. The non-farmers of Turpan Prefecture who depend upon water for daily use will be assured a more stable water supply, and the economy of Turpan will also benefit. Currently, the market economy in Turpan is comparable to other regions of China. After the project benefits have been realized, there will be increased cash inflow from selling fruits and vegetable to markets in Urumqi, and elsewhere in China, as well as exports. This is also an incentive to farmers to increase their stable production and net incomes while at the same time increasing water productivity per unit (crop value per unit of ET) through reduced water use. Another major benefactor will be the environment or ecosystem as groundwater tables stabilize and eventually rise, which will result in improvements to the surface ecosystems.

<sup>1</sup> To address the issue of relinquishing land from irrigation as noted in the PAD, special study No. 8 entitled "Study on Compensation Mechanisms for Returning Farmland for Water" was designed to provide relief to the large farmers and commercial operations who have to decrease their groundwater withdrawal for recovery purposes, and thus reduce or relinquish irrigated land areas. The study will also lead to policies from the prefecture government regarding the big water users.



71. Although the ET approach to water management may appear to be a major disincentive to enterprise farming, along with restrictions on water rights trading, the overall benefits in Turpan Prefecture are considered to outweigh these and other minor disincentives that may be perceived.<sup>1</sup> The need for this new approach to improved water allocation and management is considered essential, as other alternatives to current practices appear less attractive to all stakeholders.

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<sup>1</sup> During project preparation, interviews with farmers indicated that they were pleased and supportive of the ET approach, as from their perspective their tasks were fairly simple. They mainly had to use the amount of water provided under the new permit system based on the target ET and irrigate according to the irrigation systems program prepared under guidance of the township water and agriculture extension stations. Any water savings technologies or practices are encouraged and will be carefully reviewed to ensure ET compliance as often some technologies and applications can lead to higher water consumption. If weather anomalies or conditions require more or less water to protect crop production adjustments can be made quickly from the monitoring system in order to protect the farmers.







# Chapter VI - ET-Based Water Rights Administration System

## 4.1 General Ideas and Design Framework for the Overall System

72. This chapter focuses on the proposed design of the system and its practical application in Turpan Prefecture. As the ET-based approach is fairly new in China, its practical application and degree of sustainable success depends on implementation of the project and the commitment and compliance by water officials, water suppliers and water users in Turpan Prefecture.<sup>1</sup> The water rights administration system (WRAS) in Turpan Prefecture is designed to provide the best organizational and institutional combination so that the entire process of water rights administration can be implemented in a scientific and efficient manner. A key project activity under component 1 of the project is to focus on irrigated agriculture for ET purposes.<sup>2</sup>

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<sup>1</sup> As noted in the text, there was a strong support for this project with little or no contentious issues. The WUA system has been widely accepted by the farmers and promoted by the water agencies of the central and provincial governments following initiation by the World Bank and legislative support from the State Council, MWR, MCA and local governments. These WUAs served as the negotiating base for the farmer members of the WUAs. Farmers were well aware of the public auctioning system of water authorized in China that allowed the wealthy farmers to out-bid the poorer farmers. The auction system works well in Murcia, Spain as a form of water marketing, and may become applicable in some parts of China. But in Turpan Prefecture, most of the farmers are poor and need a strong centralized decision-making body like the Turpan Prefecture to protect their interests at the basin and local levels. These WUAs provided the farmers with an equal voice to participate in water management, albeit at their level and in water allocations.

<sup>2</sup> The ET approach is designed to result in water conservation and savings from irrigated agricultural uses of water. However, water savings techniques for other consumptive uses, such as domestic, municipal, commercial and industrial uses, will also be promoted and monitored due to the scarcity of water in Turpan Prefecture, even though the amount of water they use is significantly less than for irrigated agriculture.



73. The main idea for designing the ET-based WRAS is to carry out a systematic design based on the actual conditions of Turpan, building upon the existing legal and administrative system, but centering around three sub-systems in accordance with the ET targets and requirements. These three sub-systems are the water rights allocation sub-system, the water rights reallocation/transfer sub-system, and the water rights supervision sub-system.

74. For each of the three sub-systems, three questions have to be addressed in the design<sup>1</sup>:

- **What to administer** – by clearly defining the main tasks of water rights administration?
- **Who will administer** – by specifying the appropriate organizational structure and division of responsibilities?
- **How to administer** – by standardizing water rights administration through the design of a functional institutional system with rules and regulations to provide institutional guarantees for fulfillment of the water rights administration objectives?

75. Generally, a system of water rights for water allocation based on ET or consumptive use consists of two levels: (a) initial water rights allocation and (b) water rights re-allocation through transfers under administrative or market mechanisms. The latter always requires administrative approval. In China, water

resources are owned by the state, and managed and administered primarily by the Ministry of Water Resources at the central level and parallel water departments and bureaus at provincial to country level (or autonomous region in the case of Xinjiang). Therefore, initial water rights allocations are conducted by administrative means under the water withdrawal permit system (WWPS) prescribed by the 2002 Water Law and central and provincial regulations<sup>2</sup>. This means that the state as the owner of the water allocates the right to divert and use water to permit applicants for a renewable fixed term. This is the objective and subject of the sub-system<sup>1</sup>.

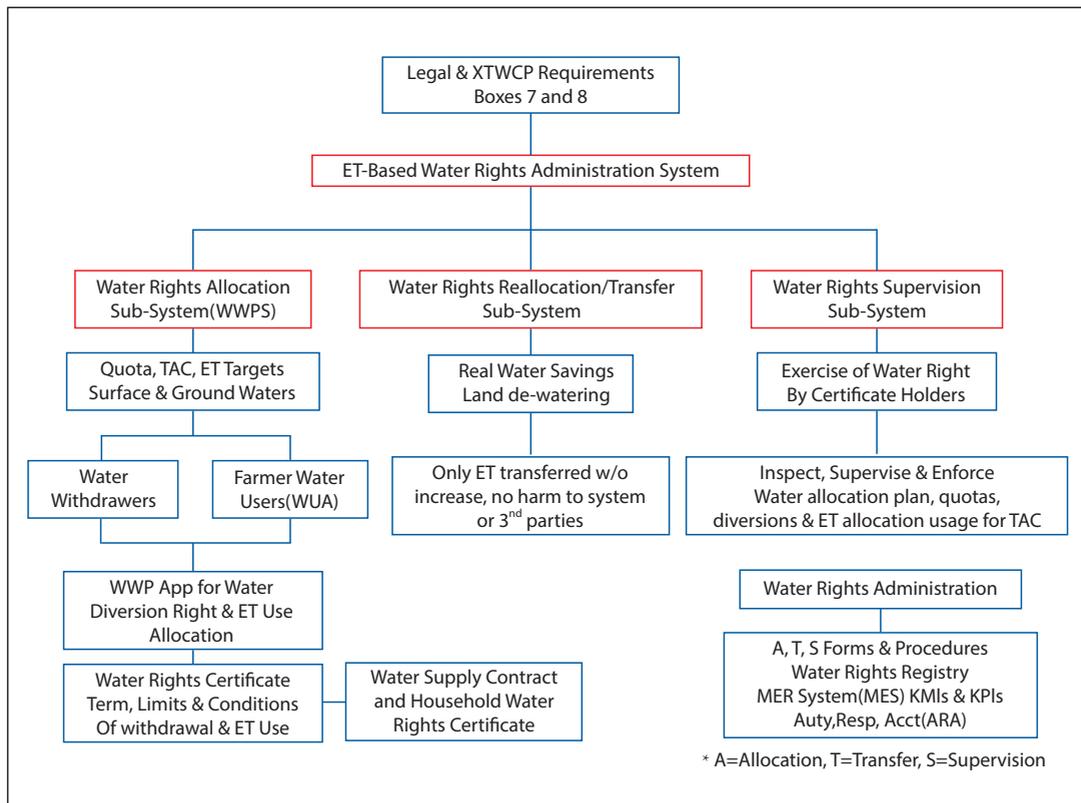
76. The objective and subject of sub-system two is water and water rights reallocations through transfers resulting in possible changes to type, place, and time of use. To ensure that the water law and permit system is appropriately and adequately carried out, the methods of inspection and supervision required under Chapter VI of the 2002 Water Law will be refined and strengthened, especially as they pertain to the permit system and water diversions based on ET determined uses. This is the objective and subject of sub-system three. All three sub-systems are subject to general administration requirements as well as the special administration requirements for each sub-system addressed under that topic. Figure 5 illustrates the overall framework and design of this proposed ET-based WRAS.

<sup>1</sup> In addition to the universal “What”, “Who” and “How” inquiries, the “Why” and “When” also needs to be addressed. In this study, the “Why” is the objective of the WRAS sub-component, and the “When” will vary depending upon the time that project analysis provides data enabling permit review and approvals, refinements and adjustment, and reissuance of permits at their term expiration, and measures taken in response to supervision findings.

<sup>2</sup> As noted, China has progressively been using the term “water rights” in a manner very similar to many states in the U.S. and other countries that have adopted the permit system with a valid permit as the evidence of the water right. A major difference in China is that often the holder of a permit for irrigation surface water is generally an irrigation district, which is likely a government or quasi-government office. However, more frequently WUAs are applying for permits for groundwater withdrawal and uses (except in large government-sponsored well systems), but they are closely monitored and supervised by water bureaus or stations.



Figure 5: Framework of the Proposed ET-Based Water Rights Administration System



77. The first sub-system is allocation of water rights. This is designed to clearly define the main tasks of water rights allocation and identify the key indicators. The rights, interests and responsibilities (RIR) of water withdrawers and water users who have an approved WWP as their water right is established under the 2002 Water Law and refined by decrees and regulations at national to local levels. The distinctive feature of the new approach is that permission for withdrawals of water is authorized under a WWP based on the inseparable link to consumptive use of water by the users to be served from that diversion. In the case of agricultural water

uses, which currently use 90-95 percent of withdrawn and delivered water (surface and groundwater), the consumptive use calculation will be determined by the ET target.<sup>1</sup> Therefore, other than the universal elements and indicators of a water right—source of water supply, point of diversion, place of use, type of use, time of use and quantity of use—specific ET indicators will be identified to determine the total authorized withdrawals for that permit and for monitoring and supervision of water withdrawals and uses, namely the water withdrawal indicators and return flow indicators.

<sup>1</sup> Use of water by municipalities (domestic use), industries and non-irrigated agricultural uses will be determined based on their record of consumptive use and water savings measures that are appropriate for those types of uses. Because plants/crops are grown as the product of water use in irrigated agricultural, consumptive use will be calculated based on ET, which can be accurately measured at basin to small plots through advanced remote sensing technologies and appropriately assigned down to the farmer household plots due to the detailed land-use maps already prepared for Turpan Prefecture.



78. This process will be carried out through reasonable organizational arrangements, division of responsibilities and institutional structures to ensure sustainable water resources utilization.<sup>1</sup> The process will utilize the existing withdrawal permit forms, modified to include and emphasize the critical element of consumptive use/ET, and specifying conditions and limitations of the water right. There are various forms designed for the current water permit system including the permit application, registration and certificate forms issued by MWR to implement the water law and SCD 460 requirements, but these forms or those used by Turpan Prefecture Water Bureau will need to be modified for the ET based WRAS<sup>2</sup>.

79. In accordance with basic procedures, water rights allocation includes at least the following seven features:

- The decision-making body that participates in water rights allocation
- The execution and management organization and its responsibilities

- The permit holders of approved water rights permits
- Basic principles of water rights allocation
- Indicators of water rights allocation assessment
- Term of water rights allocation
- Methods and procedures for water rights allocation and rules and regulations for water rights allocation management

80. The second sub-system is reallocation and transfer of water rights. Reallocation and transfer of a water right (and correspondingly, the water itself) assumes that:

- All or a portion of the initially acquired water right is being reallocated and transferred or exchanged from the original permit holder to another party upon approval by the appropriate agency, or
- The initial water right is not renewed at the end of its term or is administratively or voluntarily cancelled and terminated<sup>3</sup>.

<sup>1</sup> This report does not address the operational activities of the water bureaus and WUAs, such as how the water rights are translated into actual water delivered. Those operational aspects are addressed in special study number 3 entitled "Conversion of Water Consumption Targets into Water Withdrawal." In that study, the "entitlement" or average ET target will be derived at the river basin level and allocated to the WUAs and other water users. The "water sharing" of the actual ET target calculation for a specific period of time and according to the water availability is in proportion to the entitlement and will be converted into actual withdrawal amounts as prescribed under the permit system.

<sup>2</sup> A water right quantity granted under an approved permit and certificate of water right is not a guarantee of withdrawal in the stated amount; it is a maximum allowed under normal conditions and availability of water. This is the limitation of the water right. Thus, on a yearly or seasonal basis, the quantity actually withdrawn and delivered for use will vary according to the source and water availability as proportionally shared by all water users of that source and point of diversion, proportionately shared by all diversions from the common source. This sharing right of diversion issue does not arise under prior appropriation doctrine countries because the priority date of the water right determines the order of diversions according to available supplies, although with the group of water users under that diversion right, a similar sharing principle applies. In theory, with over-appropriated surface and ground water and receding groundwater tables, there is no "excess water" (this will occur only when groundwater tables have recovered to "safe yield" levels, and the non-diverted water demands of the environment and social needs are met). Furthermore, the condition for use and hence withdrawal, is beneficial use without waste as required by the laws and policies of China. For irrigated agriculture, such beneficial use is calculated as the ET requirement, and any use in excess of the total ET requirement/target constitutes waste. The approved water right permit and certificate may also have other limitations and conditions as determined by the permit approval agency, for example, linking the water withdrawal permit to wastewater discharge permit for point-source return flow dischargers or impacts on groundwater quality from irrigated agriculture.

<sup>3</sup> If the transfer is to another user, only the consumptive use or ET volume can be reallocated and transferred, which could require a reduction in withdrawal volume at point of diversion (if applicable) and the retirement of de-watered lands from irrigation. It is only likely that water use for irrigated agriculture will be transferred either to other higher-value agricultural uses or a change in type and place of use to higher-value domestic or industrial uses. Of course, there may be special cases of land losing its fertility to produce crops from salinity, alkalinity, etc., or taken for road or canal rights-of-way. The water bureau could "shift" the right to use the "ET" water to other reclaimable lands for which the user has use rights or it could decide to provide compensation for the productive loss of those lands. However, it is not anticipated there will be a salinity problem from application of the ET approach to water management. This is due to the very deep water tables; some of which have dropped 50-100 meters in some irrigated areas resulting from excessive overdraft of groundwater. Even in areas where water has been efficiently used, there have been no salinity problems identified during the last decade.



81. Under the new systems of water rights, the water right is “owned” jointly by two parties, i.e., the water withdrawer and the water users (in some situations these may be the same as in a WUA). Thus, reallocations and transfers for administrative purposes can be classified into two categories: the transfer of water withdrawal rights and/or the transfer of water use rights. This means that one party cannot transfer their RIR without the knowledge and consent of the other party.<sup>1</sup> Transfers resulting in reallocation of water to others must include obligations of water return flows, payment of water resources fees, compliance with water rights supervision and any other conditions and limitations stated in the water rights permit and certificate. This administrative system for water rights transfer is designed to promote optimized water resources utilization, and boost water productivity and water resources use benefits, but under the condition that interests of third parties are not harmed. In effect, when water rights are reallocated and transferred, the new water right holders are subject to at least the same requirements as original right holders.

82. The third sub-system is water rights supervision. This is designed for the monitoring, inspection and supervision of implementation of the water law and the WWPS, including the new water right indicators (ET indicators, water withdrawal indicators and water return flow indicators). Supervision is required under the 2002 Water Law for compliance at all levels. The primary change under the ET-based WRAS is the necessity to inspect and supervise withdrawals and water consumptive uses for compliance not only with the set quotas and plans, but also with permit provisions, conditions and limitations. Supervision and enforcement of the water law prior to implementation of this project and the ET-

based WRAS has clearly been simply task-based and not results or outcome based. The purpose of supervision now is to enhance performance and compliance by improving water rights administration in the allocation, reallocation and utilization of water of Turpan Prefecture, including gathering and recording of data and information, analyses, and making recommendations for refinements and corrections. As noted, the new approach creates a three-way partnership in water management—between the water managers, water suppliers and water users. Only in situations of intentional non-compliance and blatant violations should legal liabilities and sanctions be applied. The Turpan Prefecture Water Bureau is primarily responsible for supervision in the Turpan basin.

## 4.2 Design of Water Rights Allocation Sub-System

### 4.2.1 General Framework and Requirements of Water Rights Allocation Sub-System

83. In general terms, water rights allocation under ET-based water rights administration system for Turpan Prefecture consists of five key elements to ensure TAC and that the basis for withdrawal is the authorized amounts of CU/ET from the respective points of diversion:<sup>2</sup>

- Allocation (aggregated) of water CU/ET at the basin level according to the water balance (see PAD for formula to calculate water balance and CU/ET);
- Allocation (disaggregated) of water CU/ET to the three geographic areas of the prefecture (which also correspond to the administrative boundaries of the two counties and Turpan City, except for the geo-hydrologically connected groundwater sources of the basin);

<sup>1</sup> This does not prevent the common practice amongst farmers of “trading” water for use within the command area of a WUA or village because it does not involve or affect the withdrawal of water.

<sup>2</sup> The initial water right issued under the ET approach for irrigated agriculture refers to the “entitlement” or average annual target for ET/consumptive use of water derived at the basin level. On an annual basis the allocation refers to the “water sharing” contingent upon the level determined by a frequency derived from historical hydrologic data of water availability, which makes the target ET for a specific year in direct proportion to the “entitlement.”



- Determine the holders of the water rights;
- Allocation of CU/ET through water rights to the water users; and
- Allocation of water withdrawals through water rights to water suppliers

84. Due to the special hydrological conditions in Turpan characterized by a closed water system, water (surface and groundwater) is to be allocated only by the prefecture water bureau to permit applicants, with the basic principles of water rights allocation, ET targets, assessment indicators, and other conditions and limitations clearly defined. If the water withdrawal permits applicant is not also the water user, the application must provide information about the water users, and the approved permit will specify the requirements for water delivery to the users by contract between the supplier/permit holder and the water users or water user associations. When the permit to withdraw and contracts for water use are approved by the water bureau, a water rights certificate will be issued naming both the supplier and users as co-owners and this document becomes the “water right for withdrawal and use of water” in accordance with the provisions and term of the permit.

85. Water rights administration in Turpan will be the responsibility of the prefectural administrative office, the governments of the three counties, town and township governments, the prefecture water bureau, the water bureaus of the three counties, and the WWP and certificate holders (water suppliers) and water users (WUAs and other groups). The general responsibilities are:

- Turpan Prefectural Administrative Office has review and confirmation authority over water allocation and reallocation, and of water use plans and quotas, confirmation of the ET targets and annually confirming the water rights/permits registry and water diversion/use records within the boundaries of the prefecture. It also must confirm the annual supervision report, and submit it to the Xinjiang water bureau with comments on

the status of water supply and management in the Prefecture

- The prefecture water bureau has primary technical and administrative authority and responsibility over basin-wide and sub-basin area integrated water resources management, water supply and use assessments, water balance determination, and ensuring total amount control. It also has control over the preparation of the various water plan formulations, setting water sector quotas, review and approval of water withdrawal permits and water rights certificates, operation and maintenance of basin monitoring and evaluation system and water rights registry. This includes annual water allocations, withdrawals, uses and water resources and water charge fees assessments and collections; and other water management, administration, supervision and enforcement responsibilities delegated by law and regulations and the prefecture government. The Prefecture water bureau is accountable to the prefecture administrative office
- The water bureaus of the three counties are under the direct control of the prefecture water bureau and specifically responsible to assist in making preparations of assessments, plans and analysis; facilitating in the receipt and review of water rights. They also assist with applications for review and approval by the prefecture water bureau. They ensure that water diversions, delivery, and distribution and use accord with the approved water rights and the annual water allocation plans and quotas. They also receive, review and tabulate annual water diversion and use data and next year’s water diversion and use plans, assessment and collection of water resources fees, monitor the conditions of water sources and groundwater tables, and other tasks and duties delegated by the prefecture water bureau
- The Water Rights Holders, i.e., the withdrawers supplying water and users (WUAs, other groups and other users) have the right and responsibility to divert and deliver the allocated water to the appropriate users within their command areas and the users have the



right and responsibility to distribute water to its direct users according to the approved water rights (permits and certificates). They are also responsible for compliance with approved water permit and certificate terms and conditions; compliance with water supply and use contracts, assessment and collection of water resources fees and charges as applicable. They also have responsibility for the preparation and submission of annual water diversion and use reports; the collection of data and information as requested by water authorities; compliance with inspection and supervision requirements; (for WUAs) the adoption and implementation of a household water right certificate system or some other means to ensure its household members have a document stipulating their ET allocation of water; and other tasks and activities to ensure effective implementation of the ET based WRAS at their level. The water withdrawers/suppliers and water users (WUAs and other water user entities or groups) are to assist the water bureaus of the prefecture, two counties and city in making preparations prior to water rights allocation, and with other tasks and activities required by those authorities

86. The Water Law of the People's Republic of China (2002) provides: "the state shall implement the water withdrawal permit system for those who withdraw water directly from groundwater or rivers and lakes."<sup>1</sup> The water withdrawal permit system (WWPS) is currently China's basic institutional mechanism for water resources withdrawal, use, administration, management, and supervision. It is the primary approach to

grass-roots level initial water rights allocation and is also the historical foundation for water rights allocation. The WWPS can serve to normalize and legalize the acquisition and exercise of water rights when bulk or large amounts of water are withdrawn. The establishment of the new water rights administrative system is directly connected to the WWPS, as a valid permit and certificate will document a water right. It is through the exercise of the rights and obligations specified in the permit that water can be withdrawn and used.

87. Due to the critical water management problems confronting Turpan Prefecture, the XTWCP was approved and the ET target approach for water allocation and consumptive use accepted. The project and government provide incentives for water users, withdrawers, and water managers to make necessary adjustments in the allocation and distribution of water for surface and underground sources. They will also need to ensure conjunctive use of ground and surface water where appropriate (mainly in Shanshan County), and undergo a transition period of strict water control over allocations, diversions and water uses to ensure that groundwater tables will be stabilized. It is anticipated that existing water withdrawal permit holders and water users will experience a period of uncertainty about the status of their "water right". Temporary water rights will be issued until previously allocated water quantities are re-examined so that (a) the ET targets at various levels (down to the households) are established for irrigated agriculture, (b) consumptive use is determined for all other users, and (c) the link between water consumptive use and diversion of water is instituted<sup>2</sup>.

<sup>1</sup> Water Law of PRC, Article 48, 2002, as supplemented by State Council decrees, MWR regulations and local legislation by Xinjiang and Turpan. The water permit forms have been prepared by MWR for adaption and use at all levels. Those forms or the forms that are currently being used by Turpan Prefecture require modification and reissuance to reflect the CU and ET target focus in water allocations and reallocations.

<sup>2</sup> Turpan Prefecture government has a stated policy that will re-assure local farmers that their water rights will be protected with a reasonable ET target allocation and assistance to improve their water use efficiency and real water savings. In addition, large scale farming enterprises will be allocated a reasonable ET target (but are expected to adopt water saving practices at their own expense) and that existing industrial and domestic water uses will continue but that future allocations will be increased slowly to promote industrial outputs and meet growing domestic water needs. The beneficial use test will be applied to existing water rights as well as to new applications in accordance with the CU or ET allocation from the basin level. These will be carefully designed to integrate the three measures (engineering, agronomic and irrigation scheduling) to increase overall water productivity to determine the new permit withdrawal amount. As this will take time and require improved data, the "temporary permit" approach is applied to ensure compliance with the prefecture's policy.



88. The foundation for basin integrated water planning and management and allocation of water for diversion and use under the permit system is established by existing laws and regulations from central to local levels. For example, “Regulations for Water Withdrawal Permit System and Water Resources Fee Collection and Administration” provides that “units and individuals that withdraw and use water resources, with exceptions stipulated for by Article 4 of these regulations, shall all apply for and obtain water withdrawal permits and pay water resources fees.<sup>1</sup>” Thus, at the water withdrawal and use levels, the water withdrawal permit has legal effect. Water rights certificates, the legal documents that serve as evidence of an approved permit, are jointly held by (a) units and individuals who have obtained the right to water withdrawal and (b) the water user groups or individuals that have obtained the right to water use under the approved permit. Directly linking the right to water withdrawal and consumptive use (based upon ET targets for irrigated agriculture) as essentially the right to divert is the very basis for the right for consumptive use. Without this ET-based linkage, the “real water savings” accomplished at the field level cannot be converted back to the water source through reductions in withdrawals. The water rights certificates confirm the approved permit that is incorporated by reference in the certificate that specifies terms, conditions and limitations.<sup>2</sup>

89. Due to the actual conditions of Turpan and the proposed WRAS, water withdrawal permits may be held by WUAs and other agricultural

water users that directly withdraw water, generally for groundwater sources. If water is withdrawn by water suppliers (irrigation districts, water supply companies, village water committees) that currently are water rights certificate holders, they must sign a water supply and fee payment contract with WUAs and other water users or user groups even if the water rights are issued in the names of both water withdrawer and water users.<sup>3</sup> WUAs that have either obtained water rights certificates or established their water rights by contract with the water permit holder should sign water distribution agreements or adopt a “household water rights certificate” with the actual water users within their service areas, to ensure that the water use needs are assured and met.

90. The issued water rights certificates must state the necessary information to identify the permit holder, the water users and area of water uses. They must contain the key elements of water rights. This includes the source and type of water supply, point of diversion, place of use, type of use, time of use, term of use, and quantity of authorized consumptive use. For irrigation purposes, this is based on ET requirements, with the aggregate of consumptive uses supplied from the common point of diversion specifying the quantity of water that can be diverted or withdrawn, and the quantity and quality of return flow waters. The approved permit attached and incorporated by reference into the water certificate, will provide additional requirements on the term of the water right and the conditions and limitations of the

<sup>1</sup> State Council Decree 460 (2006), Article 2 elaborates on the WWPS and WRF provisions in the 2002 Water Law.

<sup>2</sup> MWR has issued and most provinces have adopted a set of permit application and approval documents and a form for water rights certificates. The documents and forms used in XUAR and Turpan Prefecture have or will be modified for irrigated agricultural withdrawals and uses of water to include ET requirements.

<sup>3</sup> In October MWR, NRDC and MCA jointly issued official document no. 502 to promote and strengthen WUAs throughout China. Xinjiang endorsed and applied 502 under WB projects and elsewhere in the XUAR. XTWCP calls for the establishment of 43 WUAs in Turpan, and will have an important role in water rights allocations, water uses and administration of the system. Therefore, document No. 502 has been attached as Annex 3. Section III requires water supply contracts between water supplier and WUAs.



water right. Under the new system, ET is the core control indicator for allocation and use of water, and all these elements will be applied during monitoring, inspection and supervision of water withdrawals and uses. Thus, the data and information contained in the water rights registry will be linked to the water diversion and use records in order to continually assess and make modifications as necessary to ensure optimum water savings and water use efficiencies, including water savings in conveyance losses. The certificate or permit will provide details of the location, timing and reporting of water measurements. This includes point of diversions, points of delivery from supplier to user (user groups such as WUAs) and other locations determined necessary to measure and maintain proper ET usage.

91. The annual and seasonal monitoring, evaluation and reporting (MER) of water diversions and usages is critical to supervision and refinement of the ET-based water rights administration system to ensure its sustainable success in addressing water scarcity and declining groundwater table. It directly involves the three main stakeholders:

- The state as owner of the water with responsibility for its allocation and beneficial use
- The water suppliers who applied for the permit and received the water rights certificates and are responsible for withdrawal and delivery to the water users
- The water users who may be established as WUAs or other individual or groups of water users, and who may also be a water supplier and water user

92. These three stakeholders are joined in a partnership relationship of authority, responsibility and accountability (ARA) to implement this new approach to water allocation, withdrawal and use for irrigated agriculture in Turpan Prefecture. A fundamental mutual responsibility is the monitoring, evaluation and reporting of hydrologic, hydraulic and other data and information required in the valid water rights certificates, water allocation and use plans, and allotments and quotas.

