

**PART III**

**DESCRIPTION OF RIVER BASINS**

Picture 38

Two different worlds separated by only a river; on the right bank of the Murghab river, '*kuchi*' nomad tents in Afghanistan, on the left bank, a cooperative in Turkmenistan. Water is largely unused on the Afghan side.  
Murichak, Bala Murghab, 21 May 2003 (N35.72, E, 63.19, NW)



## I. MAPS AND STATISTICS BY RIVER BASIN

The map 8 shows the boundaries of the five River Basins delineated for Afghanistan:

1. The Amu Darya River Basin
2. The Northern River Basin
3. The Harirod-Murghab River Basin
4. The Hilmand River Basin
5. The Kabul (Indus) River Basin

For each river basin, source of water, transboundaries riparian issues, natural resources, protected areas, land cover, type of agriculture, hydrological infrastructures (dams) and main historical development along water sources are summarized and whenever possible illustrated with pictures. The tables 8, 9 and 10 present statistics on area, population and the main land cover features by river basin. The graph 9 shows that the largest of these 5 basins is the Hilmand basin as it covers alone 43% of the national territory. The other 4 basins have similar size and represent 10 to 14% of the country. In additions to these river basins, there are 4 none drainage areas, namely Namaksar, Registan-i Sedi, Registan and Dasth-i Shortepa.

The graph on Map 8 shows that 57% of the total river flow in Afghanistan originates from the Amu Darya River Basin. The Kabul (Indus) and Hilmand River Basins contributes respectively to 26 and 11% of the total water flow. The Harirod-Murghab and Northern River Basins have a very small contribution of respectively 2 and 4%.

### Map 9

**River Basins and watersheds vectors on Landsat Satellite Image. The satellite image illustrates the features in Afghanistan and its neighbouring countries (i.e. light blue on the top left: snow; green: vegetation, mostly irrigated areas along rivers; blue: water bodies) few . Note in particular :**

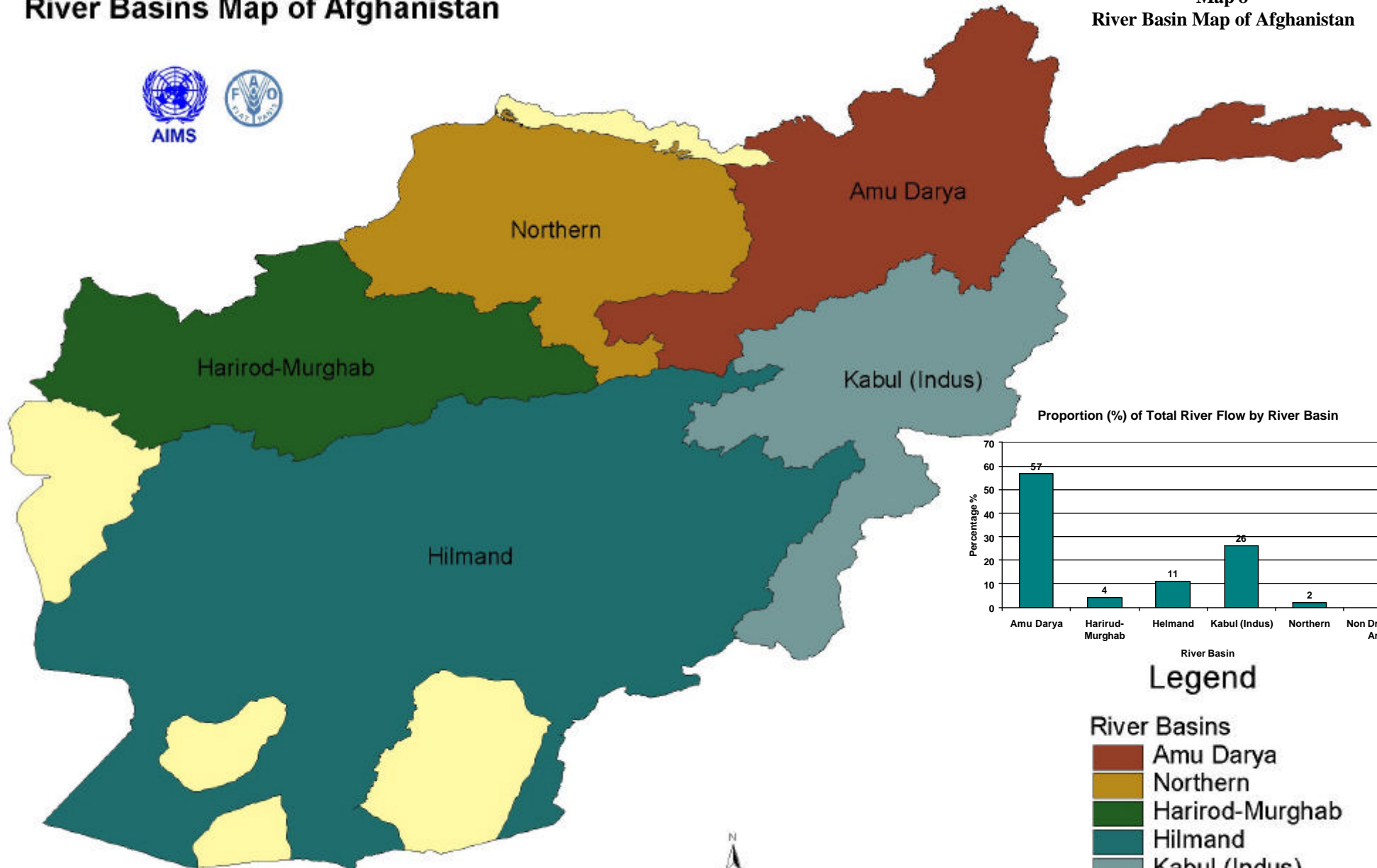
- **The end drainage areas of the Hari Rod and Murghab rivers forming the irrigated oases ‘delta’ of Tejen and Merv (or Mary) in Turkmenistan (above-left).**
- **The irrigated oases ‘delta’ within Afghanistan boundaries formed by various rivers of the Northern River Basin (above centre.**
- **The Sistan depression wetlands between Afghanistan and Iran (bottom-left)**
- **The Indus valley (bottom right)**

