# THE AFGHAN PART OF AMU DARYA BASIN

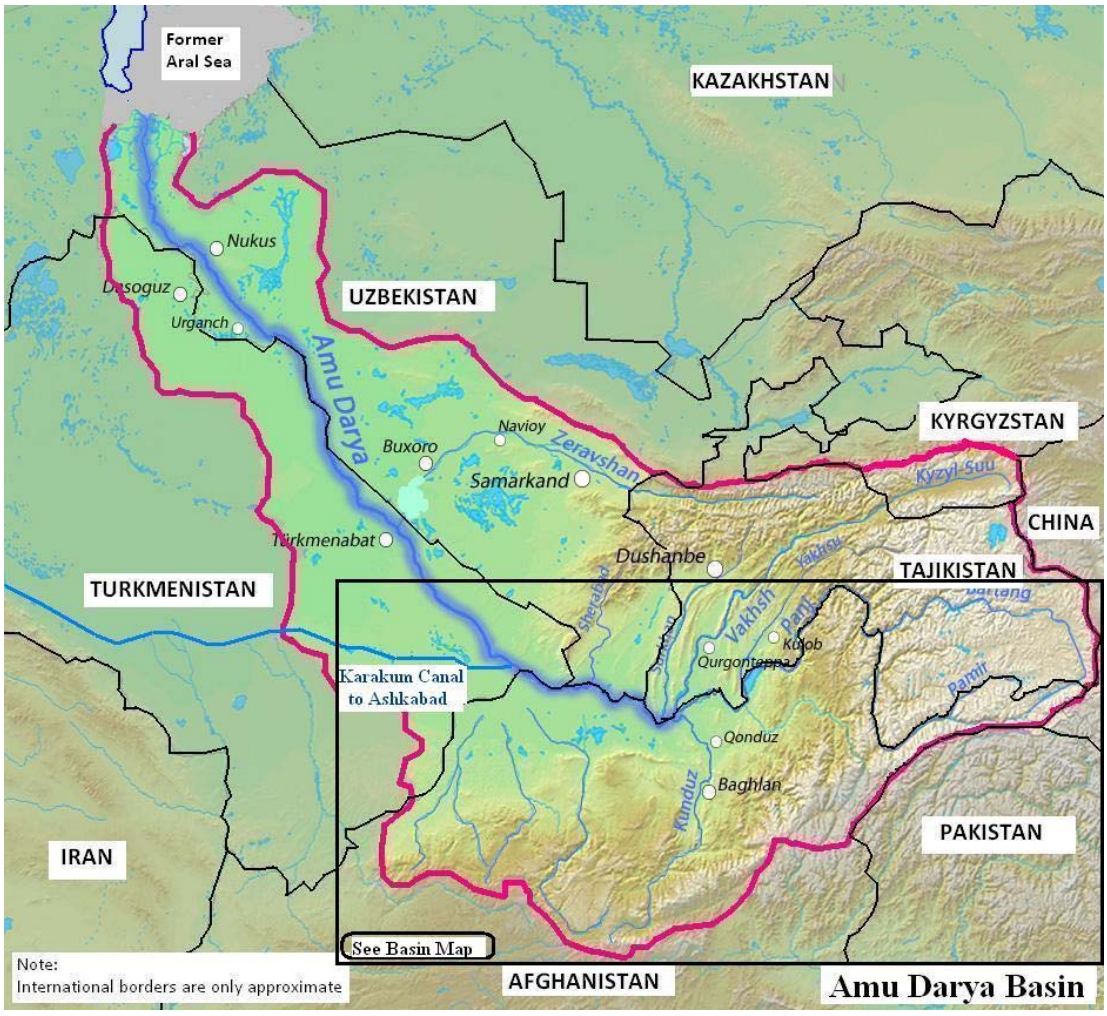
## Impact of Irrigation in Northern Afghanistan on Water Use in the Amu Darya Basin

***Walter Klemm, Sr Land & Water Development Engineer***
***Investment Centre Division / FAO Rome***

***and***

***Sayed Sharif Shobair, Chief Engineer and***
***Coordinator of the Emergency Irrigation Rehabilitation Project of the Ministry of Energy and Water of Afghanistan, FAO Kabul***

