RECONCILING TRADITIONAL IRRIGATION MANAGEMENT WITH DEVELOPMENT OF MODERN IRRIGATION SYSTEMS: THE CHALLENGE FOR AFGHANISTAN

Thomas Panella[1]

ABSTRACT

This paper provides the following: (i) a background of water resources and irrigation in Afghanistan; (ii) an overview of the current status of irrigation in Afghanistan; and (iii) a set of issues that need to be addressed for sustainable outcomes in irrigation and water resources management and development in Afghanistan. In presenting the brief overview of the current state of irrigation, the paper identifies important factors affecting the future of irrigation management and development. An important challenge for Afghanistan is to maintain the strong tradition of community-based participation in irrigation while at the same time to respond to the massive need for system rehabilitation and new development of irrigation throughout Afghanistan.

OVERVIEW OF WATER RESOURCES IN AFGHANISTAN

Afghanistan is about 675,000 km^2 and landlocked. Over 75% of the terrain has mountainous features and 27% of Afghanistan lies at an elevation above 2,500 meters. Land resources are classified as the following: 3% forest; 12% arable land, 39% mountainous and barren, and 46% pasture. Afghanistan is generally arid. Precipitation varies from 75 millimeters (mm) in the southwest to 1,170 mm in the Hindu Kush Mountains (snowfall) in the northeast with about 200 to 400 mm falling over the majority of the country (Kabul averages about 300 mm). Precipitation is seasonal with the majority falling between November through May with February, March, and April receiving the greatest amounts.[2] In addition to being naturally arid, Afghanistan is a drought prone and one season of low precipitation can substantially impact water availability.[3]

The limited precipitation and its temporal variation and spatial concentration in the central highlands and northeastern mountains creates a seasonal water tower

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[1] Water Resources Specialist, the Asian Development Bank, PO 789, 0980 Manila, Philippines. E-mail: tpanella@adb.org. The views presented reflect those of the author and not the Asian Development Bank or the Government of Afghanistan.

[2] The rainfall pattern is different from the South Asian monsoon although some eastern areas may be influenced by the monsoon resulting in a bimodal rainfall and runoff pattern.

[3] The drought conditions and growing desertification may also reflect changing climate patterns, which has serious long-term implications for water security.

effect with 80% of surface runoff in the form snow melt that originates above 2,000 m. These waters feed the major river basins in the country that flow north, south, east, and west (See Table 1). Most rivers exhibit and annual hydrograph that shadows the annual hyetograph with a one to three month lag depending on the elevation of their catchment (i.e. timing of snowmelt). In most rivers, the rainfall and snowmelt blend together for peak seasonal flows in the spring, so that good spring rains can compensate for poor winter snowfall. However, since most areas are irrigated with river diversions with no storage, this often means that discharge is excess in the spring and deficit in the summer to meet crop water requirements (AIMS, 2004 and FAO, 1997).

Table 1: Major River Basins, Major Rivers, and Mean Annual Runoff

River Basin	River Name	Mean Annual Volume (billion m^3)	Percent
Amu Darya	Ab-i Panja	36,420.00	43.35
Amu Darya	Kokcha	5,700.00	6.78
Amu Darya	Kunduz	6,000.00	7.14
Total Amu Darya		**48,120.00**	**57.28**
Kabul (Indus)	Panjshir	3,130.00	3.73
Kabul (Indus)	Kunar	15,250.00	18.15
Kabul (Indus)	Kabul (main)	2,520.00	3.00
Total Indus		**21,650.00**	**25.77**
Northern Basin	Balkh	1,650.00	1.96
Total Northern		**1,880.00**	**2.24**
Basin	Farah Rod	1,250.00	1.49
Helmand Basin	Helmand at Kajaki Dam	6,000.00	7.14
Helmand Basin	Arghandab	820.00	0.98
Total Helmand		**9,300.00**	**11.07**
Harirod - Murghab	Murghab	1,350.00	1.61
Harirod - Murghab	HariRod	1,600.00	1.90
Total Harirod - Murghab		**3,060.00**	**3.64**
	Total	**84,010.00**	**100**

Source: Note that only major rivers are listed while basin totals reflect all inflows.

Water security and irrigation are absolutely critical well being of the rural sector and the national economy as a whole since irrigated agriculture produces up to 85% of agricultural output (1978 data); makes up close to 70% of the total national economy; and employs around 80% of the population.[4] Agriculture uses

[4] Almost 35% of agriculture's contribution to the economy in 2004 came through production of opium poppy. If this is deducted from the gross domestic product, agriculture's contribution falls to between 50 and 60% (World Bank, 2004a).