#### **Digitally Compressed Mosaic of Afghanistan/Pakistan and Environs (Map 9)**

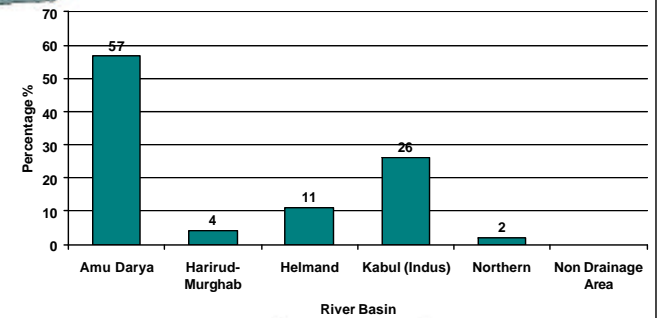
The image with this document is a mosaic of more than 100 Landsat-5 Thematic Mapper scenes acquired within one or two years of 1990 (the original image covers a larger area with 163 images). The image is digitally compressed by MrSID. The color image is comprised of three spectral bands, TM 7, 4, and 2 composited as R, G, and B respectively. The mosaic is unprojected (in geodetic latitude and longitude) on the WGS84 datum/spheroid with a pixel size of two arc seconds (approximately 60 meters). The image mosaic was spectrally enhanced using EarthSat’s LOCAL enhancement technique. This custom approach to contrast adjustment allows the preservation of spatial information across large areas of extreme brightness differences. Mosaiced and color enhanced by Earth Satellite Corporation ([www.earthsat.com](http://www.earthsat.com)).