#### *4.2.2 Basic Principles for Water Rights Allocation*

93. At the basin level, water balance in terms of consumptive use refers to the balance between actual consumptive use and target consumptive use for urban, agricultural, and ecosystem uses. The objective of estimating water consumption balance at the basin level is to determine the target ET for irrigation areas, taking into consideration the consumptive use targets for urban uses and ecological restoration.<sup>1</sup> The second step is to ensure that the actual ET for irrigated areas is less than the target ET. The basin-wide target ET will then be allocated to each of the project irrigation areas, and accompanied by an integrated set of measures (engineering, agronomic, and irrigation management) designed to achieve real water savings. The impact on ET of the implementation of these measures will be closely monitored to ensure that actual ET is less than the allocated target ET. The target ET for agricultural use at the basin-level can be derived as follows:

<sup>1</sup> Water supply for industrial and domestic uses is assumed to increase by 98 million m<sup>3</sup> by 2025 in accordance with the 12th Five-Year Plan of Turpan Prefecture, and groundwater overdraft is projected to decrease by 233 million m<sup>3</sup> by 2025 for the restoration of ecosystems in accordance with the agreement between the prefecture government and the World Bank mission during project appraisal.



Water balance at the basin level:

$$P+I-O-WC_{URB}-ET_{ECO}-ET_{AGR}=\Delta G$$

With:

$$WC_{URB}=\text{Target } WC_{URB}+\Delta WC_{URB}$$

$$ET_{ECO}=\text{Target } ET_{ECO}+\Delta ET_{ECO}$$

$$ET_{AGR}=\text{Target } ET_{AGR}+\Delta ET_{AGR}$$

Thus:

$$\text{Target } ET_{AGR}=P+I-O-\text{Target } WC_{URB}-\text{Target } ET_{ECO}-\Delta WC_{URB}-\Delta ET_{ECO}-\Delta ET_{AGR}-\Delta G$$

Objective:

$$\text{Actual } ET_{AGR} \leq \text{Target } ET_{AGR}$$

Where:

P: Annual precipitation;

I: Annual inflow;

O: Annual outflow;

$WC_{URB}$ : Baseline annual urban consumptive use (surveys plus RS-based ET measurement);

$ET_{AGR}$ : Baseline annual agricultural consumptive use (RS-based ET measurement);

$ET_{ECO}$ : Baseline annual ecological consumptive use (RS/ET measurement);

Target  $ET_{URB}$ , Target  $ET_{ECO}$ , and Target  $ET_{AGR}$ : Annual target consumptive uses for urban use, ecological restoration and agriculture;

$\Delta WC_{URB}$  and  $\Delta ET_{ECO}$ : Proposed annual change from the baseline;

$\Delta ET_{AGR}$ : Proposed annual change of agricultural water consumption, which equals the annual reduction of groundwater overdraft;

Actual  $ET_{AGR}$ : Actual annual agricultural water consumptive use after project implementation (RS-based ET measurement).

94. At the field level, water consumption balance refers to the balance between actual ET after implementation of the integrated measures (aiming to achieve real water savings) and the target ET allocated to the area (for example, a subproject area such as the irrigated area of a WUA) from the basin level. The target ET for a subproject area can be calculated in proportion with the actual ET for the subproject. Activities in the subproject area need to be well designed, including the mix of integrated measures, for actual ET after implementing the project activities to be less than the target ET. During implementation, Remote-Sensing based ET measurements will be carried out to monitor, and if necessary, take action to ensure that actual ET is less than the target ET allocated. The different steps of the envisioned ET-based management approach are presented below.

95. Water rights allocation in Turpan Prefecture should conform to the following seven basic principles:

1) ***ET management as the core.*** The core objective of ET-based water rights allocation is to achieve effective management of irrigation water use through management of consumptive use or ET. As a result, ET indicators must be specific, managed and controlled so implementation of the water rights administration system will ultimately ensure real water savings and sustainable water resources utilization. The following table illustrates how Target ET is calculated and reflects the ET indicators.



**Table of ET Actual, ET Target and ET Allocation Calculations**  
**Water Consumption Balance in Turpan Basin**

Items in Water Balance Equation	Water Items	Baseline Year			Project Completion Year 2015						Target Year 2025						
		Area Hectare	mm	Amount million m <sup>3</sup>	Area Hectare	mm	Amount million m <sup>3</sup>	Change to Baseline			Area Hectare	mm	Amount million m <sup>3</sup>	Change to Baseline			
								mm	million m <sup>3</sup>	%				mm	million m <sup>3</sup>	%	
Available Water Resources	1. Precipitation	1,916,744	14.95	286.59	1,916,744	14.95	286.59					1,916,663	14.95	286.59			
	2. Water inflow			874.00			874.00							874.00			
	3. Groundwater base flow			41.00			41.00							41.00			
	Total Available			1201.59			1201.59							1201.59			
Water Consumption	1. Ecological ET	484,188	85.10	412.04	484,188		412.04			0	498,119		412.04				0
	1.1 Man-made ET	2,950	208.52	6.15													
	1.2 Natural ET	481,238	84.34	405.88													
	2. Water Surface ET	14,013	240.45	33.69	14,197		29.48		-4.21	-13	14,197		29.48		-4.21	-13	
	2.1 Man-made ET	963	293.68	2.83	1,147		5.20		2.38	84	1,147		5.21		2.38	84	
	2.2 Natural ET	13,050	236.52	30.87	13,050		24.28		-6.59	-21	13,050		24.28		-6.59	-21	
	3. Agricultural ET	114,206	542.49	619.56	114,206	484.95	553.84	-57.54	-65.72	-11	114,206	318.62	363.89	-223.87	-255.67	-41	
	3.1 Crop ET	94,271	630.62	594.50	85,942	603.76	518.89	-27.27	-76.02		54,275	533.87	289.76	-97.16	-305.15		
	3.2 Non crop ET	19,935	125.72	25.06	28,264	123.68	34.96	0.00	10.31		59,931	123.69	74.13	0.00	49.47		
	4. Unused Land ET	1,304,338	25.80	336.57	1,304,338		336.57		0.00	0	1,304,338		336.57		0.00	0	
	5. Industries			15.42			43.61		28.19	183			100.00		84.58	549	
	6. Domestic Use			7.03			11.35		4.32	62			20.00		12.97	185	
	Total Consumption			1,424.30			1,386.89		-37.41	-3			1261.97		-162.33	-11	
Outflow			7.86			7.86		0.00	0			7.86		0.00	0		
Change in Groundwater Storage			-230.57			-193.16		37.41	-16			-68.24		162.33	-70		

Note:

1. Change in groundwater storage = total available water resources – total water consumption – outflows
2. The target year by which the prefecture government plans to fully eliminate groundwater overdraft for ecosystem preservation in Turpan River Basin
3. By 2025 the increased water availability will be 85 million m<sup>3</sup> for industry, 13 million m<sup>3</sup> for domestic use and 162 million m<sup>3</sup> for reduced groundwater overdraft. The above water availability originates from the reduced agricultural ET 256 million m<sup>3</sup> and reduced water surface ET 4 million m<sup>3</sup>
4. Reduced agricultural ET comes from abandoning arable land by building green house and water saving measures. It assumed that 25,000 mu; 35,000 mu and 60,000 mu of irrigated areas separately for 12<sup>th</sup>, 13<sup>th</sup> and 14<sup>th</sup> 5- year plan are going to be abandoned by building green house and merging remote small villages.
5. It assumed that ET saving rate is 76% by abandon, 40% by greenhouse and 25% by water saving measures, which should be verified during project implementation.
6. The industrial and domestic water consuming rates are assumed as 50% and 30% separately, which need to be verified too with field survey yearly.

2) **Unified management.** The concept of unified management set out in the 2002 Water Law and the 2009 Turpan circular pertains to managing water resources according to the boundaries of the hydrologic basin (and sub-basins) and the corresponding levels of administrative boundaries established by government in a synchronized and integrated manner. For example, the Turpan closed basin is entirely within Turpan Prefecture, and thus under the administrative control of the prefecture water bureau. However, numerous surface water sources form three sub-systems which roughly correspond to the administrative boundaries of the two counties (Tuokexun and Shanshan) and county-level Turpan City. While the underlying groundwater phreatic aquifer is hydrologically connected and recharged by inflows from the

surrounding mountains and percolating surface waters from streams (natural recharge) and return flows from channels and water uses (artificial recharge), it is not homogeneous. Therefore, Tuokexun County has very limited available and accessible groundwater, while deeper portions of the aquifer exist in Turpan City and Shanshan County. Thus, the prefecture water bureau has responsibility for overall basin water balance and TAC, while the three counties are more directly involved with the surface and underground water resources management in their respective jurisdictions. However, because of the particular basin-wide scarcity of surface and ground water and the severity of groundwater overdraft affecting the social and economic development of the whole prefecture, primary administrative authority has



to be exercised by the prefecture water bureau, particularly for groundwater management and conjunctive use. The water bureaus of the two counties and Turpan City provide assistance and coordination of water management in their respective areas, but do so under the overall guidance of the prefecture water bureau. The unified management concept is extended under the new ET-based water allocation system to include rights (authority), responsibilities and accountabilities of all three key stakeholder groups<sup>1</sup> who must cooperate, coordinate and collaborate in a unified partnership to achieve sustainable water utilization and real water savings in the prefecture that will eventually reverse the declining groundwater table. The key elements for unified management include water withdrawal and delivery, distribution and consumptive use, and drainage as return flows. The rights and obligations concerning the water right are monitored and supervised by a series of indicators that cover these key elements.<sup>2</sup>

3) ***Incorporating the new approach into the existing water withdrawal permit system.*** To achieve ET-based water rights administration, the organizations and their responsibilities of the current administrative system need to be not only utilized, but adjusted accordingly. To reduce social disruption, and implementation costs while increasing the realistic level of

operability, the design of the new administration system is based on linking and modifying the existing water withdrawal permit system and forms. There are additional requirements for the volume of water for withdrawal to be based on and limited to the volumes for authorized uses under the permit (ET target for irrigated agriculture, and calculated consumptive use, plus measured return flows for domestic and industrial uses). The water rights certificates identify both parties responsible for water withdrawal and the parties entitled to water uses, the volumes as well as the measurement requirements of withdrawals and uses. The requirements of water supply, uses and fee payment is assured through contracts from the water supplier to farmer water user associations (or other water user groups), including the requirement of issuing household water rights certificates by the WUA directly to households based upon a valid water rights certificate.

4) ***Terms and Conditions of Water Rights Allocation.*** The term of validity for the water allocation must be clearly specified in the water rights certificate in accordance with central and Xinjiang laws and regulations<sup>3</sup>. SCD 460 indicates the term for water rights might be five to ten years, but Xinjiang and Turpan Prefecture may adopt a different term for different types and locations of water diversions and water uses<sup>1</sup>.

<sup>1</sup> Water resources managers are the prefecture and county water bureaus. The water suppliers who withdraw and deliver water vary with general type of use. They include the government for domestic water, quasi-government to private bodies for industries and factories, and government entities to water users for agricultural. The water users are domestic and industrial users while for agriculture they may be WUAs, village water committees or individuals.

<sup>2</sup> If the system of water rights indicators is based on only water withdrawal without explicitly standardizing the consumption and the return flows, it will be impossible to achieve effective control of water consumption and impact on the groundwater tables. It is acknowledged that for irrigated agriculture, return flows are non-point and thus not possible to accurately measure and attribute to a specific household. Therefore, the return flows attributed to irrigated agriculture will be calculated based on impacts or changes to the groundwater table systematically monitored and measured in the basin.

<sup>3</sup> For example, under the central water law and regulations, terms of five to ten years are recommended, but some provinces have determined that those periods too long and consequently issue permits for three years. This requires a constant re-application of permits and does not provide sufficient time to encourage long-term investment in infrastructures at diversion and delivery levels and at field application levels. For these reasons, many states in the USA grant indefinite or longer fixed terms for water rights. Virginia, for example, bases the term on recoupment of the investments made. Generally all permit states and countries specify conditions for exercising the water right (diverting and using water) and maintaining the rights validity, which if violated may cause suspension, termination or modification of the water right. Like China, some states in the USA have a "use it or lose it" provision. For example, China states two years of non-justifiable use terminates the water right and Wyoming requires four years of non-use and a warning, which if followed by a fifth year of non-use, the right is forfeited. California issues a long-term water right under the condition that annual reviews may place additional limitations on the diversion and use of water to improve water use efficiency. The objective of a longer term is to reduce administrative cost and increase efficiency of personnel, as well as eliminate costs and time of the water right holders.



It should be noted that different water rights permit holders and water users have varying features. For example, WUAs are relatively stable. After water is withdrawn and delivered to their outlet by the water supplier or for those WUAs who jointly own and operate wells to withdraw water under an approved permit, the WUA (whose leadership is directly elected from the farmers represented by the WUA) distributes the delivered water to member farmer households (holders of contracted responsibility lands) based upon the ET target calculation.<sup>2</sup> In some situations, water users (WUAs) might have rights to use water from surface sources when available, and then have rights to withdraw water from groundwater as an alternate point of diversion, as a conjunctive use measure. Because the WUAs are relatively stable and the nature of their water use is long-term, they might be granted a longer period or term of their water rights. Whereas, individuals or enterprises who independently withdraw water for agricultural production that are normally engaged in farming to make a profit (this may be referred to as an “industry in irrigated agriculture production”) might be granted a shorter term water right, but with some degree of flexibility due to economic and social developments and changes in local water resources plans. Whatever term is granted for water withdrawal and consumptive use, it must be made clear that the water right is not a guarantee of that water quantity availability specified for the term granted. Rather it is conditional upon reasonable withdrawals and beneficial uses, including compliance with

measurement and reporting requirements and the availability of water. In Turpan Prefecture, this will be the recovery of groundwater tables to determined “safe yield” levels that takes into account the seventh principle described below. Other water right conditions may be included to enable inspection, supervision and modification of the right to withdraw and use water, depending upon natural conditions and the severity or scarcity of available water resources. Climate change may contribute to variations in natural conditions, and therefore other conditions that may be included cover water rationing, rotation in use, seasonal withdrawals, and conjunctive use of surface and ground waters where use of groundwater may be identified and required as an alternate point of diversion.

5) ***Ensuring water use for the contracted responsibility farmland.*** Agricultural water users in Turpan Prefecture are classified into two categories by the nature of their land holding and use. These are (a) householders of the 30-year contracted responsibility farmland, and (b) operators or enterprises of reclaimed land for commercial agricultural production. The policy of the prefecture is to ensure and protect the water rights and livelihood of the first category, and the lesser quantities of water for domestic and industrial uses. The second category of reclaimed land is allowed to withdraw and use residual water (mostly from groundwater) according to the circumstances.

<sup>1</sup> Initially, Turpan Prefecture government has considered a three to five year term for agricultural water rights with the rationale that (a) this would be consistent with the prefecture five-year plan for social and economic development; (b) it is consistent with the existing term of water right permits; and (c) this would protect the farmers’ interests. In reality, the amount of water allowed to be diverted and applied is limited to the ET target for the lands served, and this may vary from year to year. This is a condition and limitation of the water rights, and simultaneously provides the flexibility to implement the ET approach while stabilizing the groundwater tables and increasing farmers’ productivity and income.

<sup>2</sup> For all pilot areas under the project, the target ET will be allocated at the level of the WUA and big farming enterprises from the basin level through counties and townships protected by the permit system. The target will then be converted into the target distribution for the WUA or enterprise for individual farmer households within the WUA as an internal matter of the WUA. Government water officials will provide technical guidance on how to distribute fairly and consistent with the ET allocations at farm field levels. Special study number 6 called “Support for WUA ET Management” will ensure that WUAs have the necessary knowledge to control ET with project assistance to fund irrigated agriculture water savings technologies and practices (e.g., drip irrigation systems, on-farm water distribution systems rehabilitation, etc.).



6) ***Adaptation to the existing water use customs.*** Farmers in Turpan Prefecture have experienced lengthy periods of water distribution and use under scarce water supply conditions and consequently have developed their own particular customs of water use. In establishing and implementing this new water rights administration system, their customs must be respected where they do not conflict with or prevent implementation to improve water security in the prefecture.<sup>1</sup> For example, in the conjunctive use of surface and ground water, a common practice among farmers is to use surface water early in the growing season and switch to groundwater use when surface water is no longer available. Care must be taken to be flexible and not to impose hardships through rigid rules. The project will improve some surface water systems (reservoirs) to stabilize reliability of water supplies during the normal growing season, but for those converting to greenhouse farming they most likely require use of groundwater. Thus, the WWPS must accommodate alternate points of diversions linked in the water right registry and water allocation plans.

7) ***Ensuring ecological and environmental water needs.*** Ecological and environmental water needs are to be determined by the ecological service requirements to be maintained.<sup>2</sup> Ecological and environmental water needs should be determined and reserved from allocation for sector uses where necessary in such a way

that minimum ecological and environmental water availability is ensured. Comprehensive consideration must be given to local water resources availability, water resources needs, and ecological and environmental conditions to be maintained in the light of local conditions. Environmental and ecological protection of waters may be necessary for maintenance of minimum flows in surface waters and stabilizing groundwater table levels. The source of water to meet these needs at different locations within the Prefecture may be natural flows or from return flows of water right.<sup>3</sup>

#### ***4.2.3 Water Rights Allocation and Assessment Indicators***

96. The new approach to water rights allocation for irrigated agriculture is based on consumptive use or ET. As described in the PAD, the indicators must at least cover three key elements: quantities of withdrawal water, quantities of consumable water, and quantities and qualities of returned water.<sup>4</sup> The project Knowledge Management System (KMS) and in particular, the M&E system (MES) will identify the specific key and supporting indicators to monitor and measure these elements and other project activities, as well as identify the location and use of measuring instruments for the monitoring system. Computerized databases will be established for the MES, including data gathering, evaluation, recording and reporting to appropriate authorities and the permit holders

<sup>1</sup> Turpan is a prefecture that is highly populated by many minority ethnic groups. There may be some water use customs specific to a particular ethnic group and these should be well understood and be given careful consideration with sincere respect.

<sup>2</sup> The ecological service requirements for Turpan Prefecture may not have been scientifically set at this time, but it is the responsibility of the Turpan Prefecture Government to restore the ecosystem. The Prefecture's Environmental Bureau will monitor the status of the ecosystem and make its report to the Prefecture Government, who in turn will report the findings to the Xinjian Regional Government.

<sup>3</sup> The 2002 Water Law, Article 21 requires full consideration of environmental ecological needs in the development and utilization of water in arid and semi-arid regions and the prevention of groundwater overdrafts that adversely affect environmental conditions, and Article 30 requires maintenance of rational (minimum) flows of natural surface water (rivers and levels of lakes).

<sup>4</sup> A fundamental issue with many surface water withdrawals and open channel groundwater delivery systems is the high conveyance losses during delivery to water users. The allocation of water for withdrawal needs to take these losses into account and therefore, the only logical application of ET for irrigated agriculture is measurement of delivered water to the WUA or individual household users (who also may have numerous parcels of land to distribute their water, but which comes under one household). A second fundamental issue concerns losses of water delivered to the user that does not reach the point of crop-watering from which the ET is based. A third fundamental issue concerns the requirement of quantity and quality of returned waters (either to surface systems run-off or percolation into the groundwater table) as water users may consider this to be an additional cost in terms of water charges or fees that could be avoided if water is judicially applied according to agronomic principles.



and water users in a timely and systematic manner. Computer equipment and internet access at least for the water managers at prefecture and county levels is a project activity under the KMS.

97. Due to the difficulty to establish and carry out the quantity and quality indicators of return flow waters (surface flows or groundwater recharge) from agricultural water uses, the project will focus on groundwater table levels and water qualities to ascertain return flow impacts. For any authorized withdrawals and uses of water in Turpan Prefecture, remedial measures will be taken if return flows diminish or water quality deteriorates below acceptable levels.

98. Table 7 describes the technical process and calculations to ascertain the ET target and ET allocations from the available water sources for the various categories of uses, including ecological needs, to determine the impacts on groundwater storage. The formula for calculating ET allocation also factors in diversion and conveyance losses. In addition, allocations for domestic and industrial water uses include return flows less diversion volume to determine “consumptive use”.<sup>1</sup> The review and approval of temporary water rights for all approved basin water users and means of water withdrawal and conveyance of the authorized use quantities can be established for the basic water right and water entitlement based on the ET, basin water balance and TAC calculations, the application of the annual quotas, and spatial and temporal information on water sources and availabilities. Each year, the actual water allocation for withdrawal and use for each water right will have to be adjusted based upon the projected availability of water, spatial status of groundwater tables, and extent of remedial target impacts projected for that year.

99. Therefore, it is important that all three parties realize the need and benefits from strict water management measures, and accept that water use restrictions are necessary to achieve ET targets and consumptive use levels and thus are conditions and limitations of the awarded water rights. Likewise, the monitoring indicators will need to address each of the elements set out in approved water rights for gathering of data and information and assessment, at locations and intervals approved by the prefecture water bureau.

#### *4.2.4 Methods and Procedures for Water Rights Allocation*

100. Based on research of present practices in Turpan Prefecture, applicable laws and regulations, and the objectives of an ET-based water rights administration system, the following six methods and procedures for water rights allocation are proposed, consistent with the general responsibilities set out in the paragraph above:

- Turpan Prefecture Water Bureau makes prior preparations and draws up the initial water rights allocation plan based on the ET quota and taking into account the existing water withdrawal permits. In the process of preparing the initial water rights allocation plan, the water bureaus of the three counties, WUA representatives, water user representatives and other interested parties will be encouraged to participate. When the allocation plan has been finalized, the prefecture water bureau submits this plan to the Turpan Prefectural Administrative Office.
- Turpan Prefectural Administrative Office reviews and confirms the initial water rights allocation plan and makes it available to the public. After consultation with the water

<sup>1</sup> This ET allocation approach to promote water savings, reduce water waste and avoid water scarcity without adversely affecting crop production or unnecessarily increasing costs to prohibitive levels is similar to the “duty of water” concept for water allocation in many states of the US.



users to be served under the plan's water rights, the water withdrawal units apply for ET or CU based water withdrawal permits.

- Turpan Prefecture Water Bureau and water bureaus of the three counties review the water withdrawal permit applications in accordance with the water withdrawal amounts and water use quota stipulated in the plan. The prefecture water bureau recommends the action to be taken (application approval, modification or denial) and submits these recommendations to the prefecture administrative office for confirmation before the prefecture water bureau approves the permits and issues water rights certificates.
- The issued water rights certificates and approved permits are registered in the water rights registry described below which identifies the water withdrawer and diversion works and the irrigation water users by organization (i.e. WUAs) and area, and specifies the term of the water right and limitations and conditions of water withdrawal and use under the certificate.
- Water withdrawal units will sign water supply and fee payment contracts (WSFPC) with the water users groups (WUAs) and individuals. The contracts must specify the registered water right certificate and require compliance by both parties to the term, limitation and conditions of the water right. Copies of the WSFPC will be maintained by the water withdrawing unit for inspection and supervision by appointed water officials.

101. As noted, to achieve and measure real water saving through the ET approach to water allocation requires the prefecture and county

water bureaus to modify their practices, modify the water withdrawal permit forms to include the ET approach and expand the sections on conditions and limitation of the water right, and limit the right of water withdrawal to the consumptive water use (ET) allocation of the water users served. Further, since the initial implementation of the new approach and measures needs to be piloted, tested and refined at least during the initial years of the project, it is recommended that all (new and revised/reissued) water rights be considered provisional in order to allow adjustments during project implementation.

#### *4.2.5 Establishing the Water Rights Allocation Administration System*

102. Administration of the new water rights approach will be in accordance with the requirements of central and Xinjiang laws and regulations as well as organizational structures that exist in Turpan Prefecture. However, as noted, Turpan water and relevant agencies at the city and county level have not been able to fully implement the existing legal mandates for TAC, water allocation plans and WWPS in a manner that may have avoided the current water scarcity conditions, receding groundwater levels and environmental degradation. Therefore, under the project approach to base water allocation for withdrawal and use by irrigated agriculture on ET requirements in order to initiate real water savings, eight points are proposed to improve the water rights administration system. These points are set out in Box 11 and explained in the text following.



## Box 11: Requirements to Establish an Effective Water Rights Administration System

- Integrated Water Resources Planning (comprehensive and integrated river basin master plans and special plans as required under the 2002 water law)
- System of Total Amount Control
- System of Consultation for Water Rights Allocation
- Water Rights Allocation Publicity
- Water Reserved from Allocations for Eco-Environment Protection
- Safeguarding Farmers' Water Use Rights
- Water Rights Adjustment in an Emergency (emergency allotment plans)
- Water Rights Registration and Registry (computerized, linking water rights to annual water diversions and uses and the assessments and collection of fees, and linking to wastewater discharge permits for domestic and industrial discharges)

103. Based on the principles of water balance and TAC, integrated water resources planning of Turpan Prefecture forms the basis and provides measures for water rights allocations. The plans must be strictly applied. Under the water law and applicable legislation and regulations for Turpan Prefecture, this planning process should result in comprehensive basin master plans and special plans, such as addressing the water requirements of irrigated agriculture. The target ET will be determined by planning, with the aim of sustainable water resources utilization for the entire prefecture area. At the same time, relevant rules and regulations with a particular focus of the WRAS and the project must be established to ensure effective linkage between plans and actions at the various levels. At lower levels, plans must conform to and be consistent with a higher level plan. For example, the ecological and environmental water reserves contained in a higher level plan must also be reflected in the lower level plans. If a lower level plan is to be enacted before a higher level plan, interactions and coordination between the plans must be strengthened so that different levels of plans are consistent.

104. To ensure that water rights allocation in Turpan Prefecture is controlled within the limits of sustainable water resources utilization, it is necessary to refine and apply the application of total amount control (TAC) as required by the 2002 Water Law.<sup>1</sup> The water withdrawal permits must not exceed the total target ET and water withdrawal quota allocated to the prefecture.

105. Water rights allocation concerns the interests of many parties, but the prefecture water bureau must be responsible for managing and administering the state owned water resources within the prefecture. Failure to gain the understanding and support of the relevant stakeholders will lead to disputes and adversely affect the implementation of the water rights allocation plan.<sup>2</sup> Therefore, an effective consultation mechanism for water rights allocation needs to be established to strengthen democratic decision-making and mutual understanding in the process of water rights allocation.<sup>3</sup>

<sup>1</sup> Article 47 of the 2002 Water Law requires a unified system of total amount control and quota management for water uses, the latter formulated by sector. Thus, for irrigated agriculture, the quota may be the ET target.

<sup>2</sup> In this context, the term "stakeholders" refers to water rights holders and individuals or organizations, including governments whose interests bear fully on the withdrawal and use of water resources.

<sup>3</sup> When the World Bank first introduced the concept of real water savings in the Hai Basin Project there were a number of contentious issues. However, when this project was discussed with the Xinjiang and Turpan governments and water users, there was strong support for the ET based management approach as the experience from the last ten years was proof that applied water savings technologies did not "save" water because the groundwater tables continued to decline even though water withdrawals under the permits did not significantly change.



106. The Turpan Prefecture Water Bureau should be responsible for organizing the governments of the three counties and their water administration departments and water user representatives in establishing a water rights allocation coordination group to strengthen communication, consultation and collaboration in the process of water rights allocation. Impacts on third parties should be assessed in a scientific manner and the opinions of stakeholders should be sought to prevent water withdrawal permits from harming the interests of third parties. Also, consideration should be given to the need to set up an expert advisory and justification committee for water rights allocation. This committee would consist of experts in water rights and water resources planning from the water system and relevant scientific institutions and would be responsible for providing technical advice and justification in the process of water rights allocation, diversion and use, as well as technical support and a scientific basis for water rights consultations.

107. Water resources in China are public natural resources, and therefore the government must play an important role in ensuring sustainable water resources utilization and safeguarding the interests of the general public in the process of water resources development, utilization and protection. At the same time, water rights allocation concerns the interests of water withdrawers and water users. To promote equitability, transparency and accountability, a water rights allocation publicity system should be established to keep all stakeholders informed and encourage their participation.