95% of developed water supplies (Government of Afghanistan, 2004a and World Bank, 2004a). A drought from 1999 to 2001 devastated the agricultural sector with a near total failure of rainfed farming. Many traditionally irrigated lands were deprived of water, which destroyed long-standing orchards, and livestock was significantly impacted with herds and their associated rural wealth substantially reduced. By 2004, 70% of rural households had still not fully recovered income or asset losses. To cope, 40% of rural families decreased food consumption from already low levels, and many were forced to sell land for income rendering them permanently worse off and more poverty prone. In 2004, another deficit rainfall year was estimated to have caused a 25% decline in cereal output. The estimated 16% GDP growth was revised downwards to 8%, and an additional 2.5 million Afghans were faced with food insecurity. Any sustainable development strategy for the country must highlight water security and irrigation as critical components (World Bank, 2004b and IMF, 2005).

OVERVIEW OF IRRIGATION SYSTEMS IN AFGHANISTAN

Irrigation System Types

Hydrologic conditions render most surface irrigation to the major river valleys with seven provinces located in the main basins providing nearly one third of the total irrigated area (See Table 2). Total irrigated area in the country is around 2.5 million hectares although data is uncertain and many areas in many years may only have intermittent irrigation. There are five basic types of irrigation systems in Afghanistan: (i) *arhad* or Persian wheel, (ii) *karez*, (iii) traditional surface water systems, (iv) modern or formal surface water systems, and (v) pump systems. The scale and technical characteristics of each system type has different management implications. The vast majority of irrigation is considered traditional where local communities developed the infrastructure and are responsible for its management and operations and maintenance (O&M).

Arhad (Persian Wheel) System: Groundwater is lifted from shallow wells with the help of an *arhad* (Persian wheel) driven by beasts of burden supplying irrigation water to the fields of individual farmers. The size of irrigated area is generally not more than three hectares (ha). Persian wheels comprise no more than 1% of the total irrigated area in Afghanistan.

Karez Systems: Water is delivered by free flow via underground tunnels that are dug into the sides of hills or mountains to collect sub-surface flow. The horizontal tunnel is punctuated by vertical shafts and although the diameter of the tunnels is small (one or two meters), the *karez* may be tens of kilometers in length. The flow from a *karez* is typically between 10 to 200 liters per second (l/s), but may be up to 500 l/s, and may be able to irrigate anywhere between 10 and 200 ha. They are an important water source for both domestic supply and irrigation and are often used for high value crops and orchards. Approximately 7,000 *karez* may be found

in Afghanistan and are concentrated on the eastern, southern, and western flanks of the Hindu Kush Mountains. Local villages typically had a *karezkan*, who was responsible for developing and maintaining the *karez*, which is perilous work. The *karez* systems may comprise 5 to 10% of total irrigated areas although their prevalence varies by location.

Table 2: Irrigated Areas in Afghanistan by Province

Province	Irrigated Area (ha)	Province	Irrigated Area (ha)
Badakhsh.	96,907	Kunar	17,044
Badghis	66,596	Kunduz	195,324
Baghlan	145,344	Laghman	34,742
Balkh	162,921	Logar	40,631
Bamyan	28,103	Nangarhar	85,707
Farah	49,051	Nimroz	76,475
Faryab	82,439	Oruzan	98,667
Ghazni	101,241	Paktia	49,919
Ghor	57,726	Paktika	39,648
Helmand	111,906	Parwan-Kapisa	100,094
Herat	259,552	Samangan	80,899
Jawzjan	100,089	Takhar	150,788
Kandahar	121,662	Wardak	29,127
Kabul	73,261	Zabul	64,260

Source: FAO, 1997. Table 2 reflects 1978 data, however, a decline in area is generally the norm since 1978. It is also difficult to accurately define irrigated areas since in many seasons irrigation may be intermittent. However, the statistics indicate the magnitude of distribution of irrigated area throughout the different provinces of the country.

Traditional Surface Irrigation Systems: Traditional surface irrigation systems may be classed as small, medium and large scale and all are surface water diversion systems or spring fed.[5] Many of these systems have been functioning for several centuries. The traditional irrigation systems generally have no or few formal control structures and use earthen canals that rely on brush, log, mud, stone, and some masonry water control structures. Intake structures are usually not engineered or permanent and rely on brush, logs, rock, and makeshift gabions. Given the annual flood hydrology and the fact that river channels often shift laterally and many have lowering beds levels, intakes structures need to be rebuilt on a frequent basis. Traditional irrigation systems are widely distributed and constitute about 80 to 90% of Afghanistan's irrigated area.