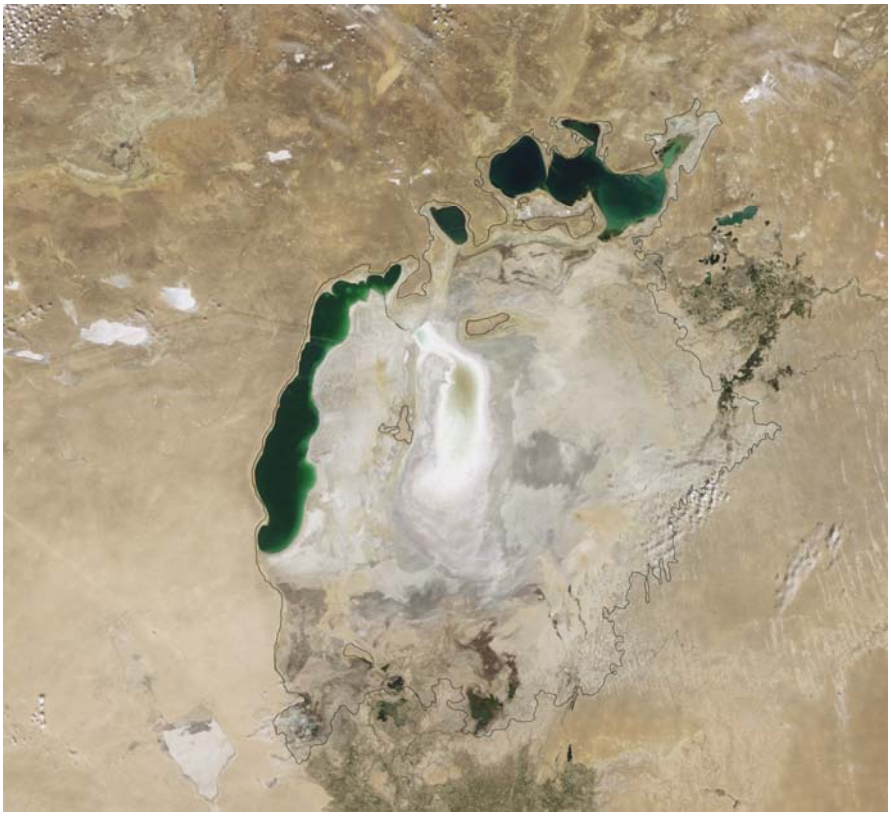
### The Amu Darya Basin



## Introduction

It is certainly too easy to blame the international community for the lack of an internationally agreed Afghan share of Amu Darya water. Fact is, however, that international financing institutions (IFIs) and many bilateral donors categorize Afghanistan as an Asian country belonging to Asia, whereas the five Central Asian countries Turkmenistan, Kazakhstan, Kyrgyzstan, Uzbekistan and Tajikistan belong to the Eastern and Central Asian country (ECA) group, viz. to Europe in the broadest sense, or at least to Eurasia. Nevertheless, Northern Afghanistan is part of the Amu Darya River Basin which is without any doubt situated in Central Asia. Once upon a time, its river Amu Darya (the ancient Oxus) was – together with the Syr Darya - the principal water supplier of the Aral Sea, now the symbol of a man-made environmental disaster (see below).

The purpose of this paper is to briefly describe the present situation in the Amu Darya Basin focusing on the Afghan part of the basin and its future irrigation development, and attempting to use commonly accepted – and objectively verifiable – information and data, the availability of the latter being one of the major constraints in finding common ground and solutions to the prevailing – and aggravating – water shortage problems in the Amu Darya Basin. Overall goal is and will be the joint management of shared water resources for the benefit of an increasing (urban) population in the five riparian states (Kyrgyzstan, Tajikistan, Afghanistan, Uzbekistan and Turkmenistan). All these five countries face similar challenges in water management: they need to boost their human and institutional capacity for integrated water resources management (IWRM), improve their drainage networks on irrigated soils, and facilitate the expansion of water-saving irrigation technologies.

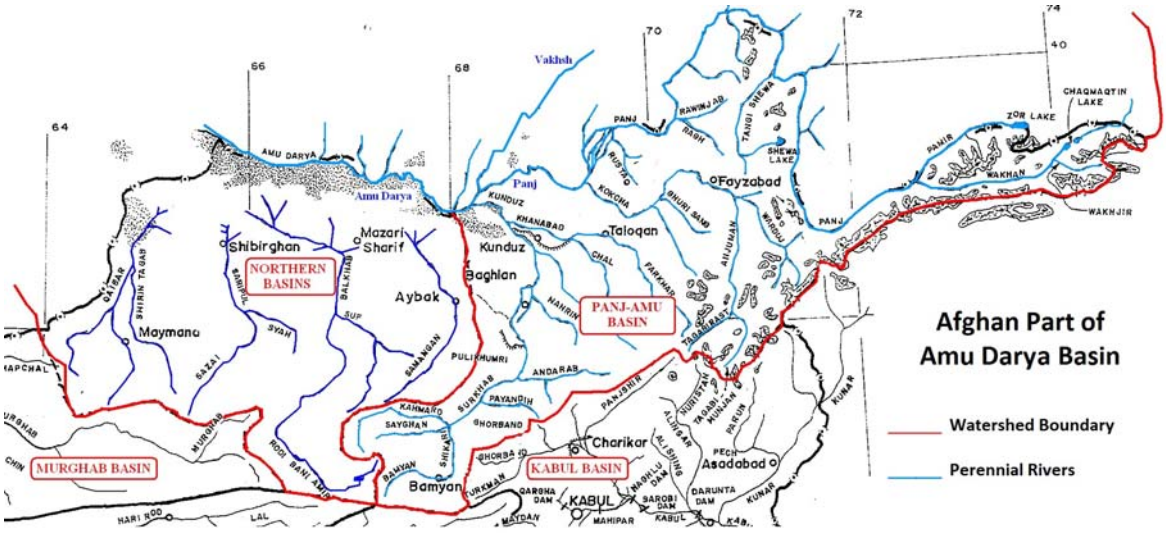


**The Aral Depression and Remaining Water Pockets (August 2009)**

**The River Basins of Northern Afghanistan: Water, Land and People**

The River Basins of Northern Afghanistan are located in the northern part of the Hindukush central range. Almost all rivers of Northern Afghanistan originate from this mountain range and flow towards north and northwest.