# River Basins Map of Afghanistan

Map 8  
River Basin Map of Afghanistan

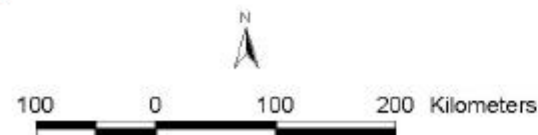


Proportion (%) of Total River Flow by River Basin



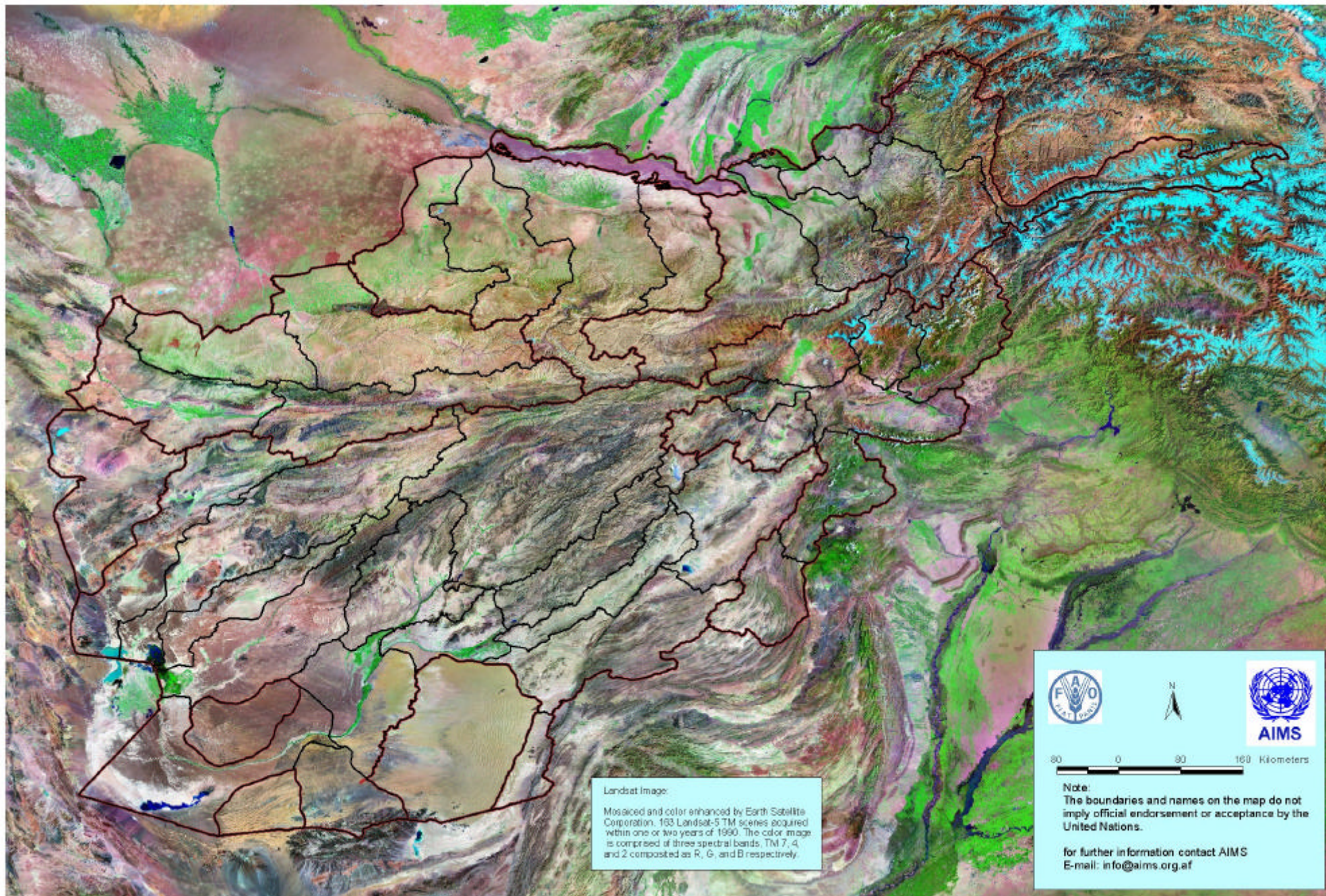
## Legend

- River Basins**
- Amu Darya
  - Northern
  - Harirod-Murghab
  - Hilmand
  - Kabul (Indus)
  - None-Drainage Area



Note:  
The boundaries and names on the map do not imply official endorsement or acceptance by the United Nations

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E-mail: [info@aims.org.af](mailto:info@aims.org.af)



**Table 8**  
**Area and Population by River Basin**

River Basins	Area Ha	Area (sq. km.)	%	Number of Settlements	%	Settled Population*	%	Population Density
Amu Darya	9069189	90692	14.04	4152	13.30	2968122	14.34	33
Harirod-Murghab	7760366	77604	12.02	2959	9.48	1722275	8.32	22
Hilmand	26234136	262341	40.62	14041	44.96	5881571	28.42	22
Kabul (Indus)	7690829	76908	11.91	7039	22.54	7184974	34.72	93
Northern	7090127	70901	10.98	2969	9.51	2783033	13.45	39
None Drainage Area	6735636	67356	10.43	69	0.22	151629	0.73	2
<b>Total</b>	<b>64580283</b>	<b>645803</b>	<b>100.00</b>	<b>31229</b>	<b>100.00</b>	<b>20691604</b>	<b>100.00</b>	<b>32*</b>

\* Based on CSO 2003-04 Figures. Nomadic population not included.