[5] Artesian springs are common in many areas and a vital source of surface water that supply about 5 - 7% of all irrigation. Although the water source is different from surface diversions of traditional systems, the distribution and system management are the same.

Small-scale traditional systems, which vary in size (up to 100 ha) are often located in remote valleys along a stream or spring, and generally only one village is responsible for the O&M. Medium scale irrigation systems range from 100 to 2,000 ha, and several village communities may share the system, which has a common water source (usually river) and may have several temporary intakes. Large-scale traditional irrigation systems are supplied by river flow and may have tens of thousands of hectares of command area and hundreds of kilometers of canals. In general, the size of the traditional irrigation systems increases as one moves down the river valleys and out into the plains since the topography is more favorable for development, the land is more fertile, and flows generally larger. Using the same source of water through intakes along a river, the systems have main, secondary, distributary and even smaller canals and may include numerous villages in their command area. In addition to irrigation water, the traditional irrigation canal networks play an important role for livestock, domestic, and municipal water supply.

Modern (Formal) Surface Irrigation Systems: Ten modern irrigation systems have been developed over the last half-century. The systems were developed and managed until the late 1970s mainly through parastatal agencies (such as the Helmand Valley Authority or the Nangarhar Valley Authority). The modern systems are generally larger than 10,000 ha and some have storage (including multipurpose). These systems were designed to have modern control structures and canal networks. The majority of the modern schemes are located in three major river valleys: the Kunduz in the North, the Kabul in the East, and the Helmand in the South, which has the largest design command area of around 100,000 hectares. Together these systems have a combined command area of about 300,000 ha or almost 10% of the irrigated area (BCEOM, 2004; DAI, 2002; Sheladia, 2002; and FAO, 1997).

Groundwater Pump Systems: Groundwater pump systems have expanded rapidly in recent years and both shallow and deep wells are being developed depending on the hydrogeology of the area. Shallow wells are generally less than 20 meters with a discharge of around 4 to 20 liters per second, and deep tube-wells can be much deeper with much higher discharge of at least two to three times that of shallow tubewells. Currently, little data exists regarding groundwater development since it is almost all supported through private investment and no regulatory framework or monitoring capacity exist (Government of Afghanistan, 2004b).

Irrigation Practices and the Current State of Irrigation Systems

In the traditional and modern irrigation systems, the dominant irrigation methods are basin/border irrigation for cereals and furrow irrigation for cotton, vegetables and oilseeds. The main physical constraints to irrigation include the following: shortage of water after the peak snow melt in April to August (depending on

location); poorly formed river intakes and water regulating structures; excessive seepage losses in some places; and deeply incised canals that are difficult to desilt. Average irrigation efficiency is considered to be about 25 to 30% due to high conveyance losses in traditional schemes; high operational losses in modern schemes with lined conveyance canals that are in poor condition; and high on-farm distribution losses due to poor command area development. In many of the river valleys, drainage is not a problem due to the fact that the fine to medium alluvial soils in the upper layers have course materials below facilitating percolation and leaching with adequate water application. In some areas outside river valleys, however, drainage is important to avoid water logging and salinazation (FAO, 1997 and Government of Afghanistan, 2004a).

Irrigation cropping intensity varies significantly depending on the particular system and location within a system. Intensities of 200% or greater are not uncommon in areas at the head reaches, yet this can only be achieved through rotation of downstream areas with as much as one third of the areas traditionally remaining fallow or through excessive abstractions by upstream users. In spite of the fact that most structures are rudimentary, Afghans are industrious farmers and once water is in the canal, it is relatively well managed within the physical constraints of the traditional systems.

Current State of Irrigation Infrastructure: About one third of Afghanistan's villages were damaged or destroyed during the first 10 years of war (1979-1989), and the war's impact of irrigation infrastructure stems partly from direct combat activities, however, degradation is mainly due to the exodus of farmers and dereliction of O&M. After the war in the 1990s, some communities were able to rehabilitate smaller traditional irrigation systems with rudimentary structures, however, in larger schemes with more complex designs and intakes from major rivers, greater problems were encountered including complete sedimentation of larger canals and dilapidation of major structures and canals.[6] An estimated 10% of systems were directly affected by combat, while another 40% of systems, particularly large-scale schemes, were damaged due to lack of O&M and uncontrolled flow entering the systems. It is estimated that in some areas access to irrigation water may have been reduced by more than 50% since the pre-war era, and irrigated area has declined by as much as 33%. In addition to the needs for rehabilitation, many of the traditionally developed schemes would benefit from improved river intakes; rationalization of canal networks; improved structures for water control and regulation; improved cross drainages; canal protection; and other improvements consistent with modern design and construction to increase water use efficiency; improve control over water distribution; and reduce annual