**Water.** In a hydrographic sense, all Northern river basins of Northern Afghanistan belong to the Amu Darya Basin whose Southern watershed boundary separates it from the Indus River Basin and the Helmand River Basin. The Amu Darya Basin includes an area covering some 534,740 km², ranging in altitude from as high as 7,134 m above Sea Level (aSL) in the Pamirs to the East where the Amu Darya originates, to as low as 320 m aSL where the Amu Darya leaves Afghan territory through Turkmenistan on its way to the West. Again hydrographically, the river basins of Northern Afghanistan are today sub-divided in two river basin units: the Panj-Amu River Basin in the Northeast including the main tributary rivers Kokcha and Kunduz, and the Northern River Basin characterized by so-called ”blind rivers”, viz. former tributary rivers which since centuries do not anymore drain into the Amu Darya leving a large desertt called Shortepa between the disappearance of these rivers in the Dasht-i Shortepa and Amu Darya.




The Amu Darya is formed by three major source rivers: the Panj[1] originating in Afghanistan (Pamir and Wakhan rivers), the Murghab River also originating in Afghanistan and flowing into the Lake Sarez, then being called Bartang River, and the Vakhsh originating in Kyrgizstan (Kyzylsu River) as well as in Tajikistan (Muksu River). On its way to the Aral Depression, only below the confluence of Panj and Vakhsh, the river is now called Amu Darya which is joint on its right bank by a few more tributary rivers (Yaksu and Karnifaghan in Tajikistan, and Surkhandarya in Uzbekistan), and on its left bank by Kokcha and Kunduz river in Afghanistan. Two particularities should not go unnoted: The Zarafshan River, originnating in Tajikistan and supplying with water the well known cities of Samarkand and Bokhara, does not join the Amu Darya anymore, thus it became another ’blind’ river, this time on the Uzbek side of Amu Darya. By far the main single water user of the Amu Darya is the Karakum Canal, beginning at Turkmenian territory on the Western Afghan border and diverting a varying water volume of 12,000 to 22,000 million m³ per year to Turkmenistan. In

[1] Panj or Panja is the name of a village and a shrine in Wakhan District of Afghanistan

order to have an idea about the flow capacity of Amu Darya from its origin on Afghan soil (Pamir and Wakhan rivers), the following observations are presented:

| River | Location | Minimum Flow [m³/s] | Maximum Flow [m³/s] | Drainage Area [km²] | Altitude [m aSL] |
|---|---|---|---|---|---|
| Panj | Ishkashim | 9 | 900 | 13,900 | 2,485 |
| Panj + Vakhsh | Shidz | 82 | 2,890 | 57,100 | 1,954 |
| Amu Darya | Hirmanjo | 189 | 4,500 | 72,400 | 811 |
| Amu Darya | Nizhni | 281 | 5,420 | 113,400 | 320 |

Source: Hydro-Meteorological Agency of Tajikistan, 2007

Average annual flow of Amu Darya and its tributaries is estimated according to various differing sources (depending on authors, countries, and time series used). An attempt to sub-divide the mean annual flow of the Amu Darya by riparian country produces the following:

| Riparian Country | Generated Average Annual Flow in million m³ | Share of Total Average Annual Flow in Percent |
|---|---|---|
| Tajikistan | 50,000 | 62.5% |
| Afghanistan | 22,000* | 27.5% |
| Uzbekistan | 5,000 | 6.3% |
| Kyrgyzstan | 1,500 | 1.9% |
| Turkmenistan | 1,500 | 1.9% |
| **Total** | **80,000** | **100** |

* the amount of 22,000 million m3 shows the amount of water generated in Afghanistan, out of which an estimated amount of 5,000 million m3 is used inside Afghanistan for agriculture purposes.
Source: Author"s estimates adopted from various sources including MEW of Afghanistan.