108. With rapid global economic integration, industrialization and urbanization plus increasing global climate changes, unusual demands on water resources are unavoidable in regional economic and social developments due to unpredictable events and emergencies. To improve “water security”, it may be necessary to establish a reserve water system for emergencies and future economic and social development. The government has the right and responsibility to manage the nation’s water resources through policies and regulations from the central level as well as at provincial and local levels. Not all water resources need to be allocated for withdrawal and use – some water should be held in reserve.

109. Reserved water can be classified into three categories according to their purposes:

- Water reserved for ecological and environmental needs, mainly for future ecological and environmental improvements, including both in-stream and riparian water use
- Water reserved for future development – Turpan Prefecture is currently at a stage of rapid development;<sup>1</sup> and
- Water reserved for emergencies, mainly for necessary water demand due to unpredictable events, such as ecological emergencies, drought mitigation, and emergency inter-basin transfers,<sup>2</sup> in addition to the rights of government to limit the amounts of water withdrawn during major droughts.<sup>3</sup>

<sup>1</sup> It may also be impossible to acquire water for future economic and social development by water rights assignments or trading, a practice now common in some western states of the USA.

<sup>2</sup> The issue of reserving water for environmental protection, emergencies, and future uses is not to create a “water right” for these purposes, but rather to “reserve” a portion of available water (surface or underground water) from being allocated under a water withdrawal permit. This is a common international practice, often confused with setting aside from allocation for various future and public uses in a plan versus issuing a water right to divert water for economic gain (agriculture, commercial and industrial uses) or a public use (community and municipal water supply). Reserved water is not a “water right”; it is water “reserved from allocation” under a water right. It can be quantified and location specific, and is a component of TAC. For example, minimum flows and environmental flows and the designation of an aquifers’ “safe yield” and level to protect the environment are not volumes and locations of water specified in a water right, but rather are waters reserved from allocation.

<sup>3</sup> SCD 460 Article 41 (2006)



110. Due to its public nature, reserved water should be determined through consultation after comprehensive consideration is given to the prefecture's water resources availability, eco-environmental conditions, economic and social development and other relevant factors.

111. In accordance with the basic principles of reserving water, reserved water may be used according to prescribed procedures when the following conditions are met:

- After successive years of dry weather or drought, normal municipal water supply faces water exhaustion and an imminent water supply crisis owing to serious water resources shortage and limited water works regulation and storage capacity;
- Ecological and environmental crisis arises because of dry weather and water shortage;
- Settle and avoid water market disorders and their wild fluctuations as a result of extreme speculation in order to maintain social stability and normal economic development;
- Solve or alleviate problems of uncoordinated, unhealthy and unsustainable socio-economic development resulting from uneven distribution of water resources and wide wealth disparity; and
- Support adjustments and re-arrangements of major national or regional development strategies and national defense developments.

112. As noted, agricultural water users in Turpan Prefecture fall into two types: holders of contracted responsibility farmland, and water users who have reclaimed lands for agricultural production. Agricultural production activities by the first type are undertaken for people's livelihood whereas the second type is generally for economic gain.

Therefore, a system of safeguarding farmers' water use rights must be established to end reallocating the water of the contracted responsible farmland holders for agricultural use on reclaimed lands, industrial, domestic and other uses in the process of water allocation.<sup>1</sup>

113. In order to enhance the security and safety of water rights, it is necessary to establish a process of water rights adjustment in an emergency under the following conditions<sup>2</sup>:

- **How to define and assess an emergency.** In an emergency, the extent of the drought or flood or other emergency requiring public administration can initiate the need for adjustments in water rights.
- **How to temporarily adjust the water rights that are already allocated in an emergency.** *Generally*, measures that can be taken for water rights adjustment in an emergency would include: proportional reduction of water, temporary administrative control, reduction of water use categories, and prioritization of water uses. However, after water rights adjustments or reallocation measures have been decided, publicity, transparency and historical consistency must be ensured. Furthermore, increasing climate change and frequency of extreme weather events causes significant uncertainty of water resources supply and demand. Thus, while discharge of carbon dioxide and other greenhouse gases should be reduced through energy conservation and emission reduction conversely, full consideration should be given to the impact of climate change on water rights and relevant measures should be formulated. Adjustments may be permanent or temporary, sector focused and regional or area specific.

<sup>1</sup> In many states in the U.S. and in other countries, the water laws include an "appurtenance doctrine" that ties certain water rights (i.e., water for irrigated agriculture of households and water rights for irrigation districts) to the land. It can be a limitation or condition included in an approved water withdrawal permit as a provision in the water rights certificate. Although these provisions protect or safeguard the farmers' water and water rights, such provisions are also restrictions on sale and transfer of water and water rights. Thus, such protective measures have both positive and negative consequences.

<sup>2</sup> Article 45 of the 2002 Water Law specifically requires contingency plans of water allotment for drought emergencies, but does not go as far as proposed for necessary adjustment to meet a wider range of emergency conditions that may occur in Turpan Prefecture.



114. In order to standardize and manage water rights allocations, a computerized system of water rights registration (or water rights registry) must be implemented for any authorized permission to use surface or ground water for which a permit application has been approved and a water right certificate issued. It is an essential tool to successfully implement a basin (or in the case of Turpan Prefecture, a closed basin) master water plan, allocation and allotment plans, sector water use quotas and actual diversion and distribution of water in accordance with the permit system. For the ET-based water rights administration, the water rights registry is fundamental to ensure proper water diversion, delivery and consumptive use by ET calculation and their supervision. The registry should be linked to the water diversion and water use records (also computerized) and other basin hydrologic data systems, in order to achieve TAC and serve as the basis for determining if actual use measured by ET is achieving the ET targets. Regardless of whom (who) issues the water rights certificate (central government, Xinjiang, or Turpan Prefecture, for water diversions and uses authorized in Turpan Prefecture), the water rights registry created and maintained by the Turpan Water Bureau must be current and complete to include all surface water and groundwater authorized diversions and uses in the prefecture.<sup>1</sup> These records are the fundamental sources of data and information for water rights analyses, inspection and supervision.

115. A water rights registry is a feature of a well-designed water withdrawal permit system required by the 2002 Water Law, SCD 460 and several MWR regulations. It is a universal practice in permit issuing water rights countries and many states in the U.S. Registration of

water rights is an obligation of the water right holder, but maintaining a water rights registry is an administrative function of the water right issuing agency.<sup>2</sup>

### 4.3 Design of Water Rights Reallocation/ Transfer Sub-system

116. For the duration of this project and for several decades after, water scarcity and the critical condition of over-drawn groundwater resources will not be comfortably resolved, even under the strict water management measures to be implemented by the ET-based water rights allocation approach for agricultural water withdrawal and use. Turpan Prefecture has never had an abundance of water, either in the atmosphere, on the surface or underground. Further, Turpan basin is not only confined to a sink or closed-basin (there are many closed-basins in China such as Tarim and Shiyang basins) without known out-flows, but it also has the second lowest spot in the world at 154 meters below sea-level and wide variations in annual temperatures. The overdraft of the groundwater table remains serious with levels still declining. Yet, political and economic interests seek to shift or reallocate water from irrigation water uses to promote more profitable industrial development and meet increasing domestic demands. This is attempted by elaborately providing for transfers and water marketing of “saved water” which is more likely to aggravate the physical system while at the same time causing more hardships for Turpan’s poorest citizens. This group is most likely to “lose” their right to use water for irrigation than to be “fairly compensated” for water they relinquish or have taken from them.<sup>3</sup>

<sup>1</sup> As noted previously, a central government construction and production farm with its own water bureau is located in Turpan Prefecture.

<sup>2</sup> A registration form is included in the various permit forms provided by MWR. Many provinces have adopted a computerized registry of water permits/rights and some link the right to use water with annual water uses to ensure proper administration of the permits (e.g., Liaoning, Gansu, Jiangsu and other provinces). The IHWR, Beijing, has developed a standardized computerized system that can be downloaded from the internet.

<sup>3</sup> It is recognized that these limitations may be contrary to the spirit and principles of the 2011 Document No. 1, but they are considered necessary under the critical water conditions in Turpan Prefecture.



117. Consequently, it is recommended that, except under the specific circumstances described below or exceptional cases, at least a five-year moratorium on all reallocations of water resulting from transfers of water rights be put in place until there is a high degree of certainty that the ET based approach will reverse (not just slow) the serious over-draft groundwater and ecosystem degradation conditions in the Turpan basin.<sup>1</sup>

118. Transfer of water rights for saved water is currently a contentious topic in China with great emphasis placed on creating water markets. But under the present conditions of water withdrawal permits (a.k.a. water rights) that most often are issued to irrigation districts or non-farmer water suppliers, there are no assurances or protection for farmer water users. This is because the “water right” is currently focused on approved “withdrawal” volume, and not on the volume of water needed for irrigated agricultural consumptive water needs and uses<sup>2</sup>. Currently, there are not sufficient water rights in Turpan Prefecture available for trading to establish a water market.

119. The exceptions for allowable reallocation and transfer of agricultural water rights are limited to the following three scenarios. These are (a) retiring all or a portion of the water rights by taking land out of irrigated agricultural production, (b) administrative cancellation or non-renewal of a water right either in lieu of an alternative source

and point of diversion, or (c) because of the serious nature of the groundwater conditions that threatens the rights of third parties. If land is taken out of production, either voluntarily or involuntarily, payment by the party to whom the water right is transferred for the water right will be made or compensation paid by the government for the loss of benefits of the right to use water.

120. Regardless, any reallocation of water by transfer of water rights or implementing conjunctive use measures should only be for the annual amount of actual consumptive use or ET, not of the volume permitted to be withdrawn.<sup>3</sup> Transfers of water rights for withdrawal and/or use will require a modification to the water right certificate and permit and the consequences will have to be closely considered in determining whether to approve such a transfer.<sup>4</sup> For the new ET-based water rights administration system, it may be premature to conclude that “saved water” can be accurately identified as sustainable to be transferred. It is possible that after five or ten years of application and refinements, the approach will be sufficiently matured. This means that all key stakeholders would be knowledgeable on how the process works and how to put the measures into practice as indicated by the performance output results measured by reduced diversion quantities and/or positive impacts on the groundwater table, and not merely by compliance with regulations and procedures.

<sup>1</sup> As noted above, water transfers and trading are legally authorized under the 2002 Water Law, a reversal on the issue from the 1988 water law, and for that reason, the use of the “moratorium” legal concept is proposed to temporarily suspend water transfers and trading on a large scale except as noted previously.

<sup>2</sup> Some farmer water users have “developed” water for diversion for their and other neighboring farmer households’ irrigation needs, typically from groundwater wells distributing water through closed pipelines to a limited number of nearby household lands. Thus “water savings” by these farmer households is generally not to free up water for reallocation by sale or trading, but to improve reliability of supply and reduce costs associated with obtaining the water at the field level or to expand irrigable but fallow household lands.

<sup>3</sup> Water and water right “transfers” could be carried out among individual farmer households within a WUA and even between WUAs receiving from the same water supplier, as these are internal matters coordinated by the WUAs. Also, when farmers lease out their lands to another to cultivate, the right to use the ET water allocation for those lands “transfers” to the new operator and the water permit will be renewed at the end of the permit term to the WUA provided there has been compliance with the conditions and limitations of water use stated in the permit. In China, the term of land use contract and water use right are not linked. This means that the water right is appurtenant to the land only if the cultivator complies with the right of use, regardless of whether the land is cultivated by the land contractor holder or lease holder.

<sup>4</sup> Water right certificate or permit modifications necessary due to transfers is of global concern. One recent study concluded “no unintended consequences occur if permit modification is done with the requirement that either (a) return flows not be reduced, or (b) only the consumptive part of the water used may be transferred. If these parameters are imposed, permit modification will have minimal effects on other water users.” see: Modification of Permits Based on Consumptive Use, Stephen E. Draper, 2002, web: <http://www.cviog.uga.edu/services/policy/environmental/georgiacommittee/whitepapers/con-sumptiveuse.pdf>.



121. Nonetheless, the topic is still valid and important to Turpan Prefecture. It is relevant not only for water saved by ET practices, or from improving water delivery efficiencies, but to enable transfers of the water rights for real water saved and retiring farmland from irrigated production, especially those large commercial enterprise farms irrigated by groundwater, to social or higher value industrial uses. But during this project period, and even for a decade or so after the end of the project, the groundwater overdraft problem will not be immediately resolved (see figure 7). Therefore, during the project, the ET approach at most will only be refined and the groundwater table rate of decline reduced and nearly stabilized to demonstrate the success of this approach. Only then should active trading and water marketing be considered.

122. Transfer of water withdrawal rights is provided for by the Regulations for *Administration of Water Withdrawal Permission and Water Resources Fee Collection*: “Any unit or individual that has lawfully obtained water withdrawal rights and has saved water resources through product adjustment and industrial restructuring, technological reform, economical water use, and other measures may transfer the water resources saved in a paid manner in accordance with the law, within the term of validity and the quota of the water withdrawal permit, after approved by the original review and approval organ”.<sup>1</sup> Based on the current status of water resources development and utilization in Turpan Prefecture, water rights transfers from ET savings resulting from investment in water saving equipment and adjustment of water use and agronomic practices are the benefits to the investor. For example, to obtain a water right for transfer of “real” water savings, industries and enterprises, or farmers or groups of farmer water users, or the government might invest in water saving technologies and practices to enable a transfer to a higher and more productive

use (industry or municipal water supply) or public benefit (environmental protection and improving groundwater tables). Notwithstanding these provisions, it is recommended that any reallocations and transfers of water and water rights be restricted.

123. The prefecture water bureau would be responsible for review and approval of any water rights reallocations and transfers of water rights. The application for reallocation and transfer of a water right or water withdrawal permit could be submitted directly to the prefecture water bureau or to the county level water bureau. The latter would receive the application and supporting documents and carry out a preliminary review to ensure the appropriate information is provided and may even make a recommendation for consideration before submitting it to the prefecture water bureau for final action. The authority and responsibility for the decision to approve in whole or in part, request additional information, or deny the request rests with the prefecture water bureau. The prefecture water bureau is accountable to the Prefecture Administrative Office for reallocations and transfers of water rights in the same manner as it is accountable for the allocation by WWP and their renewal.

124. Procedures and rules for application, review and approval or denial of requests for reallocations and transfers of water rights are basically the same as for applications for a new or renewal of a water right. The difference is more detailed considerations by the prefecture water bureau concerning possible impacts on the groundwater table and for the prevention of adverse impacts to the physical system and other users. Water transfer pricing is generally not of direct concern of the water bureau as the process must be achieved through consultation and mutual agreement of the parties.

<sup>1</sup> SCD 460, Article 27, 2006



## 4.4 Design of Water Rights Supervision Sub-system

125. The third sub-system concerns supervision of water rights administration and other supervision and inspection activities required under the 2002 Water Law and implementing decrees, regulations and provincial legislation and regulations.<sup>1</sup> Although the emphasis is primarily on those water rights established under the new approach, there must also be supervision for reallocation and transfer of water rights, and the exercise of the water rights for annual withdrawals and uses in compliance with annual allocation plans, ET requirements and sector quotas. Inspection and supervision has been a function and task of water authorities under both the 1988 and 2002 water laws, with most levels of water bureau administration having an established supervision system and responsible personnel designated. The purpose of this sub-system is not to replicate this activity, but to identify those additions and modifications in the inspection and supervision process necessitated by the ET-based approach to water allocation and administration.<sup>2</sup>

### 4.4.1 Water Rights Supervision Responsibilities at the Prefecture Level

126. The prefecture level is responsible for primary water rights supervision as provided for in the annual allocation plans, quotas

and water rights in good standing for the measured quantities of water source and supply. It is also responsible for withdrawal and delivery to water users (WUAs) based on ET allocations, distribution and use by individuals or households as well as annual reporting requirements, and the quantities and qualities of water returned to surface and groundwater systems in the three counties.<sup>3</sup> The prefecture level is also responsible for ensuring that all data and information for indicators is timely and accurately collected, and that withdrawals and uses are controlled within the limits of the quotas allocated. This will be achieved by taking comprehensive measures (including engineering, technical and managerial measures) and periodic internal inspections and supervision to ensure that the administrative system is functioning as expected. Those responsible for inspection and supervision implicitly have rigid and transparent reporting requirements, and their responsibilities must subject to review and corrections or sanctions when not carried out properly.

127. The organizations responsible for water rights supervision include the government of Turpan Prefecture, prefecture water bureau, and the water bureaus of the three counties and other relevant departments. The Turpan Prefectural Administrative Office is responsible for review and approval of the comprehensive measures for establishing and controlling all the indicators subject to supervision. Turpan Prefecture Water

<sup>1</sup> Chapter VI of the 2002 Water Law is dedicated to dispute resolution and supervision and inspection of all activities and at all levels affected by the law. Supervision and inspection was a major activity under the 1988 Water Law; therefore, water officials and water users are familiar with the purposes and general processes. In this sub-system, the primary focus is on supervision of the ET-based water rights and their administration by government officials.

<sup>2</sup> During the project, the World Bank team will supervise the design, implementation, monitoring and evaluation of the project carried out by the Prefecture with assistance from the Xinjiang Regional Water Bureau. The Prefecture will appoint an external monitoring institute to monitor the environment and resettlements under the project. Supervision of post-project activities and outcomes will be the responsibility of the Regional Water Bureau. As noted in the project agreement, a permanent ET management center will be established for monitoring actual ET and other related work with full time staff and budget allocated by the Prefecture Government

<sup>3</sup> This is a simple pyramid institutional approach to water management with the primary responsibility for water management and ET target determination and water allocation at the prefecture level water bureau and the counties, townships and WUAs responsible for ensuring proper allocations and uses based on the ET determination for that area under their jurisdiction. There is no conflict of interest between the prefecture and county water bureaus, nor with townships and WUAs. The primary decisions on water allocation based on disaggregated ET targets for uses within the basin are made at the prefecture level as set out in the water right (permit), and each level below that, including water suppliers where appropriate and water users are obliged to comply and make adjustments based on the monitoring and supervision. Violations will be reported to the Prefecture Water Bureau as provided in the water law, who will make enforcement decisions and ensure they are carried out.



Bureau is primarily responsible for monitoring, producing and analyzing ET data and monitoring indicators of returned water and for developing comprehensive measures (including engineering, technical and managerial measures) for managing all the indicators within the limits of the allocated quotas. The bureau also monitors groundwater conditions within the entire prefecture. The prefecture water bureau reports its activities to the Turpan Prefectural Administrative Office for guidance and confirmation. The water bureaus of the three counties are responsible for monitoring the indicators of water withdrawal and delivery to water users (WUAs) and on-farm water uses, and regularly reporting to the prefecture water bureau.

128. Specific to this ET-based water use allocation approach, different supervision methods are required to be adopted for different indicators. ET indicators for irrigated agriculture will be monitored primarily by remote-sensing technology, but reinforced by various measurements of withdrawals and uses and by other hydrologic data and field inspections. Under the project, Turpan Prefecture Water Bureau will set up a prefecture ET monitoring center responsible for monitoring ET and producing and providing remote-sensing ET data for the whole prefecture.<sup>1</sup> This data and information will be part of the knowledge management system (KMS) under the project as described in the previous chapter, and will be used for analysis of water rights and water uses data and information.

129. A system of water use data and information collection, analysis and reporting will be implemented consisting of surface and ground water withdrawal and use indicators

as part of the project M&E system under the KMS. Water measuring devices have or must be installed at all diversion structures (surface structures and wells) to provide accurate and timely data on how much water is withdrawn from that source. This data also serves as the basis for the assessment of water resources fees. Conveyance losses between point of diversion and delivery can be calculated from properly located and maintained measurement devices. It can be determined if the losses are within a reasonable range or if diversion and conveyance improvements are needed. The water bureaus of the three counties are responsible for monitoring water use quantities within their respective jurisdictions and report to the prefecture water bureau on a regular and systematic basis. In addition, groundwater observation wells have or need to be strategically located in the prefecture and monitored for water quantity levels and water quality conditions.

130. Indicators of return flows from agricultural use may not be monitored independently unless at drainage channels from irrigated lands that serve as the point source for return flows. Otherwise, in the interest of practicality, Turpan Prefecture Water Bureau will manage and maintain observation wells to monitor the groundwater tables in the three counties, and periodically test the groundwater quality to determine any deterioration from applications of agricultural chemical fertilizers and pesticides or other contaminants. If declining groundwater quality is a result of agricultural chemicals, their use and applications need to be controlled to reduce or eliminate this source of pollution.

<sup>1</sup> A detailed practical description of how the ET-based water use will be monitored is to be included under special study No. 1 entitled "Measurement and Monitoring of ET within Turpan Prefecture by Means of Remote Sensing". The most important role of the remote sensing technology is to monitor ET with and without the project. Once it has been detected that actual ET within the project area in a specified crop field during the growing season is greater than the target ET or the actual ET outside (without) the project area, then the relevant WUA will be informed and requested to revise their irrigation program to reduce their application of water. This will occur even though that would be less than allowable under the permit, as that calculation would be based on the target ET allocated to the WUA from the basin level.



#### 4.4.2 Supervision of Water Withdrawals, Uses and Water Rights

131. Supervision of water rights under this ET-based system primarily refers to the monitoring and administration of water withdrawal, ET, and waters returned to the system to ensure all the indicators are controlled within the limits of water rights prescribed by the water withdrawal permit and water rights certificate. Water quantity and quality of return flow waters may be independently conducted for agricultural water uses.

132. The organizations in charge of water rights supervision are Turpan Prefecture Water Bureau, the water bureaus of the three counties and other relevant departments. At the prefecture level, the water bureau will inspect and supervise the data and information produced by the ET Monitoring Center and prefecture-wide water withdrawal, delivery and consumptive use data and information. The water bureaus of the three counties are to supervise the exercise of water rights.

133. Methods adopted for supervision vary according to different water withdrawers and water users. For agricultural water use, mainly water withdrawal quantities and the generated ET are monitored and controlled. ET data will be provided in a unified manner by the ET Monitoring Center of Turpan Prefecture Water Bureau and placed on the center's web site. Likewise, local water administration departments monitoring the water withdrawals and water uses in combination with competent review and approval departments administering the water rights will be implemented.

134. The prefecture water bureau is the organization responsible for water withdrawal permit review and approval for all surface water and groundwater withdrawals. It will delegate to the water bureaus of the three counties the authority to monitor water withdrawals. They

will also receive the annual reports on water withdrawals and uses from the permit holders. These water bureaus will systematically submit the monitoring and reporting results to the prefecture water bureau. The prefecture water bureau will be responsible for administration of water withdrawals, and approve or modify the plans for the following year submitted by the water withdrawal units and individuals based on the monitoring results.

135. Under the severe conditions of water scarcity and receding groundwater tables, the prefecture water bureau has the primary responsibility for administration of water withdrawals and consumptive water uses. They must ensure compliance with the prefecture water allocation and allotment plans, quotas, valid water rights and TAC. The county level water bureaus and other involved county offices will facilitate the supervision and inspection field work and monitoring activities.

#### 4.4.3 Supervision of Water Uses and Water Rights

136. Inspection and supervision of water uses and exercise of water user's water rights requires joint monitoring and administering of water withdrawals and uses. This is necessary to ensure that water use units and individuals utilize water resources in accordance with the allocated water rights rations or water use quotas in order to promote water saving and ultimately achieve total amount control of water uses. Water withdrawals and delivery to water users will be monitored by operable and accurate measurement devices, whereas remote sensing will monitor actual ET, except in greenhouses where standardized formulas and coefficients will be applied for the size of the greenhouse, type of crops grown, temperature, etc. WUAs are the primary organizations for user's water rights supervision. The WUAs will measure or confirm the volumes delivered to the farmer household members and measure or estimate distribution consistent with ET calculations.



#### 4.4.4 Institutional Requirements for Water Rights Supervision

137. In order to ensure that allocated water rights are effectively implemented and that water resources development and utilization is ultimately controlled within the sustainability level and within the limits of allocated water rights indicators, it is necessary to establish or strengthen a system of water use planning. This is a work plan for the reasonable arrangement of water diversion, delivery, distribution, use and reasonable return flows. When fully and carefully implemented, these plans are the main means and basis to achieve total amount control of water resources in China. The water law provides “The development and planning administration departments under the local people’s governments at or above the county level shall, in conjunction with the water administration departments at the same level, determine the amount of water that can be used in their administrative regions in accordance with the water use quotas, the economic and technical conditions and the water allocation plans, formulate their annual water use plans and exercise total amount control of the annual water use in their administrative regions.”<sup>1</sup>

138. ***The Regulations for Administration of Water Withdrawal Permission and Water Resources Fee Collection stipulates*** “Water withdrawal review and approval organs shall issue water withdrawal plans for the next year to water withdrawal units and individuals in conformity with the local regions’ annual water withdrawal plans for the next year and proposed by the water withdrawal units and individuals and in accordance with the principles of unified planning and coordination, comprehensive balancing and allowing some leeway.”<sup>2</sup> To implement the ET-based water

rights administration, the existing system of water use planning has to be improved. The water use plans should make clear the quantities of water withdrawal, ET, and return flows set by the local regions and units.

139. In Turpan, water use plans should be formulated level by level in a “bottom-up” manner and reviewed and approved level by level in a “top-down” manner. The basic procedures are as follows:

- Water withdrawal units organize water users to prepare their annual water use plans, which will be submitted to the water withdrawal permission organizations for review and approval;
- Water withdrawal units formulate their annual water withdrawal plans in accordance with the annual water use plans and submit them to the local water administration departments for record and review, after which they will be further submitted to the relevant competent water administration departments for review and approval; and
- Development and planning administration departments and the water administration departments under the local governments of the three counties formulate annual water use plans of their own administrative regions based on the submitted water use plans and submit them to the next higher level water administration department or basin management organization for review and approval.

140. The water rights rations and water use quotas specified in the water allocation plans, water withdrawal permits and water rights certificates are the main basis for review and approval of the water use plans.

<sup>1</sup> 2002 Water Law, Article 47

<sup>2</sup> SCD 460 (2006)



141. Accurate water use measurement is fundamental to water rights administration. Water use measurements do not mean only measurement of the water withdrawals. In the interest of ET-based water rights administration, ET generation, quantities of water returned and its quality in addition to the traditional water withdrawal quantities should all be accurately monitored and measured. The measurement is aimed at water withdrawal units and regions at various levels as well as water users<sup>1</sup>. This undoubtedly poses a greater challenge to measure the use of water by WUAs and their household members. However, water withdrawal units and water users are required to install measurement devices in accordance with the stated technical standards and ensure the normal operation of these instruments. Water administration departments are also required to extend and actively promote water use measurement devices and monitor and control the devices in a real-time manner in accordance with their supervision responsibilities.

142. A system of regional boundary cross-section monitoring and groundwater monitoring should be established. At the same time, remote-sensing, GIS and other advanced technological tools will be applied to assist in ET monitoring. Studies should be conducted to establish these water rights administration monitoring tools for all levels. Various information and data should be integrated, analyzed and processed to achieve comprehensive measurement and administration of all the water rights indicators.

143. In addition, a system of inspection and reporting on measurement devices needs to be established to report on the conditions of the

measurement devices on a regular basis. This will provide information on their general status and encourage or demand maintenance and replacement in a timely manner. This is one of the conditions for maintaining a water right in good standing.

144. To facilitate water rights supervision in Turpan Prefecture, the computerized MES will be developed and installed to include water diversion and water use measurements. The systematic monitoring and reporting of this data and information will be used during inspection and supervision to ensure compliance with the agreed upon approach and activities or enable refinements and corrections to be made. The other primary use of the MES is to provide the basis for assessing water resources fees and other charges. For above-quota water uses, progressive block tariffs are required under the water law for administration of water withdrawal and included in the water rights indicator system.<sup>2</sup> Water withdrawal units should withdraw water in accordance with the approved water rights certificate and annual water withdrawal plans.

145. Water withdrawal quotas must be strictly implemented for large water users and heavy polluters because over-consumption and groundwater contamination of water resources jeopardizes the groundwater environment. If progressive block tariff imposition does not control the over-use or contamination of water by these types of water withdrawers and users, an order should be given to cease and suspend water withdrawals and suspend the good standing of the relevant water rights.