[6] Unexploded ordinance and land mines also pose significant challenges for irrigation development and rehabilitation in many areas.

maintenance needs (BCEOM, 2004; Government of Afghanistan, 2004b; and FAO, 1997).[7]

The large modern systems were severely degraded during the last decades of civil unrest, and many control structures are currently inoperable or looted. Generally, they have suffered much more than traditional systems since government agencies were not able to maintain facilities due to lack of staff, equipment, and funds. The maintenance of these large systems proved beyond the capability of local farmers who did not have the long tradition of community management. Consequently, only the upstream command areas now get proper irrigation in many cases. In some instances, makeshift structures have been fashioned using the existing canal network rendering these systems' O&M similar to traditional systems.

IRRIGATION MANAGEMENT IN AFGHANISTAN

Traditional Irrigation Management under the *Mirabs*

The Department of Irrigation, which was relocated to the Ministry of Energy and Water (MEW) in December 2004, is the agency responsible for irrigation management and development within the Government of the Islamic Republic of Afghanistan (the Government). However, one of the most salient features of irrigation in Afghanistan is the extent of the irrigation developed by local communities over hundreds of years and the ongoing community management that continues to be responsible for the majority of system O&M. Traditionally, local communities have selected *mirabs* who are the local water masters responsible for managing the system including water allocation and O&M with the support of community labor.[8] In larger irrigation systems, a *mirab bashi* is selected with responsibility for the entire irrigation system starting with the intake for the primary canal. A *mirab* is selected to manage the distribution from the secondary canals, while a *chak bashi* is selected at the tertiary and individual community level. In some instances, a timekeeper (*saatchi*) or assistants may be selected to oversee rotation.

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[7] The last decades of civil unrest were particularly devastating for the *karez* with many falling into disservice due to the disruption of traditional community O&M. The recent influx of groundwater pumps have also desiccated karez flows and without adequate groundwater management, this trend is likely to continue. This trend has significant equity concerns since *karez* water, which is traditionally a community resource, is being usurped for private use by individuals who can afford pumps and their operation.

[8] The discussion presents a generalized view based mainly on northern and western areas, and actual arrangements and terminology differ from system to system. In some areas, the term *wakil* is used to refer to the *mirab bashi,* or *wakil* will sometimes assist the *mirab* with defining allocation and distribution.

A village *shura* (council) usually selects the *mirab* for a one-year term although no term limit exists, and in many cases, the *mirab* will serve for the majority of his lifetime and sometimes pass the position on to his children, so long as the community is satisfied with performance. The *mirab*'s role may require full time service during a large portion of the year, and he receives an in kind fee from the harvest. The *mirabs* receive no formal assistance from the Government for their efforts although they may collaborate with the Department of Irrigation or other authorities to help execute projects. Generally, the financial and other resources at their disposal are meager, and O&M support is provided entirely by the community. However, *mirabs* are usually still able to mobilize significant community labor, sometimes hundreds of men in labor gangs, using manual methods for O&M in most systems (PCI, 2004b and Pain, 2004 and Lee, 2003).

Water Allocation: Irrigation in Afghanistan has a water allocation system based on irrigated area that dates back several centuries. In Northern Afghanistan, the *paikal* is the basic unit for water allocation, and it corresponds to both a unit of land as well as the measure of a flow of water for irrigation purposes.[9] *Paikal* land also refers to the agricultural land type (i.e. irrigated land), and historically specific taxes were paid on *paikal* land. The taxes paid corresponded to the size of the land holding and accordingly, the water allocation was also contingent on the *paikal* tax paid. A *paikal* does not always appear to be uniform, but is usually between 350 to about 500 *jeribs* of land (one *jerib* equals 1953 m^2), and its size may depend on whether it is located in the head or the tail of the irrigation system. A *paikal* is converted to a unit of water measure through a corresponding unit-width that allows water to pass through a control structure within the irrigation system, which is also called a *paikal* or *paikal* width.

Based on the *paikal* system, water allocation is proportional among different offtakes from a river as well as within the system at canal structures; each with a prescribed *paikal* allocation that corresponds to the area to be irrigated and a width of intake or division structure. The *paikal* system is based on continuous flow and does not account for changes of head in the river or in the canal, so volume of delivery is not constant, yet is roughly proportional. As one moves down the canal system, rotation is practiced in some systems with complex distribution schedules that involve hourly rotations on as high as a monthly rotation cycle in some lower level canals. In Northern Afghanistan, current *paikal* allocations were formalized into law in1925 and 1926 although the canals and practices go back several centuries as they do in many of the traditional systems throughout the country. However, many of the allocations today do not correspond to the traditional allocations and may also not reflect the on ground reality with respect to irrigation and land use. Strict adherence to the traditional allocation system has weakened in some cases. Even when the *paikal* system is

[9] *Paikal* is used in Northern Afghanistan while in the west the basic unit for land and water is the *juftgau*, yet the concept and allocation methods are the same.

adhered to it is still imprecise, however, all *mirabs* and irrigated landholders are aware of it and at least superficially acknowledged the system and their particular *paikal* allocations and rotations.[10] Most importantly, most Afghan farmers understand how the system works and irrigate with the expectation of a prescribed allocation.