The present water distribution modus of Amu Darya is based on the Tashkent Agreement of 1987 which regulates the share of water use in the Aral Sea Basin – viz. water of Amu Darya ***and*** Syr Darya River - among the five Central Asian countries up to date, without considering any formal water allocation to Afghanistan. At present, water used by the five riparian countries is estimated to be as follows:

| Riparian Country | Average Annual Water Use in million m³ | Share of Total Average Annual Water Use in % |
|---|---|---|
| Tajikistan | 7,500 | 11 |
| Afghanistan | 5,000 | 7 |
| Uzbekistan | 33,000 | 47 |
| Kyrgyzstan | 1,500 | 2 |
| Turkmenistan | 23,000 | 33 |
| **Total** | **70,000*** | **100** |

*The missing 10,000 million m³ is probably 'lost' along Amu Darya and in its delta at the Aral Depression; source: Author's estimates

**Land.** All rivers originating along the Central mountain range of the Hindukush (= Southern watershed boundary of the Amu Darya Basin) descend to the Northern plains situated in the Northern river Basins of Afghanistan along the left bank of the Amu Darya. The total Afghan area belonging hydrographically to the Amu Darya Basin includes the Northern Basins and the Panj-Amu Basin covering together 167,473 km² among which an area of 90,693 km² (the Panj-Amu Basin = 54%) is actively drained by Afghan rivers towards the Amu Darya. The remaining 76,780 km² (the Northern Basins = 46%) is drained by the "blind" rivers Khulm, Balkhab, Sar-i Pul and Shirin Tagab discharging into the Dasht-i Shortepa and not reaching the Amu Darya Therefore, the share of Afghan territory (167,473 km², all situated on the left bank of Wakhan – Panj – Amu Darya) of the total Amu Darya Basin is 31% or almost one third among the four riparian countries.

A significant area of this Afghan land, most of it being part of the Northern plains situated along the left bank of the Amu Darya, is potentially irrigable (about 800,000 ha) out of which an estimated 385,000 ha are irrigated at present.

**People.** Based on estimates[2], the total Afghan population is now in 2010 expected to be around 35 million out of which about 8 million people (23%) live in Northern Afghanistan, equally distributed at about 4 million people in each of the two major river basin units (Panj-Amu Basin and Northern Basins). With 48 inhabitants per square kilometer, population density in irrigated areas situated along the main tributaries of Amu Darya River and along the latter itself is high.

## Amu Darya Water Use in the 1958 Afghan/ Ex-USSR Agreement

In 1958, the Afghan and Ex-USSR Government signed an agreement regarding their mutual border along Amu Darya which includes in its second part entitled 'Regulations Governing the Use of Frontier (or Boundary) Waters and of Main Roads Intersecting the Frontier Line' among others the following articles:

***Article 7***

1. The term boundary (or frontier) waters in the Treaty means those waters along which the frontier line runs in accordance with the Soviet Afghan frontier demarcation and re-demarcation documents of 1947-1948.
2. The contracting parties shall take measures to ensure that in the use of boundary waters, and those waters that reach boundary waters, the provisions of this Treaty and the special agreements between the Government of the USSR and the Government of Afghanistan are observed, and the mutual rights and interest of both Contracting Parties are respected.
3. In accordance with the general principles of international law, paragraph 2 of this article shall not apply to those waters of the contracting parties which are national internal waters and which are regulated by a regime of national laws of the contracting parties.

***Article 8:*** Both contracting parties shall be allowed water use of boundary waters up to the frontier line without any condition or restriction.

***Article 16:*** Questions concerning the use of boundary waters shall be governed by special agreements between the contracting parties.

[2] *Word Development Indicators*, World Bank, Washington D.C., 2001

***Article 17***

> The competent authorities of the contracting parties shall exchange as regularly as possible such information concerning the level and volume of water in boundary rivers and also concerning precipitation in the interior of the territory of the two parties as might avert danger or damage from flooding. The competent authorities shall as necessary also agree on a mutual system of signals during periods of high water.

Besides two further agreements signed between the same parties in 1961 and 1964 with regard to hydraulic structures in general and hydropower use in the Amu Darya Basin in particular, this international agreement between the ex-USSR and the former Kingdom of Afghanistan has since then neither be modified nor cancelled, and is hence still valid according to internationally acknowledged legal practice: successive states remain bound by former obligations including issues of border, territory and water resources. It should be noted, however, that this agreement does not specify any water allocation to any of the riparian countries sharing water resources in the Amu Darya Basin.

**Afghan/Tajikistan Consultation and Cooperation**

In recent years, a number of consultations between Tajikistan and Afghanistan has taken place. These consultations comprised various issues including integrated water resources management and planning in the Amu Darya Basin in general, and the installation of hydrological stations and bank protection measures along Panj River in particular. In spite of the good spirit prevailing during the meetings in the past, little concrete actions followed the good intentions.

***Protocol signed on August 3, 2007.*** This protocol was signed between the Minister of Energy and Water of the Islamic Republic of Afghanistan and the Minister of Water Resources and Melioration of the Republic of Tajikistan in Dushanbe on August 3, 2007 with reference to and based on the Afghan/ex-USSR Agreement of 1958. Main and important points in this protocol are (i) cooperation on planning and investment in the water sector; (ii) execution and implementation of Amu Darya bank protection works; (iii) provision to technical investigation groups for water resources planning in the irrigation and hydropower sub-sectors and facilitation of their works including ensuring their security; and (iv) facilitating the rehabilitation of previous hydrological gauging stations along the Panj river and Amu Darya and determining new installation sites.