<sup>1</sup> The 2002 Water Law and SCD 460 require that water measurement devices be installed to measure water withdrawals and water uses, and to determine the extent of water resources fees for withdrawals and water charges for supply services rendered to users of water.

<sup>2</sup> Articles 7 and 49 of the 2002 Water Law require volumetric water charges for use of water and progressively increased water charge rates for uses of water above the quota. By contrast, Article 28 of SCD 460 (2006) places the fee requirement on withdrawal (not use), and provides that "if the amount of water drawing exceeds the planned amount or quota, the progressive rate of water resources fee shall be applied to the amount of water drawing above the planned amount or quota." SCD 460 does not mention water charges for the service of supplying water to the users, only payment of water resources fees for withdrawals.



## 4.5 Implementation of the ET-Based Water Rights Administration System

146. The proposed WRAS is consistent with and builds upon the current water law and regulations, organizational arrangements for water management, and control by water bureaus at prefecture and county levels and through WUAs at the on-farm level. The WRAS also utilizes (with modification or additions) the instruments for establishing water rights—the water withdrawal permit, registration, and certificate forms. However, there are at least six areas in which supporting measures will facilitate implementation of the ET-based Water Rights Administration System in Turpan Prefecture.<sup>1</sup>

147. An ET-based WRAS is a systematic and institutional innovation, which not only establishes a series of supporting rules and regulations concerning the three sub-systems (water rights allocations, water rights reallocations/ transfers, and water rights supervision), but also requires alterations to existing provisions and practices. Therefore, Turpan Prefecture must adopt necessary corresponding policies and regulations to adjust and specify the responsibilities of the relevant departments, standardize ET-based water rights administration for agricultural water uses, and establish various institutional practices to implement the new approach and ensure the rights and responsibilities of water rights holders.

### Box 12: Measures to Implement ET-Based Water Rights Administration System

- |  |  |
|--|--|
| 1. Establish complete and sound policies, laws and regulations;        | 4. Improve water savings technology, technical equipment and data systems; |
| 2. Strengthen organization and leadership;                             | 5. Strengthen management capacity; and,                                    |
| 3. Establish complete and sound planning and plan formulation systems; | 6. Strengthen publicity and extension.                                     |

148. No change or additions are considered necessary to the central water law and regulations regarding the WWPS, but a number of the measures adopted by the Xinjiang and Turpan governments predate the water law and implementing regulations. These need to be reviewed and updated; for example the 1994 measures to implement the water withdrawal permit systems and water resources fees system was markedly changed from previous 1993 SCD 119 by the 2006 SCD 460.

149. It is also recommended that Xinjiang and Turpan Prefecture adopt specific measures for Turpan basin to:

- Link and limit the withdrawal of water to the amount of water allocated for consumptive use (ET) in the served area;
- Allocate water for consumptive use of all types, but for irrigated agriculture specifically based on ET calculations, plus reasonable conveyance and application losses and necessary return flow quantity and quality;

<sup>1</sup> The intent of the project and particularly the adjustments to the WRAS is not to create any legal or institutional constraints during implementation and the pilot activities do not require any changes in national or regional water laws and regulations, which as noted above, are flexible enough to support the ET based approach that is advocated. However, at the Turpan Prefecture level, and perhaps even with additional regional legislative support, some detailed rules and regulations may need to be revised or added to facilitate implementation throughout the entire prefecture.



- Modify and republish the WWPS forms for water rights allocation to clarify allocation basis as consumptive use with authorized withdrawals based on the consumptive use allocations. It is also necessary to set out more precise and realistic conditions and limitations of water rights and water sharing during the crucial period of stabilizing groundwater tables and ecosystem recovery;
- Set out procedures for implementing ET based WRAS by delegating to Turpan Prefecture Water Bureau the primary authority and responsibility and to county water bureaus supporting authority and responsibility for all water allocations, reallocations and transfers and supervision, with county water bureaus accountable to the prefecture water bureau, and the prefecture water bureau in turn accountable to the Prefecture Administrative Office. The prefecture water bureau is also responsible for setting up, operating and maintaining the KMS and MES with permit and water use data, and all other relevant data and information to include timely and adequate collection, access and analysis; and
- Declare a five-year moratorium in water right reallocations of water through transfers based on water savings practices to enable refinement of the ET approach to water allocation and stabilization of the groundwater aquifer.

150. Implementation of the ET-based water rights approach requires some adjustments and modifications of the existing administrative system, particularly in the areas of management, methodology, and commitment in order to pragmatically enhance administrative operations. Turpan Prefectural Administrative Office, prefecture water bureau and the water bureaus of the three counties must strengthen their organizations and leadership and adopt improved engineering, technical and managerial measures in an integrated manner to effectively ensure the establishment and sustainable implementation of the ET-based water rights administration system. The performance focus is not on compliance with the rules or tasks, but on the measurable outcomes or results.

151. Turpan Prefecture will need to set up or refine a complete and sound planning and plan approval system and develop annual plans for ET checking and reduction; formulate plans for cropping pattern adjustments; prepare plans for groundwater exploitation reduction; conjunctive use of ground and surface waters with alternate points of diversion as may be necessary; and ensure strict implement of the adopted plans and measures. Implementation of the ET-based water rights administration system and the other activities under the XTWCP aim to control groundwater overdraft, mitigate water resources shortages and achieve “real water savings”. To achieve this successfully and sustainably requires very good planning, operations, management and administration that can only be improved and made dynamic via thorough and transparent supervision, reporting and refining system. Awards are encouraged for accomplishments and punitive measures only applied where intentional attempts or failure to comply with requirements are determined. The goal of supervision is improving knowledge and experience in order to improve implementation of the WRAS.

152. As an advanced administrative approach, administration of the ET-based water rights system will require many new scientific and technologic tools, practices and facilities. The Prefecture Water Bureau needs to strengthen the groundwater monitoring network (includes inter-agency cooperation and exchanges with relevant bureaus), be well informed of the dynamic conditions of groundwater, require and extend the use and maintenance of water measurement devices, develop and apply water rights administration tools, including water rights registry and link the right to divert and use water with the actual diversions and uses of water in the basin, set and refine ET targets and other water quota requirements, and analyze and process the data and information from remote-sensing ET (including water withdrawals and uses, and return flows).



153. The proposed ET-based water rights administration system places high demands on officials and management staff. They need an in-depth understanding of the ET-based theory and methodology and a strong command of advanced management tools. The Turpan Prefecture Water Bureau and PMO needs to design, implement and enhance capacity building information and training program for water rights administration staff and technical support staff at all levels with long-term and extensive technical trainings on topics relevant to effectively carry out the WRAS and project activities. In addition, WUA leaders should be capable of training their members on water rights, ET management, and monitoring techniques and reporting.

154. The ET-based water rights administration system is a relatively new concept of water resources management in China, although it builds upon existing laws and practices and the international experiences of other countries. For example, in terms of water saving, the concept of “real water savings” transforms the traditional concept to the hydrologic and hydraulic systems and water balance of the basin. Successful and sustainable implementation of the ET-based water rights administration system needs to be recognized by the general public and practiced by water officials and managers at all levels and by agricultural water suppliers and water users. Encouragement to improve efficiencies and water savings by all other withdrawers and users of water is necessary. Implementation of this system in Turpan concerns the immediate interests of all water users and citizens in the prefecture. Therefore, the prefecture must strengthen publicity and extension and make sure that all the water users and the public understand and actively assist in its implementation.





# Chapter V - Pilot Plan for ET-Based Water Rights Administration System

## 5.1 Background Information and Needs

155. The pilot plan to implement the ET-based water rights administration system focuses on the “administration” of the system, not on the water management technical requirements, activities and feasibilities of the project simultaneously being implemented on a pilot basis in the prefecture. This project is experimental, as is the piloting of all major activities under the project. Hence, a “readiness for implementation” review will be undertaken by the World Bank and project leaders to ensure all measures are in place and can be synchronized with necessary adjustments during implementation.<sup>1</sup> Questions regarding what, who and how to administer the new WRAS is the primary focus of testing in this pilot plan (see chapter 4). The form and process of administration will be closely observed and refined as necessary to ensure achievement of the WRAS, proper linkage with other components of the project, and meeting the project objectives in addressing Turpan Prefecture’s water management needs. The pilot plan must conform to the design and framework of the new WRAS set out in chapter 4. New ideas or procedures or repeat of the details of those set out chapter 4 are to be introduced during implementation of this pilot plan. Further, observation and monitoring of even small steps and actions need to be recorded and evaluated to refine the system and its process of implementation in all three sub-systems.

<sup>1</sup> The project will develop a check-list and timeline to systematically carry out the “readiness” review of all project pilot activities under all components throughout the project life, including the WRAS piloting. The timeline will allow for necessary “pauses” in project implementation activities to make sure the activities are linked and synchronized (“link and sync monitoring”) and necessary adjustments or settlement of differences are made.



156. The proposed framework and design of an ET-based Water Rights Administration System for irrigated agriculture in Turpan Prefecture and its one city and two counties must be incorporated or integrated into the other activities under Component 1 and with the other four project components of the World Bank funded Xinjiang Turpan Water Conservation Project.<sup>1</sup> The proposed administration system is built upon existing national laws and regulations and implementing measures adopted by Xinjiang and Turpan Prefectures, and existing water designed offices and bureaus in Turpan Prefecture. Therefore, the new approach is only a modification and strengthening of existing practices of Turpan Prefecture and the city and country level water bureaus.

157. To ascertain that the proposed system is adaptable and functional in Turpan, and to ensure the integration of other project efforts and outputs where relevant, it is recommended that only the first and third sub-components (water rights allocation and supervision) of the proposed administrative system be initially tested. These need to be tried, observed and adjusted as necessary under the needs and conditions of Turpan Prefecture. Currently it is considered premature to test the second sub-system on water rights transfers. As noted in the PAD, water transfers and water markets may be established later. However, this partly depends on the success and sustainability of irrigation water allocated based on consumptive use determined through ET calculations. While testing the ET approach and administration of the system, no transfers should occur. The only exception should be very selective ones when water rights are cancelled or voluntarily relinquished in land retirement from irrigation or turned-over to the government.

158. Initially one pilot area was selected that represented the “typical” water withdrawal and irrigation systems of the prefecture. However, upon further review of the project components and activities, it was decided that the pilot areas for testing the WRAS should be consistent with the project pilot areas at the levels of the prefecture and the two counties and city-county in order to determine its applicability to the three irrigated agriculture water source types—surface, groundwater and conjunctive use. It is equally important to determine the appropriateness and administrative capability of allocating and distributing irrigated agriculture water based on consumptive use as determined by ET calculations and linking those allocations as the basis for water withdrawals at the point of diversion.

159. The features of this plan are detailed below. However, the preparation to implement the pilot ET based WRAS in Turpan Prefecture is a simultaneous process with the implementation of the pilot areas for technical matters and to determine economic, social and environmental impacts in the basin. Many of the same leaders in the governments and relevant bureaus at prefecture and county levels are involved in project implementation and testing of the project features, including the adjustments in the WRAS set out in this report. However, there are a number of issues that need to be addressed in preparation for the piloting efforts of the WRAS to include the following:

- Policies and regulations at prefecture level to enable implementation of the project, including the allocation and use of water for agriculture based on ET determinations and targets and using the aggregate of the consumptive use allowances as the basis for the withdrawal of water, impacts on existing

<sup>1</sup> The infrastructure and water measurement facilities are critical to the success of this project and will be undertaken through other components of the project. For example, funds from the project and government will be provided to construct or rehabilitate the main and on-farm irrigation works of the project areas and initially the pilot areas. Included in the pilot areas is the use of the intelligent card (IC) system for groundwater withdrawals and total channel control (TCC) system for surface water withdrawals and use for more accurate water measurements.



water rights (valid permits) and authority of the prefecture water bureau to issue temporary water rights (preliminary but valid permits for testing the withdrawal and use of water based on ET calculations), prescribe the conditions and limitations of the new water rights and modify or cancel permits as necessary to accomplish the needs of Turpan Prefecture water management and project objectives

- Identification of the farmer water users by household and landholdings and command area distributing water to them – some may already be organized as WUAs, and if not, the common command area farmers may be organized into a WUA
- Identification of the point of withdrawal of water and means of conveyance for delivery of water to these water users/WUAs and require the operator of the withdrawal rights to ensure that the ET allocations relate to the water diverted and measured at the point of withdrawal and points of delivery
- Modifications to the WWPS forms to accommodate allocation of water to the WUAs and water user households based upon calculated ET amounts and consistent with the quotas and prefecture water allocation plans
- Create and link the water rights registry and the MES, to include system hydrologic and geo-hydrologic data and measured water withdrawal, delivery and distribution for application, and ensure the availability and accessibility of this data and information to prefecture and county water bureaus and other relevant bureaus
- Prepare a training outline that includes prefecture and county level water bureaus and other relevant bureaus, water withdrawal rights holders and water users (WUAs and selected households). This training should ensure that all stakeholders are aware of the technical, legal, institutional and socio-economic requirements to implement the ET-based water allocation system and facilitate addressing the water management issues of Turpan Prefecture.

## 5.2 Management Organizations

160. In order to implement the proposed ET-based water right administration system in Turpan with the objectives of recovering the groundwater tables to the acceptable level, reestablishing and enhancing the environment and ecosystem, and achieving real water savings, it is necessary to refine or establish orderly organizational and management arrangements and processes. The management and administrative objectives of this pilot are to:

- Unify leadership at prefecture, county and township/village levels;
- Introduce and put into practice the new approaches and technologies, and other activities under the project;
- Ensure a common understanding of the partnership and equality among the three key stakeholder groups - water managers, water suppliers and water users - each with an important and interdependent role in addressing the objective of improving water management and resolving the water problems of Turpan Prefecture; and,
- Effectively promote coordination, cooperation and collaboration among the relevant local government agencies and with the farmer/irrigator and other water users of the prefecture.

161. The Turpan government currently follows the historical practice in China in its organizational arrangement and those of water and other key bureaus at prefecture and county levels. Units within the prefecture and county level water bureaus already exist for most of the key activities that will be carried out under the new WRAS, such as handling the WWPS, WRF, hydrologic and hydraulic planning and construction, operational activities and data gathering, inspection and supervision, etc. The WB PAD has already prescribed a number of project management organizations at Xinjiang prefecture and county levels (PMO, PLG, and



EG). It is important not to duplicate the tasks and responsibilities of the government and project organizational bodies. It is, however, necessary to ensure a structural and procedural system to test the proposed framework and design of the WRAS, to determine the gaps, overlaps or conflicts between existing government and project administrative organizations and the proposed WRAS, and to determine ways to address them.

162. Three organizational entities are proposed for additions to their current tasks or established:

- Turpan Prefectural Administrative Office;
- Leading Group for water right system establishment at prefecture level; and
- Water Rights Management Office at prefecture level.

163. Although the Turpan Prefectural Administrative Office already exists, it will need to exercise primary approval authority over water resources allocation and supervision within the boundaries of the prefecture in accordance with the water allocations assigned under the water rights allocation plan of Xinjiang Uygur Autonomous Region. This must also be consistent with the water rights determined for allocation and use in the prefecture according to water resources availability and economic and social development demands of Turpan Prefecture. The allocation and use of water will be based upon the ET calculations for agriculture and reasonable consumptive use for all other uses.

164. To assist the Turpan Prefecture water bureau consideration should be given to setting up a leading group for water rights system establishment in Turpan. This leading group would be responsible for advising and assisting in organizing, guiding, supervising and coordinating affairs relevant to the water rights system and pilot area development in accordance with the ET-based water rights administration system. It would also be responsible for advising on organizing, guiding, supervising and coordinating of water rights allocation, supervision and

transfer and other management work within the boundaries of the administrative area after the establishment of the ET-based water right administration system. It is recommended that the prefectural executive chief act as the leader of the group. Other members might include directors of the prefectural level water bureau, environmental protection bureau, agriculture bureau and other relevant departments, executive chiefs of the three counties, water bureau directors of the three counties, director of the ET monitoring center, WUA representatives and representatives of other water users.

165. A water rights management office or unit in the Turpan Prefecture Water Bureau will need to be trained in moving from the traditional WWPS to a permit system that allocates water based on ET for agriculture and CU for all other users and which links the aggregate amount of water use allocations to the withdrawal of water from the source serving the water users. The director of this office should be the director of the prefecture water bureau and the deputy directors should be the deputy directors of the prefecture water bureau and environmental protection bureau. It should be staffed by the prefecture water bureau, with a liaison link to the environmental protection bureau's wastewater discharge permit system (WWDPS) and there should also be a link between the agriculture bureau's tasks regarding cropping patterns and agronomic matters, and the ET monitoring center and water bureaus in the three counties. The office will be specifically responsible for the water rights administration system of Turpan Prefecture. In the three counties, 43 WUAs will be established under the project, and these will be organized under water user member leadership and registered with the local civil affairs bureau. These new WUAs and other existing WUAs in the prefecture will receive technical guidance from the local water bureaus. WUAs will be responsible for water right allocation and distribution of delivered water to their users based on the ET requirements, and facilitates the supervision within their command areas.



### 5.3 Selecting Pilot Areas

166. Under the World Bank financed project, pilot areas have been selected to establish and implement the on-farm water savings improvements and correspondingly, to pilot the ET-based water rights administration system. The criteria for selecting the pilot areas under the project is that there will be one pilot area in each of the two counties and city level county that represents the three typical water supply and use systems of the prefecture; namely, surface water supply, groundwater supply and conjunctive use of ground and surface water. The piloted areas will have improvements to the delivery system (lined canals), on-farm water distribution system (lined distribution channels), and on-farm water savings application systems (drip, trickle, green houses, etc.). Only where a reliable and stable water supply can be assured will WUAs be established or improved under the project, as well as improving on-farm distribution and application of water to enable the ET targets to be met without causing economic hardship to the households.

167. For the three counties, Turpan City is representative of the groundwater supply system, Tuokexun County is representative of the surface water supply system, and Shanshan County is representative of the more complicated application of conjunctive use of surface and ground waters to meet the ET allocations. This is because some farmer households use surface water in the early growing season and then shift to groundwater withdrawal for the remainder of the growing season. Under the project, it is planned that some farmer water users of groundwater and conjunctive use will be converted to using only surface water, others to only groundwater, and the remainder will receive water from both surface and underground sources to be used conjunctively in an optimum manner as scheduled.

168. Selection of the specific village and locations needs to be coordinated with the project pilot project areas, but in general, it will involve the water bureaus and other relevant bureaus of the prefecture and counties to test the water rights administration system. These bureaus will be able to implement the WRAS in a step-by-step manner, creating the framework and mechanisms for the entire system, but only testing or piloting them in a smaller selected area. Exact details of the pilot implementation plan will evolve with other elements of the project. This will enable adjustments and refinements to the administration system while providing the flexibility needed to not cause harm or disruption to farmer households outside the pilot areas and to domestic and industrial water users. An example of information and analysis of pilot area selection is provided in annex 6 for Shanshan County.

### 5.4 Water Rights and Water Allocations

169. Given the current situation, temporary water rights will only be allocated for existing agricultural uses. This means that there will be only a renewal of existing permits and not issuance of new permits except for minor or urgent water rights allocations for domestic and industrial uses. This will be acceptable because they account for a very small percentage of water use in Turpan Prefecture. Renewal of existing water rights, whether for agriculture, domestic/municipal or industrial uses, will have priority over new applications for water allocations, and renewed or new water rights certificates will contain the term, conditions and limitations (ET/CU requirements) for water withdrawal, use and return flows.

170. In setting up the ET-based water rights allocation management system it is important to reiterate the six water rights allocation principles described in chapter 4. These principles



- Focus on ET management in exercising water rights;
- Plan, in a unified and systematic approach, for all facets of water withdrawal, use, consumption and discharge of return flows;
- Guarantee water users' rights and interests;
- Ensure water use for the contracted responsibility farmland;
- Respect existing water use customs; and
- Guarantee ecological and environmental water needs.

### 5.5 Water Rights Reallocation/Transfers

171. Designing, testing and applying a consumptive use or ET-based approach to improving water management and obtaining real water savings under the XTWCP is new in Turpan as well as almost all of China. It requires modifying the existing water withdrawal permit system by adding CU or ET for allocation and use of water, limiting water withdrawals to the consumptive use of water, and establishing an ET-based water rights administration system. Experience from the World Bank Hai Basin Project in China and in several states in the U.S. confirms that it takes many years of adjustment, refinement and training to make the system functional and operational. Therefore, as noted above, it would be premature to consider systematizing water rights transfers and water market trading. Some existing permitted uses will be cancelled or terminated through voluntary retirement of land from irrigation, and possibly some special cases of water reallocations, but these are not expected to involve extensive water right transfers or necessitate setting up a water rights trading mechanism.

### 5.6 Water Rights Supervision

172. The water rights supervision system must be established or strengthened in the pilot areas for at least two categories:

- Supervise the water withdrawal units to ensure withdrawals do not exceed allocations for consumptive water uses; and
- Supervise the water users (WUAs) in distribution of water to farmer households according to the ET calculations and targets

173. As described in chapter 4, this sub-system covers who supervises, what to supervise, and how to supervise the exercise of the water right in accordance with the approved permit and water rights certificate. The county water bureaus will appoint qualified supervisors for inspection, supervision and enforcement of water withdrawals and conveyances, water distribution and uses in accordance with the ET allocations under that water right, and observe if return flows are contributing to surface waters or groundwater tables and whether there are any groundwater quality impacts. During the first years of the project, it is anticipated that there will be no major transfers of water rights from sales or trading to be supervised. This should only occur when land is retired from irrigation for which the water rights associated with those lands would be terminated or permits for well pumping are cancelled or not renewed.

174. A water use monitoring and reporting system (MES) will be established by the prefecture water bureau and implemented at all levels of water diversion and conveyance to water delivery and distribution amongst water users. Water suppliers and WUAs will collect water withdrawal and use data within their command areas and report it to the county water bureau. The county water bureau will collect the data within its administrative boundaries and report it to the prefecture water bureau.



175. Water measurement devices will be installed and operated as one of the fundamental tools available for supervision. This is necessary to ensure compliance with the valid water rights and ET-based water allocation system. Supervision and inspection will include the installation, operation, and maintenance of these water measurement devices and read-outs to ensure accurate measurements, recording and reporting of the data. It is recommended that no water withdrawals and water uses by WUAs and others be allowed for those who have not installed water measurement devices for withdrawal from the water sources and delivery to the outlet/inlet of the water users (WUAs). The county water bureau will carry out regular inspections of water withdrawals and uses and report the data as required in the MES.

176. The county water bureaus will take measures in accordance with the relevant rules for above-quota water withdrawals such as restriction on water withdrawals, and progressive block tariffs on water resources fees, groundwater resources compensation fees and water charges.

### 5.7 Establishing Supporting Measures for Pilot Plan Implementation

177. Finally, it is necessary to reiterate the six recommended supporting measures to facilitate plan implementation as listed in box 12 of chapter 4 and explained thereafter. It is fundamentally important that these measures are taken to ensure proper administration of the new water rights system.

#### Box 12: Supporting Measures to Implement ET-Based Water Rights Administration System

- |  |  |
|--|--|
| 1. Establish complete and sound policies, laws and regulations;        | 4. Improve water savings technology, technical equipment and data systems; |
| 2. Strengthen organization and leadership;                             | 5. Strengthen management capacity; and,                                    |
| 3. Establish complete and sound planning and plan formulation systems; | 6. Strengthen publicity and extension.                                     |







## Chapter VI – Conclusions

178. This research report sets out a proposed ET-based Water Rights Administration System (WRAS) to complement the technical and other activities under the World Bank funded Xinjiang Turpan Water Conservation Project (XTWCP) in Turpan Prefecture. Water scarcity undermines water security, thereby threatening the society, economy, way of life and potential for development in Turpan. The project was considered essential under Turpan's severe water shortage, receding groundwater tables, ecosystem degradations and increasing water demands from all sectors. The primary problem was diagnosed as over-consumptive use of water in irrigated agriculture and traced back to the water allocation practices with the water withdrawal permit system (WWPS) implemented under the national water laws. Currently, surface and underground water is allocated based on an authorized diversion of a quantity of water to meet increasing demand for water as long as water is "saved" with the help of modern irrigation technologies. However, this has actually contributed to the serious declining of ground water tables and degradation to the associated eco-environments. Therefore, the present WWPS should be enriched or improved with the concept of real water savings and a new approach for ET-based integrated river basin management proposed to be implemented in Turpan river basin under the XTWCP to resolve the serious issues of degradation of the ecosystem in Turpan river basin.

179. This report sets out the design and framework of an advanced and functional ET-based WRAS based on the concept of and requirements for ET management. It builds upon and is consistent with the 2002 Water Law of the PRC provisions for a water withdrawal permit system and mandate for total withdrawal control of water within basins. Using the current permit system with some



limited modifications, the new approach to water management and administration adds a critical concept for effective allocation of water to irrigated agriculture by applying ET or consumptive use requirements as the basis for allocation, measured by ET target calculations. The important change is the link and limitation of the right to withdraw water to the ET requirements for farmer households of the area served by that diversion. The project aim is that actual ET will be equal to or less than target ET allocated from the basin level, which will be closely monitored and evaluated by using remote sensing technologies.

180. The ET-based WRAS framework consists of three sub-systems: allocation, reallocation/transfer, and supervision. It is applicable to surface water and groundwater withdrawals and uses by all sectors. The focus is on enforcement of ET targets calculated and allocated from the river basin level to the largest water user - irrigated agriculture in the Turpan basin - with the concept of “real water savings.”

181. The design of the proposed administrative system is considered feasible and doable. The technological capabilities to measure CU or ET through the advanced science of remote sensing determine how much water is actually necessary or allowable to prevent over-appropriation. This results in “real” water savings and will eventually reverse groundwater overdraft and ecosystem deterioration while also being able to shift or reallocate small amounts of needed water for domestic and industrial uses.<sup>1</sup>

182. During implementation of the project, further research and testing of the proposed design will be piloted to make necessary refinements, adjustments and changes that will ensure that the proposed framework is not just feasible, but practicable and workable under the conditions and capabilities in Turpan Prefecture. Pilot testing of the ET-based WRAS is to be carried out in all three counties of Turpan Prefecture as described in chapter 5. The piloting will be in the same locations as the piloting of the other project activities and will be carefully implemented and monitored to ensure that each aspect of the proposed framework of the ET-based water rights administration system can be carried out, monitored, supervised and enforced. However, due to the critical nature of water problems in Turpan Prefecture, the reallocation and transfer sub-system will be limited to only transfers resulting from retirement of irrigated land from cultivation or administrative cancelation or adjustments in water allocations. Therefore, it is recommended that a five-year moratorium be established to prevent a rush to transfer water and water rights, or at least until the ET-based WRAS is functional with demonstrated real water savings.

183. The concept of water rights will take on a new and expanded meaning under the project to bridge the gap between water planners and managers, permit-holding water suppliers, and water users. The new water rights - as a right to divert and use water - will specify the term of the water right and the conditions and limitations during exercise of the water right. Water users, including those who also withdraw

<sup>1</sup> Special Study No. 1 “Measurement and Monitoring of ET within Turpan Prefecture by Means of Remote Sensing” will address the questions of the relationship between remote sensing data provisions and translation into water rights, frequency of evaluation of remote sensing ET scans and how they translate into allocations, which were successfully resolved in the GEF Hai Basin and WCP projects. The most important role of the remote sensing technology is monitoring of ET with and without a new intervention for water saving, and inside and outside the project areas. Once it is detected that actual ET with the project for the specified crop field is greater than the target ET or actual ET outside the project area, the relevant WUA would be informed through the designated administrative system to determine the problems and revise its irrigation plan to further reduce their withdrawals of water according to the new withdrawal permit.



water under a permit, can be assured that their right to use water is protected. All stakeholders are cognizant of the needs for accurate water diversion, delivery and distribution as well as the crop-water needs calculated in terms of ET, and the importance of accurate and timely shared data and information to assess impacts and make necessary refinements and adjustment to improve water management at all levels.