Traditionally, dispute resolution within an irrigation network is addressed by the *mirabs*, yet concerns may be referred to the *shura* for decision and possible sanction. At the community level, enforcement appears to be addressed through public reprimands with shame as the main coercive measure. In some instances, however, *mirabs* or irrigators may bring issues to the attention of the Department of Irrigation or other district or provincial authorities, including the governor's office, for assistance to resolve a situation, especially allocation conflicts between different irrigation systems, and the *mirabs* act as system advocates (ADB, 2004; PCI, 2004b; BCEOM, 2004, Pain, 2004, and Lee, 2004).

Current State of the Traditional Management: Like the physical infrastructure, the institutional structure for community management has degraded during the last 25 years of civil unrest. In many communities, *mirabs* are no longer able to enforce the water allocation schedules or mobilize substantial labor to maintain the irrigation systems. The rise of many local commanders in the rural power vacuum created after the fall of the Taliban along with the influx of weapons over the last two decades has made it difficult to stop unauthorized abstractions of irrigation water in many areas. Upstream users are more emboldened to take water beyond their share and *mirabs*, even with the backing of provincial officials, have little recourse to address the situation. In some areas, it has been noted that the traditional water distribution had been more effectively enforced and adhered to under the Taliban than the current situation. The return of authority to local government officials and the rule of law supported through the demilitarization and demobilization of former combatants will be necessary activities to fully restore irrigation management to *mirabs* and the community.

MOVING FORWARD AND ISSUES TO CONSIDER

Moving Forward - Government and Donor Involvement in Irrigation

The Government, through various public and parastatal agencies, played a role in developing and managing irrigation systems over the last 50 years, although the majority of irrigation has always been traditional. When the war started in 1979, irrigation development activities came to a standstill with several projects abandoned. The capacity of the Irrigation Department was significantly diminished during the ensuing civil unrest leaving few qualified engineers or

[10] In some cases *mirabs* may have record books, while in other cases it appears that the allocations are known through memory.

other staff. Limited resources rendered the Irrigation Department a moribund agency with no field activities taking place and provincial offices falling into dysfunction. In the post Taliban period, the Irrigation Department moved to the newly created Ministry of Irrigation, Water Resources, and Environment (MIWRE). In December 2004 after the presidential election of Hamid Karzai, the ministries were reshuffled and consolidated, and the Irrigation Department (including water resources management responsibility) moved to the MEW.[11] As of January 2005, discussion over the final location for the Irrigation Department was still taking place with consideration of the moving it to the Ministry of Agriculture and Animal Husbandry and Food (MAAHF). Regardless of the final organizational arrangements, the task of rebuilding and developing irrigation and strengthening water resources management is enormous.

Securing Afghanistan's Future, which was released in March 2004, lays out a 12 year plan for the redevelopment of Afghanistan. The plan is not only for rehabilitation but for developing Afghanistan's economy to the point of sustainability relying an average 9% growth rate of the non-drug economy. In preparing the document, $645 million of immediate water resources needs were identified including emergency rehabilitation and improvement of small, medium and large traditional irrigation schemes; capacity development and institutional strengthening for irrigation and water resources management; and redevelopment of a national hydrological and meteorological network. Over $1.8 billion worth of long-term investments for irrigation and water resources projects, including dams, were also identified (ADB, 2003). The report estimated the following: 240,000 ha of irrigation that had gone out of production could be rehabilitated and made productive; 1,310,000 ha of currently irrigated land could be more intensively irrigated through rehabilitation; 953,000 ha of land intermittently irrigated could be brought under intensive irrigation through additional storage; and 1,035,000 ha of new area could be brought under irrigation (Government of Afghanistan, 2004c).