***Protocol signed in July14, 2010.*** This protocol was signed between the Minister of Energy and Water of the Islamic Republic of Afghanistan and the Minister of Water Resources and Melioration of the Republic of Tajikistan in Dushanbe on July 14, 2010 with reference to and based on the Afghan/ex-USSR Agreement of 1958. The parties discussed and agreed upon an exchange of water from either side of the Amu Darya to provide the concerned population with drinking water of the amount of 150 l/s, respectively.

***Draft Memorandum of Understanding.*** In 2007, too, a Memorandum of Understanding was drafted by representatives from Tajikistan and Afghanistan respectively, covering the following major issues: (i) formation of a Joint Working Group; (ii) establishment of protocols to promote hydrological and related studies; (iii) provision of support for fruitful cooperation and strengthening the implementation of joint programs; (iv) exchange of information related to water issues; (v) implementation of joint bank protection measures; (vi) establishment of a data sharing mechanisms and facilitation of data collection; (vii) training of specialists in

water and energy resources management; and (viii) facilitation of know-how transfer and experience between the two countries.

**International Standards and Best Practice of Water Sharing**

In accordance with the Almaty Declaration of 1991, the former Soviet Republics have taken responsibility for all obligations of the Soviet Union and continue with water allocation mechanisms agreed upon during the Soviet period. This follows international standards.

Regarding 'best practice of water sharing', the situation is different: up to present day, no multi-lateral water (and energy) sharing agreement has been reached so far among the five riparian countries sharing the Amu Darya Basin. Water allocations to four countries – Kyrgyzstan, Tajikistan, Uzbekistan and Turkmenistan - out of the five riparian countries are determined by Protocol 566, endorsed in Moscow in 1987. The water allocation quota established by the Scientific and Technical Council of the Ministry of Land Reclamation and Water Resources Management of the Soviet Union in this Protocol continue to be applied since 1987 as follows:

| Country | Maxim Allocation [million m³] | Share [%] |
|---|---|---|
| Kyrgyzstan | 400 | 0.7 |
| Tajikistan | 9,500 | 15.4 |
| Uzbekistan | 29,600 | 48.1 |
| Turkmenistan | 22,000 | 35.8 |
| **Total** | **61,500** | **100** |

Source: *Protoc0l 566: Improvement of the Scheme on Complex Use and protection of Amu Darya Water Resources by the Specific and Technical Council*, Ministry of Land Reclamation and Water Management of the Soviet Union, Moscow, 10 September 1987.

In determining the annual maximum water use by the four benefiting countries to 61,500 million m³, the annual share of water for Afghanistan was assumed to be 2,100 million m³. The remaining 6,400 million m³ were considered to ensure sufficient environmental flow to the former Aral Sea. Though the Interstate Commission for Water Coordination (ICWC) was established in 1992, there were, however, – and there are up to date - no adequate means to control the allocated quota in an objectively verifiable manner. Recognizing the rapid disappearance of the Aral Sea, the Council of Ministers of the Soviet Union issued in 1988 Decree 1110 which specified annual minimum inflow quota for Amu Darya and Syr Darya successively increasing in total from 8,700 million m³ in 1990 to 20,000 million m³ in 2005. These annual minimum environmental flow volumes to the former Aral Sea agreed upon in this Decree are still considered to be valid by the now independent four countries. Needless to note that no country among the four adhered to Decree 1110 in the past or does so at present which in any case could not have saved the Aral Sea.

Worldwide there are many good (and bad) examples of water sharing in trans-boundary river basins which could facilitate water sharing mechanisms in the Amu Darya Basin: either by avoiding unsuccessful attempts through 'lessons learned' (such as in the case of the Euphrates-Tigris Basins) or by replicating and/or adapting practical multi-national river basin management models (such as the one applied in the Niger Basin) to the specific conditions in the Amu Darya Basin.

## The Importance of Amu Darya Headwaters for Irrigation Water Availability

For too long, the international community has chosen to ignore the difficulties encountered by regional governments in trying to protect and conserve headwater areas[3], and their crucial, life supporting function along perennial rivers. Their protection and conservation are not feasible without offering local populations an economically viable and ecologically sustainable alternative to their present (usually traditional) farming systems, which are mostly ill adapted to the fragile, limited or shrinking natural resource base. For further illustration, a 2007 Country Environmental Analysis of Tajikistan (covering more than three quarters of Amu Darya's headwater area) by the World Bank states that *'irrational land management practices exacerbated by intermittent droughts' have resulted in many pockets of desertification, and between 96–100% of all national rangelands are degraded"*.