184. A number of critical issues related to successful implementation of the new ET-based WRAS are expected to be answered by the other special studies and project activities. These include the determination of the ecological service requirements of the Turpan basin, determination of “reasonable ET target allocations for irrigated agricultural in Turpan Basin and local farmers as well as for the large scale farming enterprises, setting the government’s policy on retiring farm lands from irrigation.<sup>1</sup> Many of these issues will depend upon analysis of the M&E reports, particularly on the issues of increasing degradation of ecosystems, which will be made public with the intent that this public knowledge will be valuable for decision-makers. This critical issue will have to be addressed by the Turpan government. The government will have to provide subsidies as incentives for water suppliers or agencies that will be collecting and paying less water use fees due to a reduction in withdrawals in an effort to meet ET targets under their jurisdiction for water supply, until water charges collected from water users cover the cost for O&M of water supply. Consideration has to be given to creating an incentive for these water suppliers to ensure that they operate efficiently and effectively, even though many are quasi-government organizations.

185. Ultimately, the central question is whether or not the project (XTWCP) and specifically the ET-based approach will work. Like the often invisible and slow movement of groundwater, this project and the ET-approach to real water saving will not immediately resolve all the water problems of Turpan Prefecture. It is estimated that it will take at least a decade or more to accomplish a significant slowing of the receding groundwater table, and perhaps only within two decades will the aquifer stabilize and the groundwater table overdrafts reverse. Nonetheless, during this time this strategy will serve and enhance the social, economic and environmental conditions in the prefecture. In providing relief to Turpan Prefecture, its water resources will be managed and administered in an integrated manner to meet the mandate of the 2002 Water Law for total amount control, as well as the needs of its people.

186. The success of this study will depend upon several factors - how well and how enthusiastically the components of the project and studies are embraced and implemented; how strongly the government supports the innovations proposed under the project; and how well and for how long these improvements are carried out after the project closes.<sup>2</sup> However, the easiest way to examine the effectiveness of the new system is through the systematic monitoring and evaluation system of the key outcomes within and outside the pilot areas of the project. Essentially, the project will be successful if there is a reduction of consumptive use or ET in the pilot areas after several years when compared to areas outside of the pilot, and if there is an increase in productivity leading to an increase in farmers’ incomes inside the pilot areas as compared to areas outside the pilot.

<sup>1</sup> The target of water allocation is intended to give priority to local farmers according to government policy, with the large farming enterprises encouraged to gradually retire farm lands from irrigation when the their land use contracts expire. Retiring farmland should be accelerated due to enforcement of the surcharge for overdraft of groundwater.

<sup>2</sup> The project (XTWCP) has already received strong support from the government through the endorsement of its design and commitment to project implementation. The anticipation of the impact of the project on promoting sustainable use of water resources in Turpan Prefecture is also positive because of the good results from proposed innovations in the previous World Bank’s projects: WCP and GEF Hai Basin Integrated Water and Environment Project.



Clearly, during the project, implementation will have to be carefully scrutinized, monitored and supervised to ensure that the pilot efforts are progressively meeting the demands of the prefecture and its people, and close attention will have to be paid to resolving difficulties that might be encountered.





# Annex 1 - Water Law of the People's Republic of China

(Adopted at the 29th Session of Standing Committee of  
the Ninth National People's Congress  
On August 29, 2002)

## Chapter I General Provisions

**Article 1.** This Law is formulated for the rational development, utilization, saving and protection of water resources, for the prevention and control of water disasters and for the realization of sustainable utilization of water resources in order to meet the needs in national economic and social development.

**Article 2.** This Law must be observed in the development, utilization, saving, protection and management of water resources and in the prevention and control of water disasters within the territory of the People's Republic of China. The "water resources" referred to in this Law includes surface water and groundwater.

**Article 3.** Water resources shall be owned by the state. The ownership of water resources shall be exercised by the State Council on behalf of the state. The waters in the ponds owned by the rural collective economic organizations and in the reservoirs built and managed by the agricultural collective economic organizations shall be used by the respective rural collective economic organizations.

**Article 4.** The development, utilization, saving and protection of water resources and the prevention and control of water disasters shall be carried out by comprehensive planning with all the factors taken into consideration, tackling problems both on the surface and at the root, with emphasis on multi-purposes use and on achieving maximum benefits so as to give full play to the multiple functions of water resources and the coordination of the water used in livelihood, production and business and ecological environment.



**Article 5.** The people's government at or above the county level shall strengthen the construction of infrastructure works and include it in the plans of national economic and social development at the corresponding level.

**Article 6.** The state shall encourage units and individuals to develop and utilize water resources in accordance with the Law and protect the lawful rights and interests. Units and individuals engaged in development and utilization of water resources shall have the obligations to protect the water resources in accordance with the Law.

**Article 7.** The state shall implement systems of water withdrawal permit and paid use of water resources with the exception that the rural collective economic organizations and their members use the waters in their own ponds and reservoirs. The department of water administration under the State Council shall be in charge of the organization and implementation of systems of water-drawing licensing and paid use of water resources throughout the country.

**Article 8.** The state shall strictly carry out water saving and devote major efforts to implementing water saving measures, popularize new water-saving technologies and processes and develop water-saving industry, agriculture, and services, and establish a water-saving society. The people's governments at various levels shall adopt measures and strengthen the management of the economical use of water, set up a system of developing and popularizing water-saving technologies and foster and develop water-saving industries. Units and individuals shall have the obligations of economical use of water.

**Article 9.** The state shall protect water resources and adopt effective measures to preserve natural flora/vegetation, plant trees and grow grass, conserve water sources, prevent and control soil and water losses and water pollution and to improve the ecological environment.

**Article 10.** The state shall encourage and support research, promotion and application of advanced science and technology for the development, utilization, saving, protection and management of water resources and for the prevention and control of water disasters.

**Article 11.** Awards shall be given by the people's governments to units and individuals that have made outstanding achievements in the development, utilization, saving, protection and management of water resources, the prevention and control of water disasters, and so on.

**Article 12.** The state shall exercise a system of basin water resource management in conjunction with administrative boundary water resource management. The department of water administration under the State Council shall be in charge of the unified administration and supervision of water resources throughout the country.

The basin management agency set up by the department of water administration under the State Council on the state designated major rivers and lake(s) (hereinafter referred to as basin management agency) shall exercise within their jurisdictions their water resource management and supervision responsibilities as prescribed by the laws and administrative statutes and assigned by the department of water administration under the State Council.

The departments of water administration of local people's governments at or above the county level shall be responsible for the unified management and administration and supervision of the water resources within the corresponding administrative boundaries in accordance with the prescribed authorities.

**Article 13.** Other relevant departments under the State Council shall be responsible for the undertakings concerning water resource development, utilization, saving, and protection in accordance with the responsibilities assigned to them.



Other relevant departments of the local people's governments at or above the county level shall, in accordance with the duties assigned to them, be in charge of the related undertakings of development, utilization, saving and protection of water resources within administrative division at corresponding level.

## Chapter II Water Resource Plan Development

### **Article 14.** *The state shall formulate a strategic national water resources master plan.*

Master plans for development, utilization, saving, and protection of water resources and for prevention and control of water disasters shall be developed in a unified manner based on basin and region boundaries. The plans are divided into river basin plans and regional plans. River basin plans include comprehensive plans for river basins and special plans for river basins. Regional plans include regional comprehensive plans and regional special plans.

The "comprehensive plans" mentioned in the preceding paragraph refers to the general plans prepared for the development, utilization, saving and protection of water resources and the prevention and control of water disasters according to the needs of economic and social development and in the light of the water resource development and utilization conditions.

The "special plans" mentioned in the preceding paragraph refers to plans for the special purposes of flood prevention, water-logging control, irrigation, navigation, water supply, hydropower generation, bamboo or log rafting, fishery, water resource protection, soil and water conservation, sand prevention and control, water saving, and so on.

**Article 15.** The regional plans within the basins shall be subordinated to plans for river basins. The special plans shall be subordinated to comprehensive plans.

The comprehensive plans for river basins, regional comprehensive plans and the special plans closely related to land utilization shall be coordinated with national economic and social development plans and with land utilization overall plans, city overall plans, and environmental protection plans with consideration for the needs of various regions and trades.

**Article 16.** Comprehensive scientific research, investigations and assessments of water resources must be conducted in preparing a master plan. The comprehensive scientific research, investigations and assessments of water resources shall be organized and carried out by the department of water administration of the people's government at or above the county level jointly with other departments concerned at the corresponding level.

The people's governments at or above the county level shall strengthen the establishment of information system of water resources and hydrology. The departments of water administration and basin management agencies of the people's governments at or above the county level shall strengthen the dynamic monitoring of water resources.

Basic hydrological data shall be made known to the public in accordance with the relevant stipulations of the state.

**Article 17.** Comprehensive plans for major river basins and lakes designated by the state shall be formulated by the department of water administration under the State Council jointly with the relevant departments under the State Council and with the people's governments of relevant provinces, autonomous regions or municipalities directly under the Central Government, and shall be submitted to and approved by the State Council. Comprehensive plans and regional comprehensive plans for



other river basins and lakes that cross provinces, autonomous regions or municipalities shall be formulated by the river basin management agencies concerned jointly with the departments of water administration and other relevant departments of the people's governments of the provinces, autonomous regions and municipalities directly under the Central Government where the rivers and lakes are located, and shall be submitted to the departments of water administration under the State Council for verification after they are reviewed and made comments on by the people's governments of the relevant provinces, autonomous regions, and municipalities directly under the Central Government. The department of water administration under the State Council shall submit them to the State Council or the department authorized by the State Council for approval after soliciting opinions from the relevant departments under the State Council.

Comprehensive plans and regional comprehensive plans for the river basins and lakes other than those concerned in the preceding paragraph shall be formulated by the departments of water administration of the people's governments at or above the county level jointly with the relevant departments at the corresponding level and with the relevant local people's governments and shall be submitted to and approved by the people's governments at the corresponding level or other departments authorized by them and (further submitted to the department of water administration) at the next higher level for the record.

Special plans shall be formulated by the relevant departments of the people's governments at or above the county level, and shall be submitted to and approved by the people's governments at corresponding level after opinions on them are solicited from the other relevant departments at the corresponding level. Of these, the plans for prevention of floods and for conservation of water and soil shall be prepared and approved

in accordance with the relevant provisions of the Flood Control Law and the Law of Soil and Water Conservation.

**Article 18.** The plans shall be strictly carried out upon approval. Any amendment to an approved plan must be approved by the organ that originally approved the plan in accordance with the plan preparation procedures.

**Article 19.** The building of water projects shall conform to the comprehensive plans for river basins. When a water project is constructed on a state-designated major river or lake or a river or lake that crosses provinces, autonomous regions, or municipalities directly under the Central Government, the basin management agency concerned shall review it to see whether the construction of the water project is in conformity to the comprehensive master plan for the river basin or not and write comments on it with signature before its feasibility study report is submitted for approval.

When a water project is constructed on other rivers and lakes, the department of water administration of the local people's government at or above the county level shall review it within the limits of its management authority to see whether the construction of the water project is in conformity to the comprehensive master plan for the river basin or not and write comments on it with signature before its feasibility study report is submitted for approval. In the case that the project to be constructed is concerned with flood control, it shall be executed in accordance with the relevant provisions of the Flood Control Law. In the case that the project is concerned with another region or sector, the execution unit shall solicit opinions from the relevant region and department in advance.



### Chapter III Development And Utilization of Water Resources

**Article 20.** In the development and utilization of water resources, the principle of promoting what is beneficial and abolishing what is harmful shall be stuck to, with consideration for the interests between upstream and downstream, between left bank and right bank, and of the areas concerned, so as to full derive the comprehensive benefits of water resources, and the overall arrangement for flood control shall be conformed to.

**Article 21.** *In the development and utilization of water resources, the demand for domestic water use of urban and rural residents shall be met first, with consideration for agricultural, industrial, eco- environmental, and navigational uses, and so on.*

Full consideration shall be given to the ecological environmental need for water in the development and utilization of water resources in the arid and semi-arid areas.

**Article 22.** In the case of inter-basin water transfer, comprehensive planning and scientific justifications shall be conducted with due consideration for water use demand of the basins where water is transferred out and in, so as to prevent damages to the eco-environment.

**Article 23.** The local people's governments at all levels shall organize in a rational manner the development and comprehensive utilization of water resources in view of the local water resource conditions, on the principles of unified allocation and development of surface water and groundwater, tapping new sources of supply and reducing consumption with high priority placed on reducing consumption, and sewage treatment for reuse.

The preparation of a national economic and social development plan and of an overall urban development plan and the layout of a major

construction project shall be in conformity with the local water resource conditions and with the flood control requirements, which shall be scientifically justified. In areas where water resources are deficient, the scale of a city and the construction of industrial, agricultural, and service projects which consume a lot of water shall be restricted.

**Article 24.** *In areas where water resources are deficient, the state shall encourage the collection, development, and utilization of rainwater and brackish water and the utilization and desalination of seawater.*

**Article 25.** The local people's governments at all levels shall strengthen their leadership of irrigation, water-logging drainage and conservation of water and soil and promote the development of agricultural production. In areas that are prone to salinization-alkalization and water-logging, measures shall be taken to control and lower the groundwater table.

Rural collective economic organizations or their members that invest in the construction of water works in accordance with the law on the land collectively owned by the economic organizations themselves or on the land contracted by them shall follow the principle of whoever invests in the construction manages and benefits and shall manage and use in a rational manner the water works and the stored water.

The construction of reservoirs by the rural collective economic organizations shall be approved by the departments of water administration of the people's governments at or above the county level.

**Article 26.** The state shall encourage the development and utilization of hydraulic energy resources. In rivers that are rich in hydraulic energy, multi-purpose development shall be made step by step in a planned manner.



***In the construction of hydropower stations, the ecological environment shall be protected, and the needs for flood control, water supply, irrigation, bamboo and log rafting and fishery, etc. shall be taken into account.***

**Article 27.** The state shall encourage the development and utilization of navigation resources. In the case that a permanent sluice-gate or dam is built on a river with a migration passage of aquatic organisms, with navigation, or with bamboo and log rafting, the construction unit shall build concurrently facilities for the passage of fish, ships and bamboo and log rafts, or shall take other remedial measures approved by a department authorized by the State Council and make appropriate arrangements during the period of construction and impoundment for the protection of aquatic organisms and for navigation and bamboo and log rafting, the expenses incurred from which shall be born by the construction unit.

Where a non-navigable river or man-made waterway becomes navigable after a dam or sluice-gate is built, the construction unit shall at the same time build facilities for the passage of ships or reserve sites for such facilities.

**Article 28.** No unit and individual shall, when diverting, storing, or discharging water, infringe upon the public interests or the lawful rights and interests of other people.

**Article 29.** Where a water project to be built by the state requires the resettlement of inhabitants, the state shall adopt the policy of developmental resettlement of inhabitants, and shall follow the principle of compensation at first half stage and assistance-support at second half stage, and shall be responsible for making proper arrangements for the livelihood and production and for the protection of the lawful rights and interests of the inhabitants to be resettled.

The resettlement of inhabitants shall be in step with the project construction. Construction unit shall take into account the resettlement area environment capacity and sustainable growth, and shall take measures suited to local conditions to formulate the plan for the resettlement of inhabitants. The plan shall be carried out by local people's governments concerned after approval in accordance with the Law. The funds needed for resettlement of inhabitants shall be included in investment plans for the project.

#### **Chapter IV Protection of Water Resources, Water Areas And Water Projects**

**Article 30.** In the formulation of a water resource development and utilization plan and in the allotment of water resources, the department of water administration of the people's government at or above the county level, the basin management agency, and other department/ departments concerned shall take care to maintain the rational river flow, the rational water level of lakes and reservoirs and water table and the natural purification capacity of water bodies.

**Article 31.** Whoever is engaged in activities of water resource development, utilization, saving, and protection and control of water disasters shall conform to the approved master plan. Whoever causes utility degradation of water bodies of rivers and lakes, groundwater overdraft, land subsidence, and water body pollution due to violation of the master plan shall be responsible for the rectifications).

In the case of groundwater drawdown, water depletion at the source, or land subsidence resulting from drainage by desiccation in mining or underground project construction, the mining or construction unit shall take remedial measures and shall compensate for the losses, if any, imposed on others in life and production in accordance with the law.



**Article 32.** The department of water administration under the State Council jointly with the environmental protection administrative department and other concerned departments under the State Council and the people's governments of the concerned provinces, autonomous regions and municipalities directly under the Central Government shall work out the water functional division plans of the state-designated major rivers and lakes, in accordance with the comprehensive basin plan, the water resource protection plan and the requirements of social and economic development, and submit them to the State Council for approval. The water functional division plans of other rivers and lakes which cross provinces, autonomous regions and municipalities directly under the Central Government shall be worked out by the basin management agencies concerned jointly with the departments of water administration, environmental protection administrative departments and other concerned departments of the people's governments of the provinces, autonomous regions and municipalities directly under the Central Government where the rivers and lakes are located, and verified by the department of water administration under the State Council jointly with the environmental protection administrative department under the State Council and submitted to the State Council or the department authorized by the State Council for approval after they are reviewed and made comments on respectively by the people's governments of the concerned provinces, autonomous regions and municipalities directly under the Central Government.

The water functional division plans of other rivers and lakes than those covered in the preceding paragraph shall be worked out by the departments of water administration of the local people's governments at or above the county level jointly with environmental protection administrative departments and other concerned departments of the people's governments at

the corresponding level, submitted to and approved by the people's governments at the corresponding level or the departments authorized by them, and further submitted to the departments of water administration and environmental protection administrative departments at the next higher level for the record.

The departments of water administration of the people's governments at or above the county level or basin management agencies shall check and define the assimilative capacities of the above mentioned water areas in accordance with the water quality requirements of the function divisions and the natural purification capacity of the water bodies and submit a proposal of total pollutant discharge limitation to the environmental protection administrative departments.

The departments of water administration of the local people's governments at or above the county level and basin management agencies shall monitor the water quality conditions of the function divisions, and if it is discovered that the total discharge of primary pollutants exceeds the controlled standard or the water quality of a function division fails to meet the utility function requirements of the water area, shall report in good time to the people's government concerned for rectification measures and notify the environmental protection administrative department of the case.

**Article 33.** The state shall establish a system of protecting safe drinking water source areas. The people's governments of provinces, autonomous regions and municipalities directly under the Central Government shall specify their protected drinking water source areas and take measures to prevent water sources from depletion and water body pollution to ensure drinking water safety for the urban and rural residents.



**Article 34.** Sewage outfalls shall be prohibited from being set up within a protected drinking water source area.

The construction, reconstruction or enlargement of a sewage outfall at a river or lake shall be agreed to by the competent department of water administration or basin management agency, and the environmental protection administrative department shall be responsible for review and approval of the environmental impact assessment report of the construction project.

**Article 35.** In the case that an agricultural irrigation water source or irrigation or drainage works is occupied, or irrigation water or water supply source is adversely affected as a result of project construction, the construction unit shall take corresponding remedial measures and shall compensate for any loss it may incur in accordance with the law.

**Article 36.** In areas where groundwater is overdrawn, the local people's government at or above the county level shall take measures to strictly control the mining of groundwater. In areas where groundwater is seriously overdrawn, areas where groundwater mining is prohibited or restricted may be specified after the approval of the people's government of the province, autonomous region, or municipality directly under the Central Government. In the case that groundwater is withdrawn in coastal areas, scientific justification shall be conducted and measures be taken to prevent land subsidence and intrusion of seawater.

**Article 37.** Discarding or piling any object/objects impedimental to flood passage or growing trees or long stalk crops impedimental to flood passage in a river, lake, reservoir, or canal is prohibited.

Within a river channel management area, construction of a building or structure impedimental to flood passage or any activity

affecting flow momentum stability, endangering the safety of a river bank or levee, or impeding flood passage is prohibited.

**Article 38.** Within a river channel management area, construction of a bridge, dock, or any other building or structure that bars, crosses or sits beside a river, or installation of a pipeline or electric power cable that crosses a river shall conform with the flood control standards and other relevant technical requirements set by the state, and the project construction plan shall be submitted to the department of water administration concerned for review and consent in accordance with the relevant provisions of the Flood Control Law.

If any construction as referred to in the preceding paragraph requires the extension, reconstruction, demolition or damage of the original structure, etc., the construction unit shall bear the expenses of the extension or reconstruction and compensate for any loss incurred there from with the exception that the original structure, etc. is illegal.

**Article 39.** The state shall exercise a permit system for sand extraction in a river course. Measures for implementation of the permit system for sand extraction in a river course shall be formulated by the State Council.

In the case that sand extraction within a river course management area affects the stability of river flow momentum or endangers the safety of embankment, the concerned department of water administration the people's government at or above county level shall specify and announce the area where sand extraction is prohibited or time period when sand extraction is prohibited.

**Article 40.** Making a polder from a lake is prohibited. In the case that a polder is already made, the lake part shall be recovered by eliminating the polder in a planned manner in accordance with the flood control standards set by the state



Making a polder from a river course is prohibited. In the event of real necessity, it shall be scientifically justified, consented to by the department of water administration of the people's government of the province, autonomous region or the municipality directly under the Central Government or by the department of water administration under the State Council, and submitted to the people's government at the corresponding level for approval.

**Article 41.** Units and individuals shall have the obligation to protect water projects and may not seize, damage or destroy a levee, bank protection, flood control and hydrological monitoring equipment, hydro-geological monitoring equipment, and so on.

**Article 42.** Local people's government at or above the county level shall take measures to guarantee the safety of water projects within its administrative boundaries, particularly the safety of dams, and levees, and to eliminate any dangerous situation within the specified time. The department of water administration shall strengthen the supervision and management of the safety of water projects.

**Article 43.** The state shall protect water projects. Project management and protection boundaries shall be specified for state-owned water projects in accordance with the provisions of the State Council.

For projects managed by the department of water administration under the State Council or by a basin management agency, the project management and protection boundaries shall be specified by the competent department or the basin management agency jointly with the concerned province, autonomous region, or municipality directly under the Central Government.

For other water projects than covered in the preceding paragraph, the project protection boundaries and responsibilities shall be specified in accordance with the provisions of the people's government of the province, autonomous region, or municipality directly under the Central Government.

Within the water project protection boundaries, activities such as explosive blasting, well sinking/drilling, quarrying, earth excavating which affect the operation or endanger the safety of the project area prohibited.

## Chapter V Water Resource Allocation And Water Saving

**Article 44.** The development planning administrative department and department of water administration under the State Council shall be responsible for national water resource allocation at the macro level. The mid-and-long-term water supply and demand master plan for the national level and for inter-provincial, inter-autonomous regional, and inter-direct municipal level shall be formulated by the department of water administration under the State Council jointly with other departments concerned, and implemented after review and approval by the development planning administrative department under the State Council. The local mid-and-long-term master plans of water supply and demand shall be formulated by the departments of water administration of the local people's governments at or above the county level jointly with the departments concerned at the corresponding level in accordance with the mid-and-long-term water supply and demand master plans of the next higher levels and in the light of the actual local conditions, and implemented after review and approval by the development planning administrative departments of the people's governments at the corresponding level.



The mid-and-long-term master plan of water supply and demand shall be formulated in accordance with the water supply and demand conditions, national economic and social development master plans, basin master plans, and regional master plans and on the principles of coordinated supply and demand of water resources, being comprehensively balanced, ecological protection, strict water saving, and rational tapping of water supply sources.

**Article 45.** In regulation and storage of run-off and allocation of water, the water allocation plans shall be formulated based on the basin, in accordance with the basin master plans and the mid-and-long-term master plan of water supply and demand.

A plan for the allocation of water covering provinces, autonomous regions and municipalities directly under the Central Government and a preliminary plan for the regulation of water under the circumstances of urgent droughts shall be formulated by the administrative organization consulting with relevant people's government of provinces, autonomous regions and municipalities directly under the Central Government, and shall be submitted to and approved by the State Council or its authorized department and then be implemented. A plan for the allocation of water covering different administrative divisions and a preliminary plan for the regulation of water under the circumstances of urgent droughts shall be formulated after consultation by the department of water administration of the people's government at the next higher level and local people's government concerned, and shall be executed after being submitted to and approved by the people's government at corresponding level. (Water allocation plans and contingency plans of water allotment for drought emergencies for inter-provincial, inter-autonomous regional and inter-direct municipal level shall be formulated by basin management

agencies jointly with the people's governments of the concerned provinces, autonomous regions and municipalities directly under the Central Government, and implemented after being submitted to and approved by the State Council or the department authorized by the State Council. Water allocation plans and contingency plans of water allotment for drought emergencies for other inter-administrative area levels shall be formulated by the departments of water administration of the people's government common to the concerned administrative areas at the next higher level jointly with the local people's governments concerned, and implemented after being submitted to and approved by the people's governments at the corresponding levels.

The local people's governments concerned must carry out the water allocation plans and the contingency plans of water allotment for drought emergencies after they are approved.

***Construction of water resource development and utilization projects on administrative area boundary rivers shall conform to the approved water allocation plans of the basins concerned and be approved by the department of water administrations of the people's governments at the next higher level common to the concerned local people's governments at or above the county level or the basin management agencies concerned.***

**Article 46.** The department of water administration of the local people's governments at or above the county level or the basin management agencies shall draw up annual water allocation plans and water allotment plans in accordance with the approved water allocation plans and the predicted annual inflow to carry out water allocation in a unified manner, to which the local people's governments concerned must conform.



Annual water allocation plans for state-designated major rivers and lakes shall be included in the annual national economic and social development plan of the state.

**Article 47.** The state shall adopt a unified system of total amount control and quota management for the use of water.

The concerned line agencies of the people's governments of provinces, autonomous regions, and municipalities directly under the Central Government shall formulate the water use quotas for the sectors of their administrative areas. The formulated quotas shall be announced by the people's governments of the provinces, autonomous regions and municipalities directly under the Central Government after they are submitted to, verified, and consented to by the departments of water administration and quality supervision and inspection administrative departments at the same level, and shall be submitted to the department of water administration and quality supervision and inspection administrative department under the State Council for the record.

Development and planning departments of the local people's governments at or above the county level jointly with departments of water administration at the corresponding level shall determine the amount of water that can be used in their administrative areas and formulate the annual water use plans in accordance with the water use quotas, economic and technical conditions and the water allocation plans, and shall control the total annual water use within their areas.

**Article 48.** Any unit or individual that withdraws water resources directly from a river, a lake, or underground shall obtain the water withdrawal right by applying for and receiving a water withdrawal permit from the department of water administration or the basin management agency and paying the water resource fee in accordance with the provisions of the state's

water withdrawal permit system and system of paid use of water resources, with the exception that a small amount of water is withdrawn for household use, as drinking water for a small number of scattered or pen-fed livestock and poultry, or for other purposes.

Specific measures for implementation of water withdrawal permit system and of collection and management of water resource fee shall be stipulated by the State Council.

**Article 49.** The use of water shall adopt a system for collecting fees by the volumetric amount and consumption of water above the quota, water shall be used in a measured manner and in accordance with the approved water use plan. Volumetric water charge system shall be adopted, and progressively increased water prices charged in the case of water use above the quota.

**Article 50.** People's governments at all levels shall promote water-saving irrigation methods and water-saving techniques, and take necessary measures of seepage control on agricultural water storage and delivery projects to raise efficiency of agricultural water use.

**Article 51.** Advanced technologies, processes and equipment shall be introduced for industrial water use to increase the number of times of recycled water uses and raise the reutilization ratio of water.

The state shall gradually eliminate backward, high water consuming technologies, equipment and products, a specific name list of which shall be drawn up and announced by the comprehensive economy department under the State Council jointly with the department of water administration and other departments concerned under the State Council. Manufacturers, sellers or users in production and business operations shall stop manufacturing, selling and using the technologies, equipment and products on the list within the specified time.



**Article 52.** Urban people's governments shall take effective measures suitable to local conditions to raise domestic water use efficiency by popularizing water-saving household facilities and reducing water leakage and losses of pipeline networks for urban water supply, and to raise the utilization ratio of recycled sewage water by strengthening concentrated treatment of municipal sewage and encouraging the use of recycled water.