Due to the critical role that irrigation and water resources must play in Afghanistan's development, substantial donor assistance is being provided to :rehabilitate irrigation systems; re-establish the Irrigation Department as a competent force in irrigation development; and develop a sound institutional framework for irrigation and water resources. Numerous aid and development agencies are involved including the following: Canadian International Development Agency, United States Agency for International Development, Japanese International Cooperation Agency, Duetsche Gesellschaft fur Technische Zusammenarbeit (GTZ- German aid agency), Government of India, Abu Dhabi Fund, Food and Agriculture Organization of the United Nations, World Bank, European Community, Asian Development Bank, and numerous non-governmental organizations (NGO) among many others. Assistance is being

[11] MIWRE was dissolved and environment was made an autonomous agency.

provided in the form of grants and soft loans, and approximately $300 to $500 million is programmed for the irrigation and water resources over the next five years, which includes some very large infrastructure projects such as completion and rehabilitation of storage facilities. Donor and NGO supported activities include the following: (i) rehabilitation and completion of irrigation schemes and associated water resource projects including traditional, modern, *karez*, and groundwater schemes; (ii) purchase of computers, vehicles, and other needed equipment for an effective irrigation agency; (iii) development of feasibility studies for new irrigation and water resources projects; (iv) introduction of new technologies such as drip irrigation; (v) reestablishment of a new hydrological and meteorological network throughout the country; and (vi) extensive capacity development for the Irrigation Department staff, *mirabs*, and farmers to provide the necessary skills for irrigation management and development as well as for integrated water resources management (IWRM).

Issues to Consider – Developing Policy Framework

The Irrigation Department is the Government focal point for donor activities to develop the capacity for irrigation management and development and for coordinating donor irrigation rehabilitation and development assistance (civil works, etc.). The Irrigation Department also currently serves as the main entity concerned with overall IWRM. Given the existing capacity constraints of the Irrigation Department, donor supplied consultant support is assisting preparation and implementation of civil works as well as assisting management, planning, and policy development for irrigation and IWRM. A vital need is to increase the capacity within the Irrigation Department to fully manage and support the current donor assistance and in the process, to become an effective irrigation agency to support sustainable irrigation management and development after donor assistance tapers off. Current donor assisted activities are providing substantial on the job training as well as more formal capacity development activities to achieve this end. However, a range of issues needs to be addressed for the long-term management and development of irrigation within a sound IWRM framework

Recently developed policy documents such as the Strategic Policy Framework for the Water Sector (adopted by cabinet in 2004), the draft Water Resources Management Policy, and the draft Irrigation Policy developed by MIWRE identify many of the issues that need to be addressed and provide initial policy direction based current international best practice. The draft Irrigation Policy states, "The specific objectives of the irrigation policy is to develop and manage irrigation systems cost-effectively; ensure technical, social, institutional and environmental sustainability; and promote user participation in local water management that can ensure overall increase in production and productivity of agricultural." However, developing the details and implementation arrangement as well as the capacity (both human and technical), especially at the provincial and regional level, to actualize the policies, pose a real long-term challenge. The

Irrigation Department with support of the donor community is undertaking activities to further develop and implement these policies.[12] While the current underdeveloped capacity of the Irrigation Department and inchoate institutional arrangements for irrigation management and development and IWRM present challenges to be overcome, they also present an opportunity to benefit from the lessons of other countries and to use current best practice in developing the institutional arrangements for irrigation and IWRM.

Issues to Consider - Organizational and Institutional Responsibilities

Agriculture and Irrigation: Regardless if the Irrigation Department stays with MEW or moves to MAAHF, a challenge exists to integrate agricultural support services with irrigation rehabilitation and development to ensure that Afghan farmers are able to maximize benefits from improved irrigation service delivery. To date, emergency interventions for irrigation rehabilitation do not explicitly include the integration of agricultural support services, although several projects under preparation will include agricultural support services as well as watershed management activities. In addition, donors and NGOs are supporting and implementing agricultural and rural development programs that address the various needs for farm production and marketing, yet a fully coordinated approach does not yet exist. The problems and difficulties of integrating agriculture and irrigation is not unique to Afghanistan, however, institutionalizing successful approaches to help farmers who have irrigation with inputs (including credit), post harvest activities, and marketing must be a priority to achieve the full potential from irrigation and to support meaningful alternative livelihood opportunities to poppy production. The modalities to achieve this present a difficult challenge since the MAAHF is currently rather weak, especially at the field level, and clear strategies to provide agricultural support services through the public sector, private sector, cooperatives, community-based approaches, or other arrangements are yet to emerge.

Integrated Water Resources Management and Irrigation: Effective IWRM at the national level will become more critical as new storage and other infrastructure projects will be developed and competing sectoral demands will intensify, especially in the face recurrent droughts. To support effective IWRM in the long-term, the draft Water Resources Management Policy calls for development of an independent apex body at the national level, yet a timeline for this is uncertain. Regardless of the final organizational structure for the responsibilities that accompany IWRM such as intersectoral allocation, entitlements, drought management, and overall responsibility for integrity of the resource base will need

[12] Policies will need to be codified in the legal framework and the national water law, which was last revised in 1981, will need to be amended or new legislation introduced.

to be defined and operationalized effectively to sustain Afghanistan's economic development.