Among the most important headwater areas worldwide is the upper Amur Darya Basin, the greatest part of it covered by the Pamirs[4]. The Amu Darya is the lifeline and source of prosperity for over 25 million people living in the lower part of the Amu Darya Basin in Afghanistan, Tajikistan, Uzbekistan and Turkmenistan, and depending on its water for the irrigation of crops on over six million hectare of land. It is undisputed that the upper Amu Darya Basin urgently needs an investment program to restore ecological equilibrium to the Pamirs in Kyrgyzstan, Tajikistan, and Afghanistan (see below under 'Recommendations')

Integrated water resources management (IWRM) – already practiced in the lower Amu Darya basin - must be shifted to the upper part, including the Kunduz and Kokcha basins, towards the headwater area which may be considered most crucial in a river basin: it is the origin of all surface water, of most of the renewable groundwater resources, and — being mountainous - one of the most sensitive ecological systems. Climate impact on glacier melting and hence seasonal changes of water availability are already evident and proven. The only variable not yet determined with sufficient certainty is the time when the negative impact of reduced Amu Darya stream flow will eventually occur (assumed to happen between 2040-2060) after a temporary increase of stream flow due to increased snow melt in the coming 30 years.

In the case of the upper Amu Darya Basin, geo-political issues have and will dominate its natural resources use: caught in the middle of intensifying East-West trade, increased South-North drug trafficking, and the first Taleban reported in 2009 to have crossed the Panj river into GBAO, the role of some 8 million Afghans living in the North and Northeast of Afghanistan, including 300,000 odd Pamiri (living in Tajikistan and Afghanistan) cannot only be limited to practice survival strategies and rely on their well-known resilience but need to be enhance to face future challenges and to achieve a satisfactory living standard together with a positive prospect for future generations. This also includes the Afghan population living in the headwater areas of tributary rivers originating in the Central Highlands. Only then there is a chance that the Pamirs' and Hindukhsh's water resources will continue to ensure increased prosperity for the population living in the lower part of the Amu Darya Basin, particularly in Uzbekistan and Turkmenistan, through the provision of sufficient irrigation water. The unacceptable alternative would be to ignore the plight of the Afghans and Pamiri, to risk further deterioration of the environment, and eventually to facilitate shelter to and clandestine agitation of criminal elements in a predictable void.

[3] Keynote of the 10th World Water Congress in Melbourne, 11-17 March 2000, Walter Klemm

[4] The Pamirs are a high altitude plateau (3,000-4,500m) at the meeting point of seven countries: Afghanistan, China, Kyrgyzstan, Pakistan, Tajikistan and Uzbekistan

## Climate Impact

Climate change has already affected irrigation water availability in the Amu Darya Basin: Due to earlier snow melting spring floods increase in size and a shortage of water occurs in summer and early autumn increasing the risk of water shortages particularly in years of drought. Due to climate change the role of nature to regulate and preserve the water resources throughout the year is reduced. To enhance this role and complement it, manmade water control is required through new reservoirs regulating seasonally variable stream flow, and providing sufficient water for drinking and irrigation purposes in summer and autumn

## Irrigation in Northern Afghanistan

By 1980, Afghanistan is recorded to have used about 5,000 million m³ of Amu Darya water for irrigation purpose[5] in Northern Afghanistan – and here mainly along the Amu Darya itself, in the tributary river basins of Kokcha and Kunduz, and along the Panj River, viz. in the Amu-Panj Basin. The then irrigated area is estimated to be in the order of some 385,000 ha. Under improved on-farm water management and taken into consideration the return flow from the irrigated fields situated upon the alluvial aquifer of the Amu Darya, this would roughly correspond today to an irrigation water requirement of 4,000 million m³.

Based on the available information[6], since the Seventies and Eighties, the following major irrigation schemes were planned:

### *Lower Kokcha Irrigation and Hydropower Project*

The implementation of phase I of this project was started before 1980 but due to war the physical works were stopped. Detailed design as well as technical and economical studies of this project were carried out with the assistance of ex-USSR experts. From 2004 to 2009, a new feasibility study has been completed by a well known international consulting firm taking into account new socio-economic and environment requirements, At present, preparations are under way to tender the detailed studies of the project which include the following services and works:

- Provision of sufficient water to irrigate 96,000 ha of existing agricultural land;
- Provision of sufficient water to irrigate 37,000 ha of new land;
- Installation of a 42 MW hydropower plant and provision of electricity for pump irrigation and to neighboring villages;
- Contribution to national food security through the production of more crops ; and
- Creation of job opportunities to raise incomes of local population.

The project will be implemented in phases with the rehabilitation of 96,000 ha tentatively scheduled to be completed by 2016, and the irrigation of the 37,000 ha of new land by 2020.

### *Kelagay Irrigation and Hydropower Project*

This project is located on Kunduz River, one of the tributaries of Amu Darya in Baghlan Province. It was also studied and designed in with the technical and financial help of ex-

[5] Water Resources Development in Northern Afghanistan and its Implications for the Amu Darya Basin, Masood Ahmad & Mahwash Wasiq, World Bank, Washington D.C., 2004.
[6] Source: Ministry of Energy and Water (MEW) of Afghanistan

USSR experts in the Seventies and Eighties. Recently, a fresh feasibility study considering all new requirements was conducted by a well known international company.

Major feature sof this project are as follows:

- Reliable irrigation water supply to 43,250 ha of existing agricultural land,
- Provision of reliable irrigation water supply to 25,365 ha of new irrigable land;
- Hydropower generation with a 60 MW plant;
- Contribution to national food security through the production of more crops, support to fishery, and establishment of processing industries; and
- Creation of job opportunities to raise incomes of local population.