**Article 53.** When a project is constructed, extended, or reconstructed, a water-saving plan of measures shall be laid down to include construction of water saving facilities. The design, construction, and operation of water-saving facilities shall go along with those of the principal project.

Water supply enterprises or units that own water supply facilities shall strengthen the maintenance and management of water supply facilities to reduce leakage and losses of water.

**Article 54.** People's governments at all levels shall take active measures to improve the conditions for drinking water for urban and rural residents.

**Article 55.** Anyone who uses water supplied by a water structure shall pay water charge to the water supply unit in accordance with the provisions of the state. The price of the supplied water shall be determined on the principles of cost compensation, reasonable income, good price with good quality, and equitable cost sharing. Specific measures shall be formulated by the competent price department of the people's government at or above the provincial level, jointly with the department of water administration or other water supply administrative department at the corresponding level in accordance with their functions and powers.

## Chapter VI Water Dispute Resolution And Supervision And Inspection For Law Enforcement

**Article 56.** Any water dispute between/among different administrative areas shall be resolved through consultations. In the case that resolution fails through consultations, the dispute shall be decided by the people's government at the next higher level, and the decision must be conformed to by all the parties concerned. Pending the resolution of a water dispute no party may build any project for water drainage, blockage, withdrawal or cutting-off (storage), nor may any party unilaterally change the water conditions within a certain area of either side of the administrative boundary, unless an agreement is reached between/among the parties concerned or approval is granted by the people's government at the next higher level.

**Article 57.** Any water dispute between/ among units, between/among individuals or between/ among units and individuals shall be resolved through consultations. In the case that a party concerned is unwilling to resolve the dispute through consultations, or resolution fails through consultations, it may apply for mediation of the local people's government at or above the county level or the department authorized by the said government or it may file a civil lawsuit in the people's court directly. In the case that the local people's government at or above the county level or the department authorized by the said government fail in mediation, the party concerned may file a civil lawsuit in the people's court.

***Pending the resolution of a water dispute, no party may unilaterally change the water conditions.***

**Article 58.** In handling a water dispute, the people's government at or above the county level or the department authorized by the said government shall have the right to take temporary measures, to which all parties concerned must conform.



**Article 59.** The department of water administration of the people's governments at or above the county level and basin management agencies shall strengthen supervision and inspection, and investigate and prosecute any activity in violation of this law in conformity with legal provisions.

Supervision and inspection officials of water administration shall strictly adhere to their duties and impartially enforce the Law.

**Article 60.** In carrying out the supervision and inspection duties prescribed by this law, department of water administrations of the people's governments at or above the county level, basin management agencies and their water administration supervision and inspection officials shall have the right to take the following measures:

- (1) to require the unit under inspection to produce relevant documents, certificates and licenses, and data and information;
- (2) to require the unit under inspection to give explanations of problems with respect to the implementation of this law;
- (3) to enter the production site of the unit under inspection to carry out investigations; and,
- (4) to instruct the unit under inspection to end any activity in violation of this law and fulfill its statutory duties.

**Article 61** Units or individuals concerned shall cooperate with the supervision and inspection officials of water administration in their supervision and inspection and may not reject or hinder supervision and inspection officials of water administration in their execution of the duties in conformity with legal provisions.

**Article 62.** In carrying out supervision and inspection duties, supervision and inspection officials of water administration shall show their law enforcement credentials to units or individuals under inspection.

**Article 63.** In the case that any people's government at or above the county level or any department of water administration of the people's government at a higher level find any department of water administration at or below its own level to engage in malfeasance or dereliction of duty in its supervision and inspection activities, it shall instruct the said department of water administration to make rectification within a prescribed time.

## Chapter VII Legal Liabilities

**Article 64.** In the case that any department of water administration, any other department concerned, or any water project management unit or any of its staff members accepts any article of property or any other benefit from any other person/persons by exploiting its/his/her office, or commits dereliction of duty by issuing a permit to or writing review and consent comments with signature for any unit or individual that is not legally qualified, failing to distribute water in accordance with the water allocation plan, failing to collect water resource fee in accordance with relevant state provisions, failing to carry out its/his/her supervision duties, or failing to investigate and prosecute any illegal activity discovered, which has serious consequences and constitutes a crime, investigations shall be made into the criminal responsibility of the in-charge person who is held responsible and any other person/persons who is/are held directly responsible in accordance with the relevant provisions of the criminal law. If the case is not enough for criminal punishment, administrative sanctions shall be taken.

**Article 65.** In the case of construction of a building or structure impedimental to flood passage, or any activity affecting river momentum stability, endangering the safety of a river bank or levee, or impeding flood passage within a river channel management area, the department of water administration of a people's government at or above the county level or the



basin management agency shall, in accordance with its functions and powers, order to stop such illegal acts and demolish the illegally constructed building or structure and restore the original conditions within a prescribed time. In the case of failure to demolish the building or structure or to restore the original conditions within the prescribed time, demolition shall be forced at the expense of the lawbreaking unit or individual, on whom a fine of between 10,000 RMB yuan and 100,000 RMB yuan shall be imposed.

In the case of construction, without consent of the department of water administration or basin management agency, of a water project, bridge, dock, or any other building or structure that bars, crosses or sits beside a river, or installation of a pipeline or electric power cable that crosses a river, concerning which there are no relevant provisions in the flood control law, the department of water administration of a people's government at or above the county level or the basin management agency shall, in accordance with its functions and powers, order to stop such illegal acts and go through the overdue formalities within a prescribed time. In the case of failure to go through the overdue formalities or failure to be approved in going through the overdue formalities within the prescribed time, demolition of the illegally constructed building or structure within a prescribed time shall be ordered. In the case of failure to demolish the illegally constructed building or structure within the prescribed time, the demolition shall be forced at the expense of the lawbreaking unit or individual, on whom a fine of between 10,000 RMB yuan and 100,000 RMB yuan shall be imposed.

In the case of failure to meet the requirements in constructing the works mentioned in the proceeding paragraph in spite of consent of the department of water administration or the basin management agency, the department of water administration of a people's government at or above the county level or the basin management

agency shall, in accordance with its functions and powers, order to rectify it within a prescribed time, plus a fine of between 10,000 RMB yuan and 100,000 RMB yuan depending on the seriousness of the case.

**Article 66.** In any of the following cases, concerning which there are no relevant provisions in the flood control law, the department of water administration of a people's government at or above the county level or the basin management agency shall, in accordance with its functions and powers, order to stop the illegal act/acts and remove the obstacle/obstacles or take other remedial measures within a prescribed time, plus a fine of between 10,000 RMB yuan and 500,00 RMB yuan shall be imposed:

- (1) Discarding or piling any object/objects impedimental to flood passage or growing trees or long stalk crops impedimental to flood passage in a river, lake, reservoir or canal;
- (2) Making a polder from a lake or making a polder from a river channel without ratification.

**Article 67.** In the case of building a sewage outfall in a protected area of drinking water source, the local people's government at or above the county level shall order to demolish it and restore the original conditions within a prescribed time. In the case of failure to demolish or restore the original conditions within the prescribed time, the demolition or restoration shall be forced, plus a fine of between 50,000 RMB yuan and 100,000 RMB yuan.

In the case of building, rebuilding or enlarging a sewage outfall in a river or lake without examination and consent of the department of water administration or the basin management agency, the department of water administration of a people's government at or above the county level or the basin management agency shall, in accordance with its functions and powers, order



to stop the illegal acts and restore the original conditions within a prescribed time, plus a fine of between 50,000 RMB yuan and 100,000 RMB yuan.

**Article 68.** In the case of producing, selling or using, in production and business operation activities, backward and high water-consuming technology, equipment or products that the state has explicitly ordered to abandon, the comprehensive economic department of a local government at or above the county level shall order to stop the production, sale or use, plus a fine of between 20,000 RMB yuan and 100,000 RMB yuan.

**Article 69.** In any of the following cases, the department of water administration of a people's government at or above the county level or the basin management agency shall, in accordance with its functions and powers, order to stop the illegal act/acts and take remedial measures within a prescribed time, plus a fine of between 20,000 RMB yuan and 100,000 RMB yuan. In a serious case, the water withdrawal permit shall be revoked if:

- (1) Withdrawing water without ratification;
- (2) Withdrawing water without conforming to the rules and conditions set in the approved water withdrawal permit.

**Article 70.** In the case of refusing or delaying to pay or being in arrears with the payment of water resource fee, the department of water administration of a people's government at or above the county level or the basin management agency shall, in accordance with its functions and powers, order to pay it within a prescribed period. In the case of failure to pay it within the prescribed time, an arrear charge calculated starting from the day of delay on the daily basis of 2% of the belated payment shall be imposed, plus a fine of between one time and five times the amount of the water resource fee that is owed or should be paid.

**Article 71.** In the case that water-saving facilities of a construction project are put in use in uncompleted conditions or without meeting the requirements set by the state, the concerned department of a people's government at or above the county level or the basin management agency shall, in accordance with its functions and powers, order to stop the use and rectify it within a prescribed time, plus a fine of between 50,000 RMB yuan and 100,000 RMB yuan.

**Article 72.** In any of the following cases that constitute a crime, investigations shall be made into the criminal responsibility in accordance with the relevant provisions of the Criminal Law. If the case is not serious enough for criminal punishment and there is no provision concerning it in the flood control law, the department of water administration of a local people's government at or above the county level or the basin management agency, in accordance with its functions and powers, shall order to stop the illegal act and take remedial measures, plus a fine of between 10,000 RMB yuan and 50,000 RMB yuan. In the case of violation of the Public Security Administration Punishment Act, the public security organ shall mete out public security administration penalty in accordance with the law. In the case of any loss incurred to anybody, the violator shall be responsible for the compensation in accordance with the law:

- (1) Occupying or damaging a water project and levee, bank-protection, or other facilities, or damaging flood control, hydrological monitoring or hydro-geological monitoring facilities;
- (2) Engaging in explosions, well digging, rock mining or earth taking within the framework of water project protection that adversely affect project operations and endangering project safety.

**Article 73.** In the case of occupying, stealing and/or plundering flood-control materials and/or other water equipment and/or facilities for



flood control and water-logged area drainage, on-farm water utilization, hydrological monitoring and measurement, and so on, and/or embezzling or appropriating funds and/or materials that the government allocates for disaster relief, rescue, flood control, resettlement and its compensation and/or other water works construction, which constitutes a crime, investigations shall be made into the criminal responsibility in accordance with relevant provisions of the Criminal Law.

**Article 74.** In the case that anyone, when a water dispute takes place or while it is being handled, stirs up trouble, makes gang fights or plunders or damages public or private property or illegally restricts the personal freedom of another person/other persons, which constitutes a crime, investigations shall be made into the criminal responsibility in accordance with the relevant provisions of the Criminal Law. If the case is not serious enough for criminal penalties, the public security organ shall mete out public security control penalty in accordance with the law.

**Article 75.** In any of the following cases when a water dispute takes place between different administrative areas, administrative sanctions shall be taken against the in-charge person who is held responsible and any other person/persons who is/are held directly responsible in accordance with the law:

- (1) Refusing to implement the water allocation plan or the contingency plan of water allotment; Refusing to conform to unified water allotment;
- (2) Refusing to conform to the decision on a dispute made by the people's government at a higher level;
- (3) Before water dispute is resolved unilaterally changing the water conditions, in violation of the provisions of this law, without an agreement reached by all the parties concerned or approval of the people's government at a higher level.)

**Article 76.** Anyone who diverts, retains or discharges water to the detriment of public interests or other's/others' legitimate rights and interests shall bear civil responsibility in accordance with the law.

**Article 77.** The State Council shall enact administrative sanctions on the violation of the provisions of Article 39 of this law concerning permit system of sand extraction in river channel.

## Chapter VIII Supplementary Provisions

**Article 78.** Where any international treaty or agreement relating to international or border rivers or lakes, concluded or acceded to by the People's Republic of China, contains provisions differing from those in the laws of the People's Republic of China, the provisions of the international treaty or agreement shall apply, unless the provisions are ones on which the People's Republic of China has made reservations.

**Article 79.** The "water project" referred to in this Law includes various projects for the development, utilization, control, allocation and protection of water resources in the rivers, lakes and groundwater sources.

**Article 80.** The development, utilization, protection and management of seawater shall be exercised in accordance with the provisions of relevant laws.

**Article 81.** The undertakings for prevention of floods shall be exercised in accordance with the provisions of the Law of Prevention of Floods.

The protection and control of water pollution shall be exercised in accordance with the provisions of the Law of Prevention and Control of Water Pollution.

**Article 82.** This Law shall come into force as of October 1, 2002.





# Annex 2 - Regulations for Water Withdrawal Permit

And Collection and Management  
of Water Resources Fee State  
Council Decree of PRC No. 460

## Chapter I General Provisiton

**Article 1** This Regulation is formulated for the purposes of strengthening management and protection of water resources, and promoting the conservation and rational development and utilization of water resources in accordance with the provisions of the Water Law of the People’s Republic of China (referred to as Water Law hereinafter).

**Article 2** For the purpose of this Regulation, “water drawing” is referred to drawing water directly from rivers, lakes or underground aquifers by using water drawing works or facilities.

In order to draw water, any unit or individual shall apply for a water drawing permit and pay water resources fee, except in the cases given in Articles 4.

The water drawing works or facilities referred to in the Regulation include sluice, dam, canal, man-made river channel, siphon, pump, well, hydropower station, etc.

**Article 3** The department of water administration of the people’s government at or above the county level is responsible for the organization and supervision of implementation of the water drawing permit system in accordance with the limits of authority for administration by level.



The river basin authorities designated by the department of water administration under the State Council for important rivers and lakes as determined by the state are responsible for the organization and supervision of implementation of the water drawing permit system under their respective jurisdictions in accordance with the provisions of the Regulation and authorization by the department of water administration under the State Council.

The departments of water administration, finance and price administration of the people's government at or above the county level are responsible for the collection, management and supervision of water resources fee in accordance with the provisions of the Regulation and within the limits of their authority.

**Article 4** Application for water drawing permit is not necessary in any of the following cases:

1. Water use of rural economic collectives and their members by drawing water from ponds or reservoirs owned by the collectives;
2. Water drawing of a small amount for household use and for drinking of livestock and poultry reared sporadically or in pens;
3. Temporary emergency water drawing or discharge that must be done to guarantee the safety of construction or operation of underground engineering such as mines;
4. Temporary emergency water drawing that must be done to prevent or eliminate harms to public security or interests.
5. Temporary emergency water drawing that must be done to combat drought in agriculture and protect the ecology and environment.

The limits of a small amount of water drawing as mentioned in 2 shall be determined by the people's government of province, autonomous region and municipality directly under the central government; the water drawings as given in 3 and 4 shall be timely reported to the

department of water administration of local people's government at or above the county level or to the river basin authority for records; the water drawing as given in 5 shall be approved by the department of water administration of the people's government at or above the county level or the river basin authority.

**Article 5** In issuing water permits, domestic water use of urban and rural residents shall be satisfied first, and agricultural, industrial, ecological and environmental and navigation uses, etc shall also be considered and taken care of.

The people's government of province, autonomous region and municipality directly under the central government may, within the limits of their authority given in the Regulation, specify priority sequence for the above-mentioned water uses within the same river basin or region in the light of site-specific conditions.

**Article 6** Implementation of the water drawing permit system must accord with comprehensive water resources plans, comprehensive river basin plans, mid to long term water demand and supply plans and water function zoning plans, and abide by water allocation plans approved in accordance with provisions of the Water Law; if the water allocation plan has not been formulated, the water allocation agreement signed between local people's governments shall be observed.

**Article 7** In implementation of the water drawing permit system, consideration shall be given to both surface water and groundwater, and to the principles of combining water supply expansion with water conservation, with priority given to conservation, and combining total amount control with quota based management.

The total amount of water consumption with approved water drawings in a river basin shall not exceed the amount of exploitable water resources in the river basin.



The total amount of permitted water drawings in an administrative region shall not exceed the draw able amount of water assigned to the region by the river basin authority or the department of water administration at the next higher level, in which the total amount of permitted groundwater drawings shall not exceed the exploitable amount of groundwater in the region, and shall meet the requirements of the local groundwater development and utilization plan. In formulation of the groundwater development and utilization plan, opinions shall be solicited from the department of land and resources administration.

**Article 8** The principles of openness, equality, equity, high efficiency and convenience to the people shall be observed in implementation of the systems of water drawing permit and collection and management of water resources fee.

**Article 9** Any units and individuals have the obligation to conserve and protect water resources.

Units and individuals that have made outstanding achievements in the conservation and protection of water resources shall be awarded by the people's government at or above the county level.







## **Annex 3 - Strengthening Farmer Water User Associations**

**Ministry of Water Resources  
National Development &  
Reform Committee  
Ministry of Civil Affairs  
Document Shui Nong [2005] No.502**

[Directed to:] Water resources (Water Affairs) bureaus, development & reform committees, pricing bureaus and civil affairs bureaus of provinces, autonomous regions and direct municipalities; (water affairs) bureaus, development & reform committees, pricing bureaus and civil affairs bureaus of independently planned municipalities; water resources bureaus, development & reform committees and civil affairs bureaus of Xinjiang Production and Construction Corps.

In line with the essentials of accelerating the reform of property right system for the small sized infrastructures in the rural areas as stipulated in the State Council document (ZhongFa [2005] No.1) entitled “Recommendations of the Central Committee of the Communist Party of China and the State Council on the Policies Concerning the Improvement in Comprehensive Productivity of Agricultural by Further Intensifying Rural Work”, and in accordance with the provisions of ‘Actively fostering farmers’ water user cooperatives’ and ‘Exploring to establish water management system dominated by various rural water use cooperatives’ as stated in the State Council document (GuoFaBan [2002] No.45) ‘Recommendations on Implementing Water Works Management System Reform’, the following directive suggestions on strengthening development of Farmer Water User Associations (hereinafter abbreviated WUAs-noted by the translator) are hereby brought forward with the purposes of further deepening reform of grass-roots level community-based water management system in the rural areas, facilitating virtuous operation of and giving full play to the water works.



## I. Fully Understand the Significance of Strengthening the Development of Farmer WUAs

Water resources infrastructures play a very important role in fighting natural calamities to protect agriculture, improving agricultural production conditions, upgrading comprehensive agricultural productivity and accelerating increase of farmers' income and development of rural economy. In the process of reforming the construction and management system for the rural water infrastructures, such approach of encouraging and guiding the farmers to organize by themselves on a voluntary base, conduct mutual aid and cooperation and take responsibilities to construct, manage and maintain the rural water from which they directly benefit, can solve the problem of 'lacking main entity' of collective water management organization after rural land was contracted to households, and also the problems including that a great deal of small sized on-farm water works and in-the-field works below tertiary canal level in the major and medium, sized irrigation districts are being utilized but nobody cares about their maintenance, and the resulted serious aging and damage of those water works. Such approach is needed to cope with the new situation in the rural area where accumulated labor and compulsory labor contribution system were abolished. It's also needed to consolidate the achievements obtained through the program of 'Extending and Completing Auxiliary Water Works and Implementing Water Saving Improvement in the Irrigation Districts (2+1 Program-noted by the translator)', and to ensure full functions of the water works in the irrigation districts. Strengthening development of WUAs is of great significance to fostering and upgrading awareness and level of farmers' self-management, clearly defining ownership of rural water works and establishing modern and highly efficient water management and operation system. (Household contract responsibility system)

In recent years, many places have been experimenting and extending participatory irrigation management with farmers' involvement based on their past successful experience in reforming grass-root level mass water management organizations and by learning and making references to international advanced water management methods. Through such explorations, they have obtained a great deal of good experience and apparent benefits in raising farmers' awareness of democratic management, building closer relations between water suppliers and users, improving management and maintenance of the on-farm works and irrigation and drainage service, promoting water saving, increasing water charge collection ratio, releasing the farmers from unreasonable burden, and reducing agricultural production costs and ensuring increase of farmers' income, etc. Practice has proven that local governments, irrigation district management units and farmers all welcome development of Farmer WUAs and the reform, and the future direction for irrigation district management reform is that Farmer WUAs take responsibilities to manage the on-farm irrigation and drainage works. All relevant departments and irrigation district management units should further raise understanding, unify thinking, upgrade consciousness for implementing reform, and adopt practical and effective measure to strengthen and actively foster and support WUA development.

## II. Directive and Basic Principles for Strengthening Farmer WUA Development

The directives for strengthening Farmer WUA development are as follows:

Taking Deng Xiaoping Theory and "the Three Represents" as the guiding thinks and adhering to "human being first" (human-oriented?) and all-around, harmonious and sustainable development concept, implementing the guidelines and policies by the central government concerning the 'three rural



problems' and, through strengthening and fostering development of Farmer WUAs, solving the long-lasting problems concerning rural water works management, including "lacking main entity" of rural water management, unclear definitions for responsibilities, rights and obligations, unsatisfactory efficiency and effectiveness, so that farmers can rely on mutual aid and cooperation and collective measures to self-determine on construction and management of rural water works, thus anti-disaster capacity and management level of rural water infrastructures can be upgraded, water saving can be promoted, agricultural comprehensive productivity and farmers' income can be increased and harmonious development of people, natural resources, environment, economy and society realized while sustainable agricultural and rural economic development ensured.

The basic principles for strengthening Farmer WUA development are:

Firstly, giving guidance to various irrigation districts based on their local conditions. Specific local conditions including habits, current practice, management level and existing problems in the irrigation districts should be considered and the direction and principles for water management system reform should be followed in defining detailed measures to strengthen Farmer WUA development. The method of applying or copying one model everywhere mechanically or 'cutting it even at one stroke' (one size for everything?) disregarding actual local conditions should not be adopted.

Secondly, taking active and reliable measures and paying attention to effectiveness. Active measures should be taken to support the reform and strengthen, foster and develop Farmer WUAs. At same time, attention should be attached to effectiveness so as to ensure success and benefits in every place where reform is implemented, and that experience can be gradually extended from separate places to a wider area.

Thirdly, realizing self-management with governmental guidance. Governments at all levels should strengthen guidance and support to Farmer WUA development and really empower the water users with part of or all rights to and responsibilities for rural water works management.

Fourthly, organizing Farmer WUAs based on farmers' voluntary participation and mutual benefits. Principles of voluntary participation, democratic discussion and decision-making, mutual benefits should be followed in strengthening, fostering and supporting WUA development and, in doing so, governments' exceeding their duties or giving compulsory orders should be avoided.

### III. Responsibilities and Tasks of Farmer WUAs

Farmer WUAs are non-profit social organizations that are organized through democratic consultation and agreed upon and established by the majority of water users. As farmers' own organizations, Farmer WUAs have main bodies formed by beneficiary farmers. Within Farmer WUAs, all members have equal status and enjoy identical rights, responsibilities and obligations. The aim of establishing Farmer WUAs is to have mutual aid and cooperation, self-management and self-service.

The responsibilities of Farmer WUAs are to serve the farmers within the associations, seek maximal benefits from the irrigation and drainage facilities within the Farmer WUAs' command areas, organize the water users to construct, rehabilitate and maintain the irrigation and drainage works, actively conduct construction of the on-farm water infrastructures, sign contracts with water supply unit, mitigate conflicts among the farmers or between the farmers and the water supply unit, collect water charges from the water users and pay the water supply unit as per the contracts.



The tasks of Farmer WUAs are to construct and manage well the rural water works, realize rational and highly efficient utilization of water resources, continuously upgrade water use efficiency and benefits, provide equal, high quality and highly efficient irrigation drainage service to the local farmers, so as to realize the objectives of increasing agricultural comprehensive productivity and farmers' income, developing rural economy and making it prosper, protecting and improving eco-environment.

Within the framework of national laws and their charters, Farmer WUAs enjoy ownership, operational and management rights to the irrigation and drainage facilities within their command areas and are subject to policy guidance by water administrative (responsible water administration agency) and community registration management departments and professional and technical instructions by irrigation district management units. Meanwhile, Farmer WUAs have the right to the supervision over the construction and management of the irrigation districts and participate in relevant water-related activities. The relationship between Farmer WUAs and the irrigation district management units are of mutual cooperation type in the process of constructing and managing the water works, and are of buyer-and-sellers type in the process of water trading.

#### IV. Procedures for Establishing Farmer WUAs

Firstly, conducting wide-ranging awareness raising and mobilization activities and organizing training courses (at large?). In guiding the farmers to organize Farmer WUAs on voluntary bases, the prerequisite is to fully respect farmers' wishes. Establishment of Farmer WUAs should be based on the real needs of the local people and the specific local conditions, with thorough consideration of the local irrigation and drainage features, and proper approaches should be adopted.

Secondly, defining a reasonable command area for each of the Farmer WUAs to be established. In order to facilitate rational water regulating and distribution, organizing engineering maintenance in a unified way and improving water use efficiency and benefits, irrigation management boundary of farmer WUAs should be decided jointly by the local governments, village committees, water management units and farmers' representatives through consultation, based on the principle of taking into consideration of both river system and canal system and administrative zoning system as well. Size of the farmer WUA to be set up should suit its tasks and ensure convenient mutual aid and cooperation among the water users, while every effort should be made to obtain lower cost but higher efficiency.

Thirdly, establishing Farmer WUA charter and management systems. Survey and registration of farmer households should be conducted so that farmer water user groups can be divided, and representatives of the farmer households and candidates for the executive committee of WUA can be elected. Then plenary meeting (assembly) of the representatives of the farmer households can be held can executive members of the WUA elected, followed by definition of the charter and management systems and methods, including water supply management, engineering maintenance, water charge collection and payment and financial management systems and methods, so that relevant rights, responsibilities and obligations of all parties concerned can be made clear. Person in charge of the WUA should be democratically elected that strictly follows relevant rules and regulations, so that capable, impartial people who are enthusiastic in promoting public welfare and thus enjoy the trust of the farmers can be elected. Charter of WUA and management systems should go through democratic discussions and then be passed by voting.



Fourthly, having the Farmer WUAs registered. Farmer WUAs should register with the civil affairs departments of the local governments at county level and are subject to line management by the water administrative departments at county level. Line administrative departments can entrust the township level water management units to deal with relevant management issues on their behalves.

Conditions and procedures for WUA registration follow (the) provisions stated in relevant documents, including the one issued by the MCA entitled 'Guiding Recommendations on Strengthening the Fostering, Development, Registration, and Administration of Rural Specialized Economic Associations'.

## V. Operation and Capacity Building of Farmer WUAs

All farmer water users have responsibilities and obligations to save water, maintain water works and pay water charges. In the process of constructing and managing irrigation and drainage works, members of Farmer WUAs should dedicate to public welfare undertakings while adhering to the principle of fair and reasonable distribution according to work. Subsidy for labor contribution of WUA members should be approved by its executive committee or plenary meeting of representatives, and reported to the township government and irrigation management unit for record.

Flexible and diversified operational mechanism can be used by the Farmer WUA to manage the water works belong to the Farmer WUAs. The water works can be managed by the WUA collectively, or by WUAs entrusting to individuals or groups through contracting.

Farmer WUAs should persist in the principle of 'Farmer operate, farmers manage and farmer (be) benefited' and strengthen organization and establishment of internal systems and

procedures, so as to ensure democratic, open, effective and standardized operation of the Farmer WUAs.

Farmer WUAs should establish and complete supervision systems. All water-related affairs, financial status and staff engagement should be open, transparent and subject to supervision by all water users, local government and community. Farmer WUAs should report their work to the meeting of representatives of the members regularly and set up bulletin boards at suitable place easy to attract attention publicizing to the water users water charge rate, water use amounts, water charge revenues and expenses, etc. Farmer WUAs should be financially independent and those Farmer WUAs of larger size should establish supervision boards (auditing committee).

Consciously finding and training woman key members in the Farmer WUAs should be done so as to give more play to women in the process of water users' participating in irrigation management.

Farmer WUAs should enhance their capacity building and actively participate in the training courses on policies, techniques and operation that are organized by water administrative departments and irrigation district units with the purpose of improving their technical skills and comprehensive quality, while strengthening study. Study, training and management of WUA members should be strengthened so as to improve operational level and management capability of WUA members.