Policies produced under MIWRE have consistently shown a commitment to decentralized water resources management primarily through river basin authorities. Currently, development of river basin authorities is being pursued through various donor supported projects although it will be some time before functional capabilities are developed and institutional arrangements finalized. Addressing basin issues is critical for irrigation since a pressing rehabilitation need is to improve irrigation intakes, which require frequent rebuilding in the traditional systems. However, before more permanent and possibly gated structures are developed, agreement needs to be reached over the sharing arrangements among the different canal intakes along rivers.[13] As more multipurpose storage will likely be constructed in Afghanistan, river basin authorities may have a vital role to play with regard to operation of basin infrastructure and flows. As with the IWRM functions at the national level, international best practice would suggest that in the long-term, service delivery such as irrigation and development of infrastructure be decoupled from a basin management authority, which should have a regulatory role. In the mean time, however, due to the current organizational linkages and the fact that irrigation uses 95% of developed water supply, it is likely that irrigation and IWRM will be addressed through the Irrigation Department.

Issues to Consider - Rehabilitation and Development Assistance

Emergency versus Long-term Development: Although an urgent need exists for irrigation system rehabilitation, a long-term approach is required to rebuild capacity and institutions for more sustainable development and to support the Afghans to fully assume irrigation O&M, management, and development activities commensurate with the donor community's eventual diminished presence. Initially, many aid efforts focused on short-term, emergency rehabilitation measures, which may not support long-term development or may contribute to deterioration of community participation by excluding community involvement or giving the impression that communities no longer need to take O&M responsibilities. The Government has recommended cessation of purely emergency works that do not contribute this long-term vision. The long-term development approach has also led to the realization (in some cases reorientation of programs) that capacity development activities (short and long-term) for all stakeholders must be an explicit component of assistance projects.

[13] Although historical allocations exist, changes have taken place since they were created and discussion of permanent off-take structures is very contentious among *mirabs*.

Influx of Donor Assistance: The massive influx of aid resources to Afghanistan to rehabilitate irrigation is needed, and given the large number of agencies providing rehabilitation assistance, many disparate activities are taking place in the field. Coordination of rehabilitation efforts is vital to ensure that resources are not duplicated or working at cross-purposes and are sequenced to achieve maximum development impact. This challenge will increase as more programs move from preparation to implementation. It will require donors to work closely with each other and the Irrigation Department and to fully communicate all activities and ensure a common agenda. To manage the donor rehabilitation efforts, many ad hoc arrangements such as project coordination units have been created with ministry staff and consultant support. These provide a more expedient and efficient means to manage and implement donor assistance and are essential due to limited capacity. However, it will be important to mainstream and transform the ad hoc arrangements and functions into a permanent organization and institutional structure of the Irrigation Department to ensure that the capacity developed and housed in the ad hoc arrangements (including qualified and trained staff) remains with the Irrigation Department once funds diminish and projects end.

Balancing Modern and Traditional Irrigation

Although substantial assistance is needed and will be provided for some time, the Irrigation Department, which will be developed with donor support, must become sustainable in terms of its mandate and financial resources in the long-term. All aspects of the Irrigation Department need additional capacity, yet lessons from previous donor assisted irrigation departments should be observed. In many countries, donor programs are currently supporting reforms for greater decentralization; right sizing of irrigation departments with greater out sourcing of services; and empowering user participation as means to improve responsiveness and accountability. In some cases, it was donor assistance of a generation ago that helped entrench these public agencies with resources and power that is currently being retrenched as a means to improve service delivery.

Traditional irrigation systems comprise and will continue to comprise the vast majority of irrigation in Afghanistan.[14] Although imperfect, these systems have century-old traditions of community management and O&M and have sophisticated means of water allocation with farmers who understand the rules and have an expectation of limited allocation. Development agencies struggle with mixed success around the world to achieve these management objectives, and the recent emphasis on participatory irrigation management and irrigation management transfer underscores these efforts. In Afghanistan, community

[14] Some Government support had been provided over the years for development and repair of larger structures.

management has been the norm for centuries and the only means of system management and O&M during the recent civil unrest.