The project is thus under design and expected to be completed by 2020.

### *Upper Amu or Lower Panj Irrigation and Hydropower Project*

The proposed site of this project is located on Amu Darya in Kunduz province. It was also studied and designed with the technical and financial help of ex-USSR experts in Seventies and Eighties. Recently a new feasibility study considering all pertinent requirements is under way. This feasibility study, too, is carried out by an internationally renowned company.

Right now, this project is in its initial planning stage and the exact area to be irrigated is not yet determined. It is estimated, however, that the potentially irrigable area exceeds 500,000 ha of existing and new land, and that the installed hydropower capacity may reach up to 1,000 MW. The expected irrigated area to be developed within the coming 10 years is about 215,000 ha.

***Summary.*** By 2020, the three planned major irrigation projects would comprise an additionally irrigated area of some 200,000 ha resulting in a total irrigated area in the Afghan part of the Amu Darya Basin (without the Northern Basins whose rivers do not contribute water to the Amu Darya) of approximately 600,000 ha corresponding to an annual maximum of 6,000 million m³ water withdrawn from Panj, Amu Darya itself and the major 'boundary' rivers Kokcha and Kunduz.

### *NATO's ENVSEC (Environment and Security) Initiative*

This initiative has its origin in a project proposal prepared by UNEP/GRID Arendal/Norway on behalf of the Tajik Agency for Hydro-Meteorology and Environmental Monitoring in Dushanbe in 2007 under the title 'Strengthening trans-boundary cooperation in water resources management between Afghanistan and Tajikistan in the upper Amu Darya River Basin'.

## Impact of Planned Afghan Irrigation Schemes on Amu Darya Water Use

**Situation in 1980 (see also above).** The volume of water that was diverted from rivers of the Amu-Panj Basin (mainly Kokcha and Kunduz River) "appears to have been about 5,000 million m³ in 1980" which corresponds to a reasonable irrigation water requirement rate of 13,000 m³/ha at 50% overall system efficiency[7]. This assumed volume is derived from a 1965 estimate of 2,500 million m³ which at that time (in 1965) irrigated about 200,000 ha,

[7] *Water Resources Development in Northern Afghanistan and its Implication for Amu Darya Basin*, M. Ahmad, M, Wasiq, The World Bank, Washington D.C., 2004

approximately half the area under irrigation in 1980 which was approximately 385,000 ha in the Amu-Panj Basin.

**Recent past (from 2004 onwards) and present situation.** All over Afghanistan, existing irrigation schemes have been and are at present rehabilitated and modernized. Under the Emergency Irrigation Rehabilitation Project, the Ministry of Energy and Water (MEW) together with the Food and Agriculture Organization of the United Nations (FAO) has rehabilitated 80 traditional irrigation schemes with a total area of around 80, 000 ha of land situated in the Northern Basins. More than 700 farmers and Mirabs (Water Bailiffs) were trained for proper water management and operation and maintenance of the rehabilitated schemes which eventually improved water efficiency by 5 to 10%.

In the Panj-Amu Basin, too, a large number of irrigation schemes were and still are under rehabilitation and modernization, their total area reaching about 50,000 ha. With about 250,000 ha at present under active irrigation, there are 135,000 ha left for rehabilitation and modernization requiring an annual water volume of about 1,500 million $m^3$. Thus, at present, we may have a similar situation as in 1965 with an irrigated area of 250,000 ha using about 2,500 million $m^3$ of water in the Amu-Panj Basin.

**Future situation.** Once all formerly (in 1980) existing irrigable areas are brought under production again, the required irrigation water requirements would have benefitted from efficiency gains through better on-farm water management. Hence, a reduced amount of some 4,000 million $m^3$ of irrigation water would be needed to satisfy annual cropwater requirements withdrawn from the Kokcha and Kunduz rivers, from the other "boundary rivers" joining Panj river, and from the latter, and the Amu Darya itself. This would leave Afghanistan using 1,000 million m3 less irrigation water than in 1980.

In the case of additional irrigation development under the Upper Amu or Lower Panj Irrigation and Hydropower Project, up to 500 $m^3/s$ would be diverted for irrigation purpose from the Amu Darya. By 2020, however, not more than about 215,000 ha might be brought under irrigation corresponding to an additional annual irrigation water requirement of some 2,000 million m3. This would amount to a total water use of Amu Darya water in Northern Afghanistan of about 6,000 m3 which is only 1,000 million m3 or 1.4% of the mean annual Amu Darya volume more than in 1980. This appears to be the maximum possible water withdrawal from Amu Darya by Afghanistan during the coming decade, still representing a very ambitious program of investment in irrigation development and expansion of irrigated areas.