## VI. Truly Create Good (friendly) Environment for Farmer WUA Development

It is the governments' responsibility to promote management system reform of irrigation and drainage works and create favorable conditions for Farmer WUA establishment and development.



All relevant departments should also provide policy, financial and professional support to Farmer WUA development. Water administration departments at all levels should take initiatives in presenting suggestions and recommendations on promoting the reform to governments, so as to obtain governmental attention and support. Communication and coordination between Farmer WUA and other relevant departments, such as departments of development and reform, pricing, financial, civil affairs, agricultural and policy research, should be enhanced, so that reform of rural grass-root level community water management organizational system can be done well with joint efforts from relevant departments with different responsibilities.

Based on summarizing local experiences, learning from advanced approaches and experience in other places, local policies and legislative regulations should be formulated to define the nature and tasks of Farmer WUAs and responsibilities, rights and obligations of all parties in relation to irrigation and drainage issues, including relevant governmental departments, irrigation district management units, etc., so that favorable policy and regulation environment can be provided to support WUA development. Local water administrative departments should take initiatives to actively communicate and coordinate with the civil affairs departments to do a good job in (of) registering and managing Farmer WUAs.

Water administrative departments at all levels and irrigation district management units should ensure information open to public, thus providing conditions for Farmer WUAs to fully play their roles. Training of key members of Farmer WUAs should be strengthened to upgrade their technical skills and comprehensive quality. Good models, achievements and experiences obtained can be used to raise the social status of Farmer WUAs and extend their impacts, and various practical and feasible methods should be adopted to create conditions

for water users to participate in irrigation management. Occasions for the water users to release their opinions and voice their appeals and requests should be provided. For issues including decision-making on major affairs that closely relate to the water users, irrigation and drainage project planning, water distribution and regulation, water pricing, water charge collection and payment, engineering construction, management and maintenance, etc., Farmer WUAs' opinions should be fully heard.

Departments of development and reform, pricing and water administration at all levels should abide by relevant policies issued by the central governments to deepen reform of agricultural water pricing and facilitate ascertaining funds sources for WUA operation and management activities and operation and maintenance of engineering structures. Overall consideration for all demands and possibilities should be conducted so that rehabilitation and completion of the irrigation and drainage structures can be gradually arranged into the plans for rural water works construction, and funds should be raised from all possible sources to support implementation of the plans, so as to improve status (shape) of the on-farm structures.

In the process of developing Farmer WUAs, water administration departments should strengthen organization and guidance, exercise functions as responsible line agency, enhance supervision and check and establish a complete objective-based assessment system. It is also required that plans and implementation programs should be worked out, while good services in information exchange, technical guidance and financial subsidy should be provided so that difficulties and problems occurred in the reform can be found and solved in a timely manner. In-depth survey and investigations should also be carried out, so that experience can be summed up and good models can be found for extending to a wider area to promote in an all-around way sound and orderly development of Farmer WUAs.





## Annex 4 - Measures of Xinjiang to Implement National Water Law

Adopted (at the 26th Session of the Standing Committee of the Seventh People's Congress of Xinjiang Uygur Autonomous Region on May 8, 1992 and revised at the 7th Session of the Standing Committee of the Tenth People's Congress of Xinjiang Uygur Autonomous Region on December 26, 2003

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### Chapter I General Provisions

**Article 1** These measures are formulated in the light of the actual conditions of the region in accordance with the "Water Law of the People's Republic of China" (hereinafter referred to as the "Water Law").

**Article 2** the "Water Law" and these measures must be abided by in the development, utilization, saving, protection and management of water resources and in the prevention and control of water disasters within the administrative area of the autonomous region.

The water resources referred to in these measures include surface water and groundwater.

**Article 3** Water resources are owned by the State.



The water withdrawal permit system and paid use system are implemented in water resources withdrawal and use. Where laws and administrative regulations have other provisions, such provisions shall prevail.

**Article 4** People's governments at or above the county level shall strengthen water infrastructure construction, which shall be included in their economic and social development plans at the same level, and take effective measures for saving and protecting water resources to achieve sustainable utilization of water resources.

**Article 5** The autonomous region exercises a system of basin water resources management in combination with administrative boundary water resources management and strengthens unified management and scientific allocation of water resources in the basin.

The water administrative department of the autonomous region is responsible for unified management and supervision of water resources in the whole region; water administrative departments of the autonomous prefectures, municipalities (prefectures) and counties (cities) are responsible for unified management and supervision of water resources in accordance with the limits of the specified authorities within their own administrative boundaries.

The water administrative department of the autonomous region may set up basin management agencies on important rivers and lakes determined by the region and on inter-prefecture / Municipality Rivers and lakes. Water administrative departments of the autonomous prefectures and municipalities (prefectures) may set up basin management agencies on inter W county/city Rivers and lakes. The basin management agencies implement unified management and supervision of water resources in accordance with their responsibilities within their jurisdictions.

**Article 6** Other relevant departments of people's governments at or above the county level are responsible for the work concerning development, utilization, conservation and protection of water resources within their administrative areas in accordance with the division of duties.

**Article 7** Water administrative departments of people's governments at or above the county level and basin management agencies shall establish a water administration supervision system to strengthen organizational development for water administration, strengthen supervision of water activities, exercise their statutory duties and keep water affairs in order.

## Chapter II Water Resources Planning and Development and Utilization

**Article 8** A comprehensive water resources master plan for the whole region shall be formulated by the autonomous region.

Comprehensive basin master plans for important rivers and lakes determined by the autonomous region and for inter-prefecture/municipality rivers and lakes shall be formulated by the water administrative departments of the autonomous region jointly with relevant departments at the same level and people's governments of relevant prefectures and municipalities and submitted to the people's governments of the autonomous region for approval.

Comprehensive basin master plans and regional (local) comprehensive master plans for other rivers and lakes shall be formulated by the water administrative departments of the autonomous prefectures, municipalities (prefectures) and counties (cities) jointly with relevant departments and relevant local people's governments at the same level and submitted, after justification organized by the water administrative departments at the next higher level, to the people's governments at the same level for approval.



Special plans for flood control, irrigation, water supply, hydropower generation, aquaculture, water resources protection, water saving, soil and water conservation, sand prevention and control and so on shall be formulated by relevant departments of people's governments at or above the county level and submitted, after opinions are solicited from other relevant departments at the same level, to the people's governments at the same level for approval. Such special plans prepared by water administrative departments shall first pass justification organized by water administrative departments at the next higher level before submission for approval.

Regional (local) plans within river basins shall conform with the basin plans, and special plans shall conform with their comprehensive plans.

Water resources master plans approved shall be submitted to the water administrative departments at the next higher level for the record.

**Article 9** Water resources master plans shall be revised in a timely manner and submitted for approval in accordance with the prescribed procedures. Once approved, a plan must be strictly implemented. No unit or individual may breach it.

**Article 10** In preparing water resources master plans and developing and utilizing water resources, the proportion of water for ecological purpose shall be determined in the light of the eco-environmental conditions and the ecological water demand of the basins or the local areas to maintain reasonable flow in rivers, reasonable water table of groundwater and reasonable water level in lakes so as to protect the eco-environment.

In areas where eco-environment is fragile and in basins and areas where there have already been ecological problems of rivers drying up, lakes shrinking, and so on, industrial structures shall be adjusted, non-ecological water use shall be strictly controlled to increase water use for ecological purpose and land reclamation shall be prohibited.

**Article 11** When a water project is constructed on a river or lake, its feasibility study report shall be reviewed with signed comments on whether it conforms with the water resources master plan, before its submission for approval, by the water administrative department of the people's government at or above the county level or the relevant basin management agency in accordance with the limits of administration authority specified by the autonomous region.

Any construction project which is not reviewed or is found not conformable with the water resources master plan in the review may not be approved by the relevant department.

**Article 12** People's governments at or above the county level shall increase investment to strengthen construction of water works for flood control, irrigation, power generation, drinking water supply, ecological use and so on.

In irrigation areas which have already suffered from or are prone to salinization-alkalization and subsurface water-logging, irrigation and drainage methods shall be improved and groundwater table shall be managed to prevent and control soil salinization-alkalization and subsurface water-logging.

**Article 13** the autonomous region encourages units and individuals to invest in construction of water works. The principle that "whoever invests will be benefited" shall be adhered to in the construction and management of water works.



In the development and utilization of water energy, water areas and other water resources, the persons to have the right to the development may be determined by the competent water administrative department of the people's government at or above the county level through bidding, auction, listing, trading and so on, under the condition that the water resources master plan and the flood control master plan are conformed with, and the incomes shall be turned in to the finance bureau.

**Article 14** In water diversion, groundwater mining, water interception (storage), drainage, and construction of other water resources development and utilization projects, due attention shall be given to the interests between the upper and the lower reaches, between the left and the right banks, and of the various parties concerned.

No one party may construct a water resources development and utilization project on a border river between different administrative areas or on a transboundary river unilaterally without consultation and agreement between various parties concerned and submission to and approval of the water administrative department of the people's government at the common next higher level or the relevant basin management agency.

### Chapter III Protection of Water Resources, Water Areas and Water Works

**Article 15** Water administrative departments of people's governments at or above the county level shall draw up a water function zone division system for the rivers and lakes under their jurisdiction jointly with the environmental protection administrative departments and other relevant departments at the same level and submit it to the people's governments at the same level for approval and to the water administrative departments and the environmental protection administrative departments at the next higher level for the record.

The water function zone division system shall specify zones for water source protection, zones for industrial water use, zones for agricultural water use, zones for landscape and tourism water use, zones for ecological water use and so on.

Upon its approval, the water function zone division system shall specify the boundaries of the water function zones with marks established.

Activities of water resources and water areas development and utilization and pollutant discharge into water bodies shall conform to the requirements of the approved water function zone division system.

**Article 16** Water administrative departments of people's governments at or above the county level shall strengthen unified planning for groundwater development and utilization to develop and utilize groundwater rationally and define groundwater overexploitation areas and exploitation prohibition areas jointly with other relevant departments, which shall be publicized upon submission to and approval of the people's governments at the same level.

Relevant local people's governments shall cut down on groundwater mining in areas of groundwater overexploitation to gradually achieve water balance. In areas of groundwater exploitation prohibition, construction of groundwater withdrawal works shall be banned within a prescribed time limit and plans for shutdown and alternative water sources shall be formulated for existing water withdrawal works.

**Article 17** Construction, reconstruction or expansion of a pollutant discharge outlet on a river or lake shall be reviewed and consented by the competent water administrative department or basin management agency. The environmental impact assessment report of the construction project shall be reviewed and approved by the environmental protection administrative department.



Wastewater and polluted water discharged into rivers, lakes and other water areas shall meet the requirements and stipulated discharge standards of the water function zone division system. Competent water administrative departments or basin management agencies shall carry out monitoring and supervision.

**Article 18** In drinking water source protection zones, construction of pollutant discharge outlets or any projects that have nothing to do with water resources protection is prohibited and activities of tourism, sports, entertainment and so on that may affect the quantity and quality of the drinking water are also prohibited. Relevant people's governments at or above the county level shall order the demolition of any existing pollutant discharge outlets or works that do not meet the standards.

Proposals for defining drinking water source protection zones shall be put forward by relevant departments organized by the people's governments at the prefecture, municipal or county (city) level and made public to the society upon submission to and approval of the people's government of the autonomous region.

**Article 19** Discharge of garbage and other solid waste matter and disposables into rivers, lakes, reservoirs and canals is prohibited.

**Article 20** the management and protection boundaries of rivers, lakes and water works shall be determined in accordance with the following provisions:

1) Management boundaries of rivers without dikes are the area within the ridges of the banks in the case of rivers with bank ridges and the area to be covered by water at the designed flood level or the highest flood level in history in the case of rivers without bank ridges;

2) Management boundaries of rivers with dikes are the water area, shoal, beach land (including arable land), flood passage area, dikes and dike protection area between the dikes of the two banks; the width of the dike protection area is the area which extends 20 - 50 meters from the external foot line if the annual runoff is more than 100 million m<sup>3</sup> and 15 - 30 meters if the annual runoff is less than 100 million m<sup>3</sup>;

3) The management and protection boundaries of reservoirs, dams, spillways, hydropower stations, canals, key water control structures and other water works shall be defined in accordance with the specific standards established by the water administrative department and land resources administrative department of the autonomous region.

The management and protection boundaries of rivers, lakes and water works shall be put forward by relevant water administrative departments or basin management agencies and water works management organizations upon their surveys and submitted to people's governments at or above the county level for approval.

**Article 21** Construction of bridges, wharfs, gates, dams, and other buildings or structures that obstruct, cross, border and go through rivers or go through dikes and installation of pipelines, cables and other construction works shall conform with the flood control standards and other relevant requirements stipulated by the state and submitted for the review and consent of competent water administrative departments or basin management agencies in accordance with the relevant provisions of the flood control law before other construction review and approval procedures are gone through.



**Article 22** Tourism development, aquaculture and other business operations by making use of rivers, lakes and other water areas shall be undertaken within areas prescribed by competent water administrative departments or basin management agencies and measures shall be taken to treat the waste water, solid waste matter and disposables and other pollutants to meet the requirements of water function zone division system and water resources protection and prevent pollution of water bodies.

**Article 23** the sand extraction permit system is implemented for sand extraction in rivers.

Water administrative departments or basin management agencies shall formulate plans for sand extraction in rivers in the light of flood passage and dike safety in the rivers and specify extraction zones, extraction prohibition zones, extraction period and extraction prohibition period, which shall be publicized.

For sand and soil extraction, quarrying, panning and other activities within river management boundaries, the master plans shall be conformed with and permits shall be applied for, in accordance with the law, to competent water administrative departments or basin management agencies; it shall be handled jointly with other relevant departments by law if the latter are concerned.

#### Chapter IV Allocation and Economical Use of Water Resources

**Article 24** the development and planning department and water administrative department of the autonomous region are responsible for the macro-level water resources allocation for the whole region. The regional and inter-prefecture/municipality mid and long-term water supply and demand master plans shall be formulated by the water administrative department of the autonomous region jointly with other relevant departments and implemented upon review

and approval of the development and planning department of the autonomous region.

The mid and long-term water supply and demand master plans of the autonomous prefectures, municipalities (prefectures) and counties (cities) shall be formulated by the local water administrative departments jointly with other relevant departments at the same level in accordance with the mid and long-term water supply and demand master plans of the next higher level and in the light of the local actual conditions and implemented upon review and approval of the development and planning departments of the people's governments at the same level.

**Article 25** Runoff regulations and storage and water allocation shall be conducted in accordance with the basin master plans and the mid and long-term water supply and demand master plans and basins shall be used as the units for preparation of water allocation plans.

Ecological water use shall be reasonably allotted by water allocation plans. Existing water allocation plans may be adjusted in accordance with the original approval procedures owing to the need of ecological improvement.

For inter-administrative boundary rivers, water allocation plans and contingency plans for water allotment under drought emergency conditions shall be prepared by the water administrative departments at the common next higher level or the relevant basin management agencies jointly with the relevant local people's governments and submitted to the people's governments at the same level for approval.

**Article 26** Water administrative departments of people's governments at or above the county level or basin management agencies shall formulate their annual water allocation plans and allotment plans in accordance with the approved water allocation plans and the



predicted quantities of annual incoming water and implement unified water distribution, which shall be examined. Water allocation shall be cut down on by two times for those who have used water beyond the plan.

The annual water allocation plans and allotment plans of the basins must be implemented by relevant water use units.

The annual water allocation plans and allotment plans of local areas shall be prepared in accordance with the annual water allocation plans and allotment plans of the basins.

**Article 27** Those who withdraw and use water resources directly from rivers, lakes or underground (including water use for hydropower and thermal power) shall apply for water withdrawal permits to water administrative departments of people's governments at or above the county level or basin management agencies and pay water resources fees in accordance with the law.

**Article 28** Construction units that apply for water withdrawal permits for construction, reconstruction or expansion of construction projects shall submit water resources justification reports at the same time.

**Article 29** Water administrative departments of people's governments at or above the county level shall set their whole society water saving targets for different periods, set up and improve the water saving system, strengthen leadership in water saving work, develop water saving agriculture, industry and services and establish a water saving society.

**Article 30** Water administrative departments of people's governments at or above the county level shall extend water saving irrigation techniques with measures taken suited to local conditions and accelerate reconstruction of existing physical works for water saving. Water

use units and individuals shall actively apply water saving irrigation techniques, adopt water saving cultivation techniques, and actively develop water saving agriculture and ecological agriculture of high efficiency.

Industries and enterprises shall strengthen technological transformation for water saving, weed out backward technology and equipment, cut down on water consumption and increase the rate of water reuse. Water administrative departments shall organize water use units to conduct water balance tests, examine the water use capacity of enterprises and exploit their potential of water saving.

Water saving devices and equipment shall be used for public utilities and civil works in urban areas. People's governments in urban areas shall take measures to implement wastewater reuse and increase the rate of recycled use of wastewater.

**Article 31** Construction, reconstruction or expansion projects that require water withdrawal shall install supplementary water saving equipment to extend new water saving techniques, equipment, technology and products. The water saving equipment shall be designed, constructed and put in use at the same time as the construction projects.

**Article 32** the water administrative department of the autonomous region shall establish water use quotas for sectors jointly with relevant line departments, which shall be publicized by the people's government of the autonomous region upon review, verification and consent of the quality and technical supervision administrative department.

Water use plans of units and individuals shall be checked and determined in accordance with the water use quotas. For above-quota or above-plan water use, progressive block tariff shall be imposed.



**Article 33** Water use units and individuals shall install water measurement devices that conform to the provisions and make sure that they are in normal operation. If there is no measurement device or the device is not in normal operation, the quantity of water use may be calculated in accordance with the maximum designed capacity of the water use equipment.

**Article 34** People's governments at or above the county level shall adopt water pricing policies that are instrumental in saving water resources and protecting the environment.

When agricultural water supply is transferred to municipal and industrial water supply, the water price shall include additional money for agricultural water saving compensation, which shall be earmarked for agricultural water saving. The specific rules shall be laid down by the finance, pricing and water administrative departments of the autonomous region.

For agricultural water supply, water distribution to households, measurement at households and volumetric charging shall be implemented.

**Article 35** for water supplied by water works, water charges shall be paid to the supplier. In the case of refusal to pay water charges or water charge arrears without reason, the supplier may stop water supply.

Water charges collected by the supplier shall be publicized on a regular basis. No organization, unit or individual may introduce any other charges on top of the water price.

Water charges shall be used mainly for maintenance, operation and management of water works in accordance with the relevant provisions of the state and the autonomous region and may not be appropriated for any other purposes.

## Chapter V Legal Liabilities

**Article 36** For water administrative departments or other relevant departments and water works management units and their staff, in any of the following circumstances, administrative penalties shall be imposed on the executive who is directly responsible and other responsible person/persons; if the offence constitutes a crime in a serious case, criminal responsibility shall be investigated and dealt with in accordance with the law:

- 1) A permit is issued to, review, comments and consent are signed for or approval is given to a unit or individual that does not meet the statutory requirements;
- 2) Water resources fees and other charges are collected not in accordance with the rules;
- 3) Land reclamation is approved in land reclamation prohibition areas in violation of the rules;
- 4) Water is allocated not in accordance with the water allocation plan or water is supplied for land reclamation in violation of regulations;
- 5) Supervision responsibilities are not exercised or illegal act found is not investigated and dealt with;
- 6) Other acts of power abuse and malpractice for selfish purposes.

**Article 37** In the case of discharge of wastewater or polluted water in violation of the provisions of Article 17 of these measures, the water administrative department of people's government at or above the county level or basin management agency shall order the stop of the illegal act. If no correction is made within the prescribed time limit, the order to demolish the discharge outlet within a prescribed time limit shall be given upon submission to and approval of the people's government at the same level. If it is not demolished within the prescribed time limit, demolition shall be forced. The cost of demolition shall be borne by the responsible person who violates the law.



In the case of environmental pollution resulting from wastewater or polluted water discharge, the water administrative department or basin management agency shall suggest and request that the environmental protection administrative department of the local people's government at or above the county level mete out penalties in accordance with the law.

**Article 38** In the case of dumping garbage into a river, lake, reservoir, or canal in violation of the provisions of Article 19 of these measures, the water administrative department or basin management agency shall stop it and order the offender to clean it up. If the circumstance is serious and obstructs flood passage, a fine between 10 thousand yuan and 50 thousand yuan may be levied. In the case of pollution of a water body, it shall be suggested and requested that the environmental protection administrative department deal with it in accordance with the law.

**Article 39** In the case of tourism development, aquiculture and other business operations beyond the specified water areas in violation of the provisions of Article 22 of these measures, the water administrative department of people's government at or above the county level or basin management agency shall, in accordance with their authority, order the offender to rectify it within a specified time limit. In the case of no rectification within the prescribed time limit, a fine of less than 20 thousand yuan may be imposed. In the case of pollution of a water body, the environmental protection administrative department of the local people's government at or above the county level shall handle it in accordance with the law.

**Article 40** In the case of unauthorized water withdrawal by making a breach on a river or lake and installing a pump or constructing a temporary structure without permission in violation of the provisions of Article 27 of these

measures, the water administrative department of people's government at or above the county level or basin management agency shall, in accordance with their authority, order the offender to stop the illegal act and take remedial measures, and a fine of less than 20 thousand yuan may be imposed.

**Article 41** any other act that deserves administrative penalty in violation of the provisions of these measures shall be punished in accordance with the provisions of the Water Law and other relevant laws and regulations.

## Chapter VI Supplementary Provisions

**Article 42** these measures shall come into effect as of March 1, 2004.

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## Annex 5 - Circular of Turpan Prefecture for Groundwater Management

TuDiXingBan [2009]

*People's governments of all the counties (city) and units directly under the prefecture, "Implementation Measures of Turpan Prefecture for Groundwater Resources Management" have been approved by the Prefectural Administrative Office and is herein issued to you for careful implementation.*

*December 29, 2009*

### **Implementation Measures of Turpan Prefecture For Groundwater Resources Management**

Water resources are extremely scarce in Turpan Prefecture, which belongs to an area deficient in water resources. With acceleration of new industrialization and urbanization process in the prefecture and continuous increase of population, discrepancy between water resources supply and demand has been more and more serious, becoming a bottleneck that restricts the economic and social development of the prefecture. In order to speed up water saving society development, effectively strengthen groundwater resources management, rationally develop, utilize and protect groundwater resources and institutionalize and standardize the disordered groundwater exploitation in Turpan, it is urgent that the strictest water resources management rules and regulations be implemented to ensure sustainable development of the economy and society. In accordance with "Water Law of the People's Republic of China", State Council Decree No. 460, "Regulations for Water Withdrawal Permission and Water Resources Fee Collection Management", "Regulations of Xinjiang Uygur Autonomous Region for Groundwater Resources Management", "Measures of Xinjiang Uygur Autonomous Region for Water Resources Fee Collection Management" and other laws and regulations, these measures are formulated in the light of the actual conditions of Turpan Prefecture.



## I. Objectives

Through joint efforts throughout the entire prefecture, multiple effective measures shall be taken to accelerate extension of water saving techniques, improve comprehensive utilization of water resources, vigorously carry out water saving oriented cropping pattern adjustment to give preference to high water productive sectors, with active support for water saving industry development, in our best endeavor to optimize water allocation among various sectors within 10 years, reduce agricultural water use by 20%, cut down groundwater exploitation by 260 million m<sup>3</sup> so as to achieve groundwater exploitation and recharge balance, ensure that the irrigation area is controlled within one million mu, significantly improve water environment in Turpan Prefecture and facilitate the sustainable growth of its economy.

## II. Principles

- 1) Unified management of surface water and groundwater shall be further strengthened, management of groundwater exploitation by various sectors through unified planning shall be intensified, water quota based electricity allocation and groundwater exploitation controlled by electricity allocation and other measures shall be implemented so as to really achieve total amount control and quota management.
- 2) Cropping pattern adjustment shall intensify. The Principle of “maximizing benefits from farmland” and requirements of “good quality, high efficiency, safety and low consumption” shall be adhered to so as to speed up strategic adjustment of agricultural and rural economic structures. Greenhouses shall be vigorously developed to raise water efficiency in agriculture and significantly increase farmers’ incomes.

- 3) Adjustment of water use structures shall be intensified to give strong preference to the secondary and tertiary industries. Water saving industry shall be vigorously developed, the technology shall be improved, water recycles and waste water treatment and other measures shall be adopted to raise water reuse and reduce unit water consumption. High energy and water consumption and high polluting enterprises shall be prohibited from entering Turpan Prefecture. The development of existing high water consumption and high polluting enterprises shall restrict and development of low consumption, low pollution, and high output value and high productivity industrial projects shall be stuck to. New, extended and reconstructed projects must adopt advanced water saving equipment and water saving technology. Water resources justification for construction projects shall be strengthened and management of water withdrawal permits shall be standardized. Development of water saving areas, water saving units and water saving households shall be accelerated.
- 4) The number of pump wells shall be gradually cut down and groundwater exploitation be reduced through high and new technology water saving and structural adjustment in agriculture.

## III. Measures

In 2006 Shanshan County and Turpan City were identified by the Region and the Prefecture as serious groundwater over exploitation area and groundwater overexploitation area respectively. The groundwater situation in Tuokexun County will not be optimistic either. In accordance with Article 16 of “Regulations of Xinjiang Uygur Autonomous Region for Groundwater Resources Management”, “in areas where groundwater exploitation is restricted, the water



administration departments of the people's governments at and above the county level shall formulate and issue annual plans for exploitation to rationally allocate surface and ground water. Total amount of water withdrawal shall be strictly controlled and groundwater exploitation may not be increased without approval so that water exploitation and recharge balance will be achieved", Article 17 provides that "in areas where groundwater is overexploited, the water administration departments of the people's governments at and above the county level shall jointly with other relevant departments set the targets for groundwater exploitation adjustment and reduction; annual plans for exploitation and recommendations for distribution of wells and adjustment of abstraction aquifers shall be formulated and submitted to the people's governments at the same level for approval and implementation thereafter" and relevant provisions of other document, measures are formulated as follows for the purposes of scientific and rational development of groundwater and sustainable development of both social and ecological environments in the prefecture.

### *1 General provision for management of groundwater exploitation*

- 1) In accordance with Article 35 of the Water Law of the People's Republic of China "In the case that an agricultural irrigation water source or irrigation or drainage works is occupied, or irrigation water or water supply source is adversely affected as a result of project construction, the construction unit shall take corresponding remedial measures and shall compensate for any loss it may incur in accordance with the law", "groundwater resources compensation fee" shall be imposed on groundwater resources exploiters except the holders of 30 year contractual responsibility farmland.
- 2) All water users who exploit groundwater must submit annual water use plans to water administration departments and total amount control and quota management shall be implemented. Specifically water quota based electricity supply and electricity controlled groundwater abstraction shall be adopted, i.e. the water quota is converted into electricity quantity, which serves to control groundwater abstraction so as to achieve ordered management of groundwater.
- 3) All water users that exploit groundwater must install water and electricity measurement devices, which shall be taken charge of by electricity departments and paid for by the water users.
- 4) The counties (city) shall establish groundwater management bureaus (stations) as deputy section chief level institutions, which are funded in full by the finance bureaus. Their staff quotas shall be determined by the counties (city) and the staff members are transferred from among the existing staff. If there are not enough people, they can be recruited through open advertisement. Their main responsibilities are (1) to formulate groundwater control targets in accordance with the irrigation area and surface water and groundwater conditions of the counties (city), check and ratify the total water use amount and the irrigation quotas of the water users, disseminate the relevant policies to the households, and assign water quantity indicators and electricity quantity indicators to the households; (2) to be responsible for annual review of water withdrawal permits of all groundwater users; (3) to supervise groundwater users' installation of water measurement devices, check on the normal operation of the devices, and contact relevant companies to replace or repair the device when there is a technical failure or natural



- damage; (4) to keep on file information about all groundwater users and be responsible for management and alteration of the files and other related matters; (5) to be responsible for providing to electricity departments the electricity quantities converted from groundwater abstraction and assign electricity use quotas to control electricity use of groundwater users so that the objectives of total amount control and quota management will be achieved; (6) to be responsible for long-term collaboration and communication with electricity departments, coordinate various matters among departments to avoid uncontrolled and disordered management due to unsmooth communication among departments; (7) to cooperate with water administrative law enforcement departments in addressing events in violation of laws and regulations and these implementation measures and resolving disputes; and (8) to assume responsibility for disseminating these implementation measures and providing other services.
- 5) Electricity departments must cooperate closely with groundwater management departments in their work: (1) they may not supply electricity to any organization, group or individual that has not obtained the groundwater abstraction permit or in the case of a permit that has not passed the annual review; (2) they may not supply electricity to any groundwater abstractor that has altered the water quantity without approval of the groundwater management bureau (station); (3) they may not supply electricity to any groundwater abstractor that withdraws water below standard or beyond the quota without approval of the groundwater management bureau (station); (4) they may not supply electricity to any groundwater abstractor that has not installed water measurement devices; (5) they may not supply electricity to any groundwater abstractor that intentionally damaged water measurement devices; (6) they shall cooperate with water administrative law enforcement departments when various events in violation of laws and regulations take place and provide support in dealing with those events; (7) they shall maintain normal order of electricity supply and conduct maintenance and repair of the devices and equipment under their charge; and (8) they shall cooperate in disseminating these implementation measures.
  - 6) Water resource fee and groundwater resource compensation fee shall be collected by water departments; and agriculture-related groundwater resource compensation fee shall be collected by electricity departments on behalf.