The traditional irrigation systems are in serious need of rehabilitation and improvement, and especially in the larger systems, support from the Irrigation Department and donor-assisted projects can offer tremendous benefits. One of the greatest challenges facing irrigated agriculture in Afghanistan will be to provide the needed rehabilitation and system upgrading to the traditional irrigation systems and provide the benefits of modern irrigation while at the same time supporting traditional community management, O&M, and allocation. In the long-term, this means achieving the proper balance and clearly defining the institutional arrangements of the *mirabs*, farmers, and Irrigation Department, so that the Irrigation Department provides needed support and serves as a technical resource, yet at the same time does not usurp or debase the communities role in managing the system.

The draft Irrigation Policy as well as the Strategic Policy Framework for the Water Sector acknowledge the importance of community participation through the *mirab* system and commit to maintain it. The Irrigation Department is also currently developing common principles and guidelines for community participation to be used by donors and projects working with traditional irrigation systems. In defining the terms of engagement with community members, the guidelines will also define many of the institutional issues that will need to be addressed regarding the roles and responsibilities among the Irrigation Department, *mirabs*, and irrigators. Development of the guidelines will also raise many of the issues that must be addressed for the long-term sustainability of irrigation such as: cost recovery for O&M and rehabilitation beyond community in-kind labor; irrigation service fees; and ownership of irrigation assets. Discussion has also taken place and the draft Irrigation Policy calls for the introduction and formalization of water user associations for irrigation management based on the *mirab* system. While certain elements of the *mirab* system need strengthening and the *mirabs'* role will undoubtedly evolve with development, care needs to be exercised in altering institutions that have worked effectively for centuries. As the policies and implementation guidelines emerge and are confirmed over time, the legal framework will also need to be developed to support the institutional arrangements for irrigation management within the civil society that is being reestablished in Afghanistan.

Development of New Irrigation

Modern Systems: Over the centuries, traditional irrigation systems have developed the best land with readily accessible water supply in the major river valleys. They have also been developed up to or beyond the point of reliable water supply. Any new irrigation is likely to require some associated storage and will be developed using "modern" methods. The Strategic Framework for Water

Resources calls for expansion of irrigated area and increasing the modern systems from their current 10% to 35% of total irrigated area. Revitalizing existing modern systems and developing new ones raise the fact that new institutional arrangements to manage these systems will also need to be forged. Ideally, lessons from the traditional systems can be used to ensure active participation of the water users in the management and O&M of these systems. These issues are being addressed in the Helmand Valley where the main rehabilitation work on modern systems is taking place, yet the institutional arrangements are still evolving. In addition to the management of irrigation system, development of new systems, dams, and storage reservoirs even with donor assistance raise technical, social, economic and environmental concerns that will require creation of supporting institutional frameworks and much capacity development.

Groundwater Development: Groundwater is a relatively underdeveloped water resource that holds great potential to bring the benefits of irrigation to many new areas as well as to supplement surface water irrigation in the tail reaches of existing systems. Groundwater development also presents and obvious opportunity that is being exploited for rural and urban and water supply. However, a clear strategy for its management and development is yet to fully emerge. The possible dangers of uncontrolled groundwater development are already being seen in some areas with the loss of *karez* flows. Complicating the situation is the fact that in most areas of Afghanistan little knowledge exists regarding the extent of groundwater resources although investigations have started. In addition, institutional responsibility for groundwater development and management is still evolving, especially with change in ministries at the end of 2004. Previously, most responsibility rested with the Ministry of Mines and Industry (MMI) while the Strategic Policy Framework for Water Resources calls for shared responsibility between MMI and MIWRE (now defunct). An important priority for the Government is to clearly define ministerial responsibility, develop an institutional framework for management and development, as well as create the knowledge base and monitoring capability to support effective groundwater management and development. Some of these activities are currently being supported through several donor projects, however, a nationally focused initiative on groundwater has not been fully realized. As in many countries, implementation and enforcement of any groundwater regulation will be difficult after a framework has been developed.

CONCLUSION

The importance of irrigated agriculture and water resources to the future of Afghanistan cannot be overstated, and the Government in cooperation with the donor community is currently providing tremendous resources commensurate with importance of rehabilitating and developing irrigation and water resources. Afghanistan has a rich tradition of community managed irrigation, yet at the same needs to develop an effective and modern irrigation department and new

infrastructure to ensure irrigated agriculture realizes its full potential for the economic development of the country. The Government and Irrigation Department have made remarkable progress to address many difficult challenges, yet much work lies ahead. The situation with regard to the management and development of irrigation is still fluid in many respects, however, in charting the long-term course for Afghanistan's irrigation it is important that the valuable resource of community irrigation management provides a foundation for future development. For Afghanistan, a critical challenge will be reconciling traditional irrigation management with development of modern irrigation systems.

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