## Recommendations to Adjust Impact (if any) by the Riparian Countries

The impact of water withdrawal for irrigation purposes by Afghanistan may be mitigated by improved water management practices to increase productivity in irrigated agriculture - known to be necessary in all riparian countries including Afghanistan itself. If Uzbekistan and Turkmenistan continue to improve the drainage systems of their irrigation schemes and increase field application efficiency by better on-farm water management, some 2,000 $m^3$ per hectare in year could be saved. This translates in an annual amount of water saved of 8,000 million $m^3$ - a significantly higher amount of water than the assumed future Afghan demand due to the planned increase of irrigated area.

In order to improve overall water use in the Amu Darya Basin including the accommodation of Afghanistan's share in the near future, crucial issues should be discussed and persistent problems solved by targeting the following eight points:

1. **Consultation and collaboration among the five riparian countries:** Afghanistan should continue to participate (or at least be an observer in the initial stage) in dialogue for improved water management in the Amu Darya Basin not only with Tajikistan but also with the other four riparian countries. Starting with consultations on technical aspects such as sharing hydro-meteorological data and operating together gauging stations of common interest will be helpful in deepening the dialogue concerning basin-wide water management and development in the future.
2. **Formalized regional cooperation of the five riparian countries:** The participation of Afghan experts in the work of relevant Central Asian regional organizations would allow the joint management of shared water resources and adaptation to climate change at regional level. The development of such cooperation would also give an opportunity to deepen the knowledge on available water resources, their variability and dependency on accelerated glacier melting in the upper Amu Darya Basin, and subsequently their impact on irrigation water availability in the lower Basin. In the long-term, the inclusion of Afghanistan as a full partner in the future legal and institutional framework for cooperation on the Amu Darya is an obvious objective.
3. **Improvement of the hydro-meteorological data base** including the installation and operation of key hydrological, and meteorological stations (including snow gauging) situated along the Panj-Amu Darya. In this regard, many initiatives have been undertaken in the past. They should be strengthened and their results integrated in day-to-day management of the Amu Darya Bain's water resources.
4. **Protection of Amu Darya headwater area:** Considering the crucial importance of a basin's headwater area in preserving downstream water availability – particularly in the Amu Darya Basin for irrigation purposes under negative climate impact (change in the regime of the river because of shrinkage of glaciers and early snow melt), urgent actions to be undertaken and embedded in a regional cooperation program focusing on policies and strategies to increase technical capacities and to operate a hydro-meteorological observation network in mutual trust are:
   - The establishment of a "Rural Investment Facility" at a central location in the headwater area, for example by the Government of Tajikistan in Dushanbe with delegated program implementation authority given to the Governorate of the Gorno Badakhshan Autonomous Oblast (GBAO) in Khorog;
   - The coordination of all investment related projects, and the development of a methodology to select investment projects on their merits to livelihood improvement, ecological balance and sustainability; and
   - The willingness and determination to draw lessons from past project activities for the implementation of adapted farming systems that respond to, and ultimately restore, the fragile and degraded conditions of land and water in the different agro-ecological zones of the Pamirs and Hindukush.

   Eventually, the importance of assisting the population living in the upper Amu Darya Basin cannot be overemphasized as more evidence of future irrigation water shortages in the lower part of the Basin are evident – though the observed acceleration of glacier melting will increase Amu Darya stream flow in the short and medium term.
5. **Planning and implementation of Amu Darya river training** works including Amu Darya bank protection. Studies in this regard are under way.

6. **Irrigation and hydropower planning:** the upper Amu Darya Basin is very potential for power generation which not only fulfill the requirements of CA countries also can partly fulfill the shortcoming of energy in South Asian countries, therefore implementation of joint hydropower projects for the benefit of all CA countries is recommended.
7. **Energy exchange:** Right now there is good progress in the field of energy trade between Afghanistan and the CA countries as well as with Pakistan and India.
8. **Transport:** Recently a trade agreement between Afghanistan and Pakistan was signed. Based on this agreement, Afghanistan can export its goods to India through Pakistan and Pakistan can export its goods to CA through Afghanistan. This type of initiative beyond Amu Darya water resources management is beneficial for all countries in the region.

---

**References**


Glantz, M.H. (ed.), 2002: *Water, Climate, and Development Issues in the Amu Darya Basin*. Report of Informal Planning Meeting held 18–19 June 2002 in Philadelphia, Pennsylvania. Boulder, CO: Environmental and Societal Impacts Group, NCAR.

Masood, A. Wasiq, M., 2004: *Water Resources Development in Northern Afghansistan and its Implications for Amu Darya Basin.* World Bank Working Paper No. 36, Washington D.C.

Prokosch, P., 2007: *Strengthening trans-boundary cooperation in water resources management between Afghanistan and Tajikistan in the upper Amu Darya River Basin*, Tajik Agency for Hydro-Meteorology and Environmental Monitoring in cooperation with ENVSEC (Environment and Security) Initiative, UNEP/GRID Arendal, Norway

Documents on Kabul International Conference on Afghanistan, Kabul, 2002

Afghanistan National Development Strategy and Prioritization and Implementation Plan, Kabul, 2010

News letter of Ministry of Energy and Water of Afghanistan, 06-08/2010 series,