## *2 Management of groundwater exploitation for agriculture*

- 1) For all agricultural production activities throughout the prefecture water shall be abstracted in accordance with quotas and specified quantities. The guidance irrigation quotas established for water saving irrigation in Official Document TuDiXingBan [2007] No.10 shall be the ceiling of the quotas for agricultural production for the whole prefecture. Specific quotas shall be determined by the counties (city) in the light of their actual conditions and local crops; but they may not exceed the quotas set in Official Document TuDiXingBan [2007] No.10.
- 2) Holders of 30 year contractual responsibility farmlands are exempted from paying groundwater resource fees and groundwater resource compensation fees if they abstract groundwater below the quotas.
- 3) With the exception of the holders of 30 year contractual responsibility farmlands, all those (including various line agencies, enterprises and land reclamation collectives) that irrigate farmland for production and abstract



groundwater below the quotas shall pay groundwater resource compensation fees; in the event of groundwater abstraction above the quotas progressive block tariff shall be levied, where three times the groundwater resource compensation fees shall be imposed for the extra quantities if the above-quota abstraction is less than 20% and five times the groundwater resource compensation fees shall be imposed for the extra quantities if the above-quota abstraction is more than 20%, in which cases water resource fees shall be collected at the same time.

- 4) Holders of 30 year contractual responsibility farmlands who are engaged in agriculture by means of greenhouses are exempted from paying groundwater resource compensation fees for their groundwater abstraction.
- 5) For all those (including various line agencies, enterprises and land reclamation collectives) that build greenhouses on cultivated lands for agriculture, with the exception of the holders of 30 year contractual responsibility farmlands, irrigation quotas shall be checked and determined in accordance with the actual irrigated areas inside the greenhouses; they are exempted from paying groundwater resource compensation fees if groundwater is abstracted below the quotas; in the case of above-quota groundwater abstraction which is less than 20%, three times the groundwater resource compensation fees shall be imposed for the extra quantities and five times the groundwater resource compensation fees shall be imposed for the extra quantities if the above-quota abstraction is more than 20%, in which cases water resource fees shall be collected at the same time.
- 6) With the exception of the 30 year contractual responsibility farmlands, the lands farmed by various line agencies shall be cleared out strictly in accordance with the relevant regional provisions and be reserved, in

principle, for municipal use and greenhouse construction. Those lands that cannot be abandoned or returned shall be treated in the same way as non-30 year contractual responsibility farmlands

- 7) Priority shall be given to surface water use in areas of mixed surface and ground water irrigation; water shortage shall be met by groundwater as a supplementary supply. In the case of above quota groundwater abstraction, water resource compensation fees and water resource fees shall be imposed in accordance with the rates corresponding to the nature of the farmlands.

### *3 Management of groundwater exploitation for industries*

- 1) Quotas for industrial groundwater exploitation are determined in accordance with the sectors to which the industries or enterprises belong. If there are already quotas which have been set for certain sectors by the regional government those quotas shall be followed; otherwise sectoral water use quotas set by the relevant line departments under the State Council shall be referred to or they can be determined in accordance with the water balance test results.
- 2) All industrial water users must have their water withdrawal permits annually reviewed and submit every year their water abstraction plans, which will be reviewed and ratified by the groundwater management bureaus (stations), with their water abstraction quotas determined, for implementation of total amount control and quota management.
- 3) Existing industries and enterprises with self-provided wells must pay groundwater resource compensation fees at the same time as they pay groundwater resource fees. In the event of groundwater abstraction above the quotas progressive block tariff shall



be levied. Three times the groundwater resource compensation fees shall be imposed for the extra quantities if the above-quota abstraction is less than 20% and five times the groundwater resource compensation fees shall be imposed for the extra quantities if the above-quota abstraction is more than 20%.

- 4) Industries and enterprises to be newly set up must go through water resources justification and be reviewed and approved by water administration departments before implementation. County and city water departments shall first of all consider establishing concentrated water supply schemes. In the case that a concentrated water supply scheme is not possible they can consider and review and approve construction of self-provided wells. After established the industries and enterprises must pay groundwater resource compensation fees at the same time as they pay groundwater resource fees. In the event of groundwater abstraction above the quotas progressive block tariff shall be levied. Three times the groundwater resource compensation fees shall be imposed for the extra quantities if the above-quota abstraction is less than 20% and five times the groundwater resource compensation fees shall be imposed for the extra quantities if the above-quota abstraction is more than 20%.
- 5) In industry and enterprise sites if groundwater is needed for domestic and tree-planting purposes and so on, water use quotas shall be allocated for abstraction in accordance with the provisions in Official Document TuDiXingBan [2007] No.10.

#### 4. For other sectors

- 1) In the case of groundwater abstraction for domestic purposes in urban areas, water abstraction plans must be submitted annually and the management shall be conducted in a

classified manner in accordance with existing laws, regulations and management measures.

- 2) Self-provided wells located in planned urban areas shall be closed down in batches in accordance with "Circular Concerning the Transmission of Recommendations of the Prefecture Water Bureau for Closing down Self-Provided Wells in Planned Urban Areas of Turpan Prefecture" (TuDiXingBan [2005] No.130). Those that are not closed down shall be treated in the same way as for established industries and enterprises and water resource compensation fees and water resource fees shall be levied.
- 3) Kariz systems shall be managed in a classified manner. Those that are owned by collectives and farmers in rural areas shall remain to be managed in the original way; for those that are not collectively owned and those that are not used for irrigation of basic farmlands, their current conditions shall be maintained and they are prohibited from extending and increasing withdrawal, in which case water resource fees shall be imposed in the same way as groundwater abstraction in accordance with rates specified in Official Document TuDiXingBan [2007] No.10. For Karizes that are used for profit making, water resource fees shall be imposed at the rate equal to 0.5% of the business turnover.
- 4) Spring water shall remain to be managed in the same manner as the original water department measures.
- 5) When the electricity quantity within the groundwater abstraction quotas runs out, the quantity for above-quota progressive block tariff may not be bought indefinitely. The maximum limit is 50% of the electricity quantity for the original quota which may not be exceeded.



- 6) Alteration to water use quotas which is really necessary due to major adjustment of cropping pattern, enterprise production scale, and so on must be approved upon verification through investigation by the original approval department.
- 7) Change of water use method must be reviewed and approved by water administration departments before water withdrawal. Fees shall be collected in accordance to the rate corresponding to that after the method is changed.
- offender shall also bear the costs of work stoppage, device, repair, installation, travel, communication, and other various expenses:
- fail to install groundwater abstraction measurement devices which are supposed to be installed or fail to install them within the specified time limit;
  - the groundwater abstraction measurement device does not work properly and the user does not inform the relevant department of it in a timely manner;
  - the groundwater abstraction measurement device is tested and found by the quality supervision department to work improperly or inaccurately and the user does not inform the relevant department of it in good time within the specified time limit;
  - the groundwater abstraction measurement device is changed without consent of the relevant department;

#### **IV. Measures for accountability, supervision and management**

- 1) In the case of intentional dismantle and damage of water measurement devices or modification to and resetting of water measurement devices without authorization, which affects the normal operation and accuracy of the devices, a fine between 10,000 yuan and 100,000 yuan shall be imposed in the light of the seriousness of the case in accordance with the relevant provisions of the Water Law of the People's Republic of China and Regulations of the People's Republic of China for Electric Power Supply and Use and the offender shall be ordered to install measurement devices of accepted quality. Intentional destruction or theft of a measurement device shall be dealt with in accordance with the law by the public security organ.
- 2) Under any of the following circumstances, the water administration department at and above the county level shall determine the water abstraction and electricity use quantities in accordance with the maximum abstraction capacity and the earliest and longest continuous time and accordingly collect groundwater resource fee, groundwater resource compensation fee and progressive block tariff for the above-quota quantity. The
  - 3) Anyone who sets up bypass pipe or cable to abstract water or use electricity by avoiding the water meter or electricity meter or steals water in any other way in addition to paying the various costs as per the previous provision shall be fined between 20,000 yuan and 100,000 yuan for illegal arbitrary water abstraction in accordance with the Water Law of the People's Republic of China.
  - 4) Disciplinary inspection, electric power, water departments and other supervision departments at various levels shall jointly supervise the implementation of these measures.
  - 5) Electric power, water administration and other departments shall cooperate with each other to ensure the implementation of these measures.
  - 6) All pump well users for groundwater exploitation for industrial and agricultural production throughout the prefecture must



strictly abide by these implementation measures. Water administration supervision departments shall make selective inspections on a irregular basis. If any falsification is found it shall be seriously dealt with in accordance with the relevant laws and regulations. In the event of a serious case, the water withdrawal permit shall be revoked.

- 7) Any staff member who operates in collusion with user/users in violation of regulations during implementation of these measures, once discovered, shall be seriously dealt with. In the event of a serious case, the staff concerned shall be dismissed or punished by transferring him/her to the judicial authorities.
- 8) Water resource fees paid by all the groundwater users throughout the prefecture shall be collected and managed in accordance with the relevant provisions in “Circular Concerning the Issuance of Measures of the Turpan Prefecture for Groundwater Resource Fee Collection and Management” (TuDiXingBan [2007] No.10)”
- 9) The groundwater resource fees collected (including those collected by the electricity departments on behalf) under these measures shall be submitted in full on a monthly basis to the finance bureaus at the same level, which shall arrange for the funds to be used mainly for water saving projects and preparations for other water projects. The money may not be appropriated for any other purpose.
- 10) Audit offices at various levels shall conduct annual audit of the groundwater resource compensation fees collected by the electricity departments on behalf.

**V. The rates of groundwater resource compensation fees shall be set by the counties (city) in the light of their respective actualities.**

**VI. These measures apply to all groundwater exploiters and users in industry, agriculture and any other sectors throughout the prefecture**

**VII. The counties (city) may formulate detailed rules for implementation of these measures in the light of their actual conditions**

**VIII. These measures shall come into effect as of the date of their promulgation**

**IX. The prefecture water bureau is responsible for interpretation of these measures**

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**Key words: water, water saving, measures, circular**

Cc: Office of Prefecture Party Committee, Office of Work Committee of the People’s Congress and Office of Work Committee of the People’s Political Consultative Conference.

Turpan Prefecture Administrative Office issued on December 29, 2009

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*Note: These measures appear complete and implementable. However, the measures do not refer to “water allocation based on calculated consumptive use or ET (even though 02WL uses the terms “consumptive use” and “beneficial use”). Important is the capability of the implementing agencies at local level, their enthusiastic support of developing a partnership relationship with the water users (suppliers and users), and emphasis on the importance of adequate, timely and accessible data and information – to all stakeholders to insure transparency and accountability.*





## Annex 6 - Shanshan County Pilot of ET-based WRAS

1. Shanshan County is located in the east part of Turpan Prefecture, Xinjiang and covers an area of 35,000 km<sup>2</sup>. Under it there are five towns, four townships, one ethnic minority township and one horticulture farm, comprising 68 administrative villages and 348 natural villages. The county is a low-lying area surrounded by mountains. With annual average precipitation of approximately 16 mm, its evaporation exceeds 3,600 mm, a typical region of water resources scarcity. Within the boundaries of the prefecture, there are mainly three rivers (Kekeya River, Kan'erqi River and Ertanggou River); the surface water resources available amount to about 129 million m<sup>3</sup>, with some 194 million m<sup>3</sup> of groundwater resources exploitable.

2. In 2008, Shanshan County had a population of 220 thousand, 68% of which were farmers and 71.4% belonged to ethnic minority groups (mainly Uygur). Around two thirds of the people are engaged in irrigated agriculture. The irrigation is by surface water and pump wells plus Kariz systems. The total water use of the county in 2008 reached 550 million m<sup>3</sup>, 96% of which was for agriculture and groundwater was overexploited by 230 million m<sup>3</sup>.

3. According to the data of the second detailed land survey, there is altogether an area of 656 thousand mu irrigated land, including 304 thousand mu basic farmland (i.e. contracted 30 year responsibility land), 146 thousand mu land (with land development certificates and land use certificates, roughly half of which are for organizations and the other half for individuals) permitted and registered for development in accordance with relevant policies and provisions (policy for western development and various other policies for promoting economic development and so on), 79 thousand mu



windbreak and sand control woodland land and 127 thousand mu land reclaimed without permission. During the twelve years from 1986 to 1998 the irrigated area increased by 80 thousand mu and from 1998 to 2004 the area expanded by 230 thousand mu. In 2005, Shanshan County began banning land reclamation and well drilling for irrigation.

4. Currently, grapes are the main crop in agricultural production of Shanshan County. In 2007 wheat completely dropped out, and in 2009 the area of grape growing reached 167 thousand mu. Under the exothermic natural conditions in Shanshan, grapes and other main crops consume a lot of water so that the irrigation quota is high, ranging from 800 to 1,600 m<sup>3</sup>/mu depending on the soil texture. The quota is 800 m<sup>3</sup>/mu under water saving irrigation. This demands substantial amount of water and undoubtedly exacerbates the strain on water resources in Shanshan County.

5. Qiketai Town is located 31.5 km east of the county seat of Shanshan County and covers a total area of 3,792 km<sup>2</sup>. There are 8 administrative villages, one livestock brigade and 33 natural villages under the town. Six of the administrative villages belong to Kan'erqi Basin and the other two belong to Kekeya Basin. Its total population is 14,000, comprising mainly Uygur (46%), Han (42%) and Hui (12%) ethnic groups. With a total area of 28,700 mu farmland, Qiketai produces cotton, grape and Hami melon (sort of honeydew melon - translator). Of these cotton (long fiber cotton) is the major crop, with a long history, and Qiketai Town is an important cotton production base of Turpan.

6. In this town, there are altogether 151 pump wells, 22 working Kariz systems, and 90 vegetable greenhouses. A total of 4,300 mu farmland has been returned (given up) over the past two years. Qiketai is very rich in mineral deposits including a number of nonferrous

metals, such as gold, copper, iron, coal, crystal, mirabilite as well as significant amounts of petroleum and natural gas which makes it one of the main oil and natural gas fields of Tuha Oil Company.

7. In 2008, the total water use in Shanshan County was 550 million m<sup>3</sup>, of which agriculture used 530 million m<sup>3</sup>, accounting for 96% of the total water withdrawn and used. Groundwater was overexploited by approximately 230 million m<sup>3</sup>. Mandating that groundwater is not to be overexploited, the total water use for agriculture could be 300 million m<sup>3</sup> at most. The county has an irrigated area of 656 thousand mu, including 383 thousand mu of basic farmland and windbreak and sand control woodland, which accounts for 58% of the total. Without considering the unevenness of water use, the water use would have come to about 310 million m<sup>3</sup>, which approximates the amount of water usable for agriculture in 2008. Therefore, it could be estimated that after some water is reserved and some water saving measures are taken, it is possible to effectively reduce and control groundwater overdraft by allocating water rights in Shanshan County above the firm guarantee of water uses for the basic farmlands and ecological and environmental woodland.

8. This is a simple, straight-forward linear calculation, but it does not take into account the reality of return flow impacts and assumes the return to some past groundwater table level without calculating a "safe yield" (or sustainable yield as preferred by some water experts) groundwater table level of the apparently unconfined or phreatic aquifer. This determined level should reflect the amount of groundwater that can be withdrawn taking into account recharge and eco-environmental needs which groundwater management concept for withdrawals is similar to the "minimum flow" levels of surface water rivers and lakes to protect existing downstream users, public interests in non-allocated or water permitted/licensed



uses (such as fishing, boating, recreating, etc.) and the eco-aquatic environment. The setting aside of water from allocation to be “reserved” or dedicated to public interests is not a “water right” in China; it is a water quantity withdrawn from allocation (set out in prefecture water master plan and allocation plan) to maintain minimum flows and groundwater tables, above the recharge from withdrawal and irrigated agriculture losses (return flows). To be successful the ET or consumptive use degree of accuracy applied to ET measurements has to likewise be applied to other features of the water use system; a fine measurement here and a rough estimate there will not gain acceptance, credibility or sustainability.

9. The right to use water for irrigated agriculture is based on the ET calculated needs for that locale and use, and the ET target for that same area is the indicator applied for accounting and refinement of delivered water.

10. Consideration should also be given to a certain amount of supplementary water and special demand of specific crops in the process of setting the ET for withdrawal and use under the water right. It may take several years to improve the diversion and delivery systems to a more highly efficient level that would reduce conveyance losses to reasonable limits even though such losses normally result in return flows to surface and ground water systems, but increase the water resources fees paid and may create expectations in water users of greater amounts of water available but not deliverable. And under some conditions, irrigation farmers need more water than allocated due to soil conditions, crops grown and climate and weather conditions. In order to allow sufficient time for them to adjust their irrigation schedules and practice, some temporary supplementary water

should be supplied. For example, in the first few years of ET-based water right management water users may find it difficult to change their way of water use, which will result in more on-farm ET than the permitted or targeted ET. To guarantee the users’ rights and interests of these special demands, additional water might be allowed in the water withdrawal right allocation.<sup>1</sup>

11. Although the pilot location for trying out the proposed water rights administration system based on the ET approach is suggested to focus on Qiketai Town, Shanshan County, it is recommended that a plan and procedures for water right allocations be formulated for the entire county:

- First, in the light of the economic and social development needs of Shanshan, the total ET and ET quota of the county (total ET = ET quota × area) needs to be worked out through consultation with the stakeholders, based on the baseline survey of the whole area, and be submitted to Turpan Water Bureau for approval
- Second, in accordance with the county’s total ET and ET quota/target and current water use of different sectors and future water demand and environmental and ecological water demand needs to be approved by Turpan Prefecture Water Bureau.
- Third, based on the water use quota publicized by Xinjiang Uygur Autonomous Region, Shanshan County will work out its own water use quota, which will be submitted to the prefecture water administrative department and the administrative department for approval and quality supervision and inspection, which after prefecture consent would be publicized by Shanshan County Government.

<sup>1</sup> Special demand means the extra amount of water needed by crops in their growing period in addition to the basic amount allocated and the allowed water conveyance loss, such as more water needed for protection of grape from frost, potato rinsing, high-yield forage, and so on.



- Fourth, in accordance with the total ET for agriculture, water withdrawal, farmland conditions, agricultural irrigation quota and so on of Shanshan County, and the irrigation area control target identified, objectives for cropping pattern optimization of all the towns and townships and WUAs, a plan for pump well closing down and groundwater abstraction reduction will be developed.
- Fifth, under the leadership of Turpan Prefecture Water Bureau, Shanshan County Water Bureau will specifically allocate the total agricultural ET to the water withdrawal units of Qiketai Town based on the area of farmland to be served, soil conditions and normal cropping patterns, so that the volumes of water for use can be allotted to the individual water users or WUAs. This water withdrawal and use plan for Shanshan County will be prepared and submitted to Turpan Prefecture Water Bureau for approval.

12. The next major task upon receiving the approved county water withdrawal and use plan from the prefecture water bureau, is for the prefecture water bureau to issue water withdrawal permits and water right certificates in accordance with the provisions of Chapter 3 above, specifically identifying the target ET and conditions and limitations on water withdrawal and use. Copies of these documents will be provided the county water bureau for their records and distribution to the appropriate water diverts and water user groups. The prefecture water bureau will enter the approved documents into the water rights registry of the county and provide internet access to this registry. The county water bureau would add records of water use and fee payments or add columns to the registry for this additional seasonal and/or annual data and information. The county would maintain a record and files on the annual water withdrawal and water use reports, and submit an annual or as requested report to the prefecture water bureau, indicating compliance or non-ability to comply with the ET quotas/targets, reasons and recommendations.

13. Once the water withdrawal permits and water rights certificates have been issued or renewed with stated conditions and limitations, the next task is for the water suppliers and water users to prepare and sign Water Supply and Fee Payment Contracts.

14. Priority will be given to ensuring water use for needs of basic farmland, windbreaks and sand control woodlands. The agreements will provide the total ET, ET quota and target for that user (WUA), total water supply, mode of water supply, water supply probability, uses of the water supplied, irrigation quota, cropping pattern, relevant rights and obligations of the supplier and water users, etc. Of these, quantity of water supplied, ET quota, total ET, water supply probability, irrigation quota, cropping pattern and so on will be based on the type and area of the land that the user holds and be determined in accordance with the water right allocation plan.

15. The county water bureau will instruct water suppliers to divert and supply water to water users in their command area according to the water rights certificates and water supply and fee payment contracts, and jointly monitor the cropping pattern, generated ET and so on during the period of water supply.

16. After several seasons or years of piloting the proposed ET-based water rights administration system, an assessment will be made to determine necessary refinements and additions to insure the proper functioning and sustainability of the system. Unified distribution and conjunctive use of surface water and groundwater are prerequisites and the basis of reasonable water resources allocation. As Shanshan County belongs to an area of serious groundwater overdraft, the principle of surface water first and groundwater second must be adhered to in water withdrawal and use; and in some instances, water users may be requested to make conjunctive use of surface and ground water. Withdrawal of surface water may vary from



year to year according to climatic conditions and run-off, which may require water withdrawals to be adjusted and where additional water need, to authorize withdrawals from groundwater, if water is available. Groundwater withdrawal rights may need to be adjusted according to the change in the surface water withdrawal right and conditions of the groundwater or phreatic table and sustainability of aquifer yield.

17. If water users change their cropping pattern, the quantity of water withdrawn and supplied corresponding to the ET quota may also have to be changed. When the cropping pattern is adjusted withdrawals from groundwater may be adjusted, with surface water being used as much as possible to ensure that ET generation will be controlled within the target limits. This may in turn require the water supplier to adjust the quantity of water supplied to the users.

18. If the water withdrawal or water use rights are transferred, upon approval of the transfer the county and water withdrawer will need to adjust the water rights accordingly.

19. However, during the first part of the WB XTWCP or later at a time when the ET-based approach has been verified to be successful and sustainable, a water market mechanism may be created. But at this time, any water and water rights transfers by sale, trading or land use retirement must be approved by the prefecture water bureau and insure that ET conditions will improve or at least remain the same.

20. Care should be taken to increase the water users' motivation for water saving improvements in the adjustment of the water ET allocations and targets. The task of cropping pattern adjustment should be set with an eye to achieving the agricultural water saving objective and then be assigned to various land holders with the schedule and details for task fulfillment. Water will be allocated in line with scheduled cropping patterns and irrigation and ET quotas.

21. Under the leadership of Shanshan County Water Bureau, a plan water right, withdrawal and use adjustment under emergency conditions needs to be prepared to be put immediately into place if the situation arises and with full knowledge and understanding of the parties involved. The plan must explicitly specify the following:

- Clearly define what are an emergency condition and the basis for assessing it. For example, under what drought conditions or public administration emergency conditions should these measures be implemented?
- Clearly define how to adjust the water right, withdrawal and/water use for water needs allocated in an emergency. There are many ways to make the adjustments. For example, proportional reductions, temporary administrative controls, reducing the categories/types of water use, prioritizing water uses, and so on. Once determined, publicity, transparency and consistency of water rights adjustments and/or reallocation measures must be carried out and accounted for.







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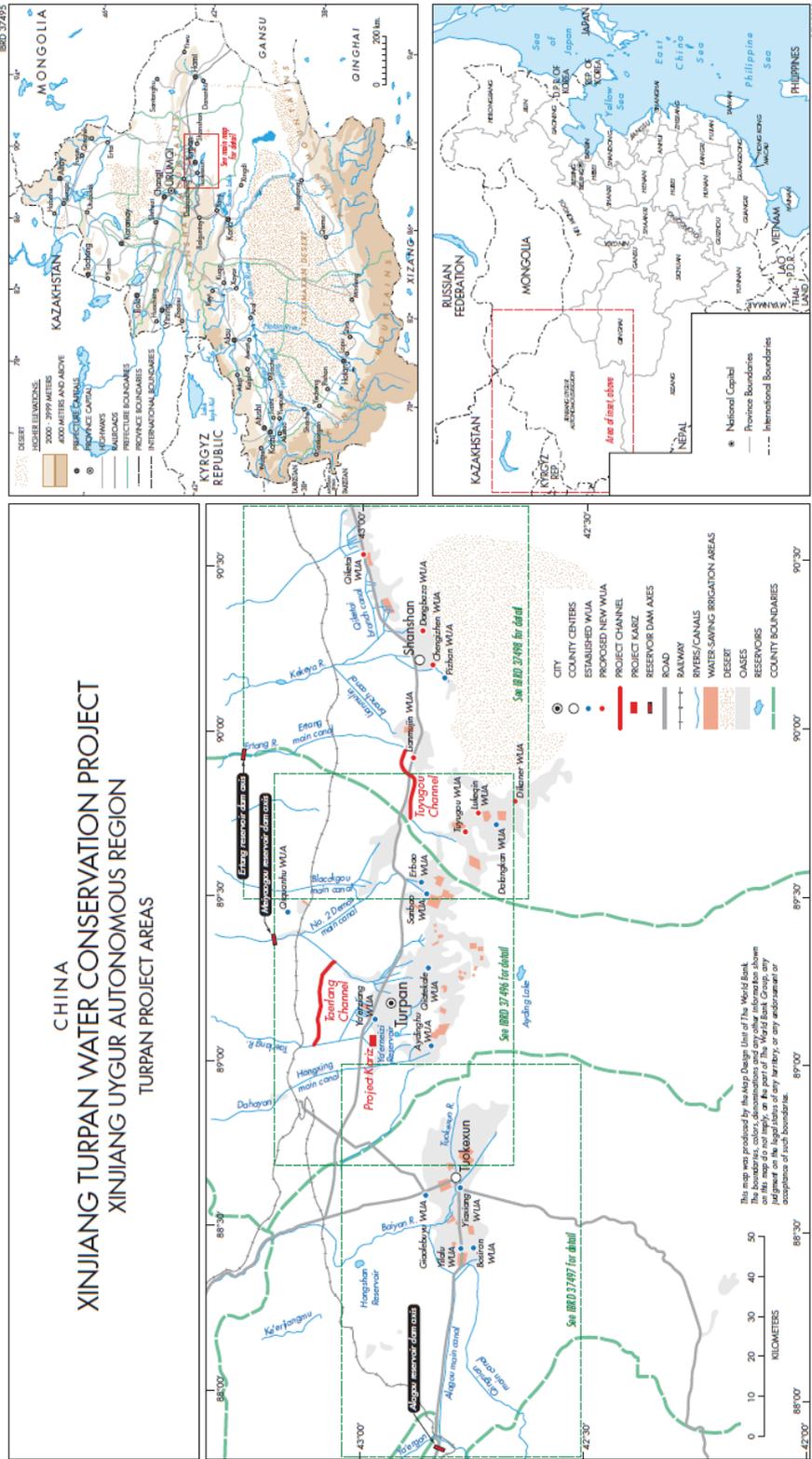
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# Map - Location of the Study





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