**Table 9**  
**Snow Cover, Water Bodies and Marshlands by River Basin**

River Basins	Area (sq. km.)	Snow Cover	%	Water Bodies	%	Marshlands*	%
Amu Darya	90692	10385	71.00	62	2.51	678	16.23
Harirod-Murghab	77604	49	0.34	13	0.51	127	3.04
Hilmand	262341	73	0.50	2271	91.48	2284	54.67
Kabul (Indus)	76908	4074	27.86	25	0.99	264	6.32
Northern	70901	44	0.30	33	1.33	205	4.92
None Drainage Area	67356	0	0.00	79	3.20	619	14.82
<b>Total</b>	<b>645803</b>	<b>14626</b>	<b>100.00</b>	<b>2483</b>	<b>100.02</b>	<b>4177</b>	<b>100.00</b>

\* Permanently and Seasonally inundated

**Table 10**  
**Agriculture Land, Rangeland and Forest Cover by River Basin**

River Basins	Irrigated land*	%	Intermittently Cultivated	%	Rain-fed Land **	%	Rangeland	%	Forest Cover ***	%
Amu Darya	3540	22.70	481	2.92	13156	29.13	56643	19.41	648	4.96
Harirod-Murghab	1725	11.06	1284	7.79	9371	20.75	52481	17.98	99	0.76
Hilmand	4758	30.50	9002	54.61	2344	5.19	113258	38.81	114	0.87
Kabul (Indus)	3060	19.62	1781	10.80	1554	3.44	37152	12.73	12141	92.91
Northern	2378	15.25	3870	23.48	18747	41.50	32148	11.02	64	0.49
None Drainage Area	138	0.88	67	0.41	0	0.00	131	0.05	1	0.01
<b>Total</b>	<b>15598</b>	<b>100.00</b>	<b>16485</b>	<b>100.00</b>	<b>45172</b>	<b>100.00</b>	<b>291813</b>	<b>100.00</b>	<b>13067</b>	<b>100.00</b>

\* Intensively cultivated (1 and 2 crops per year)

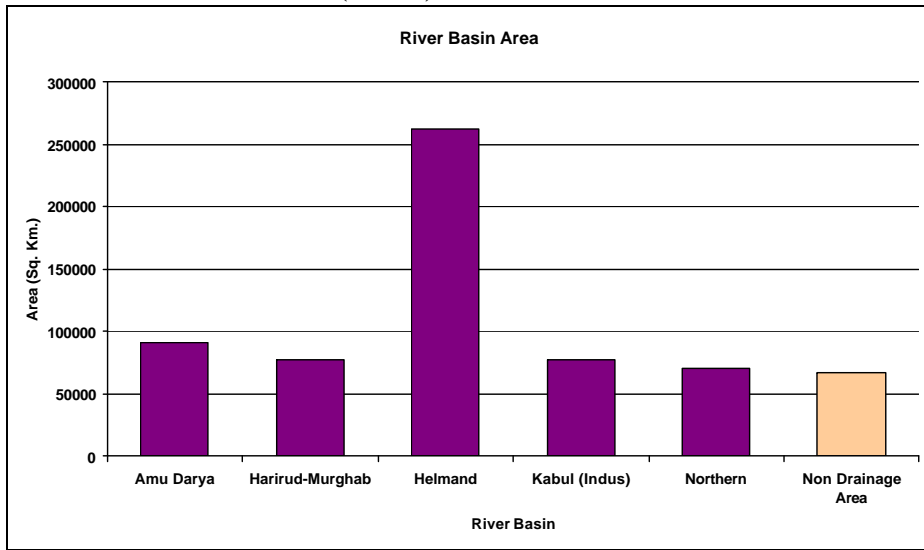
\*\* Sloping and Flat Laying Areas

\*\*\* Degenerated, Open and Closed Forest Cover

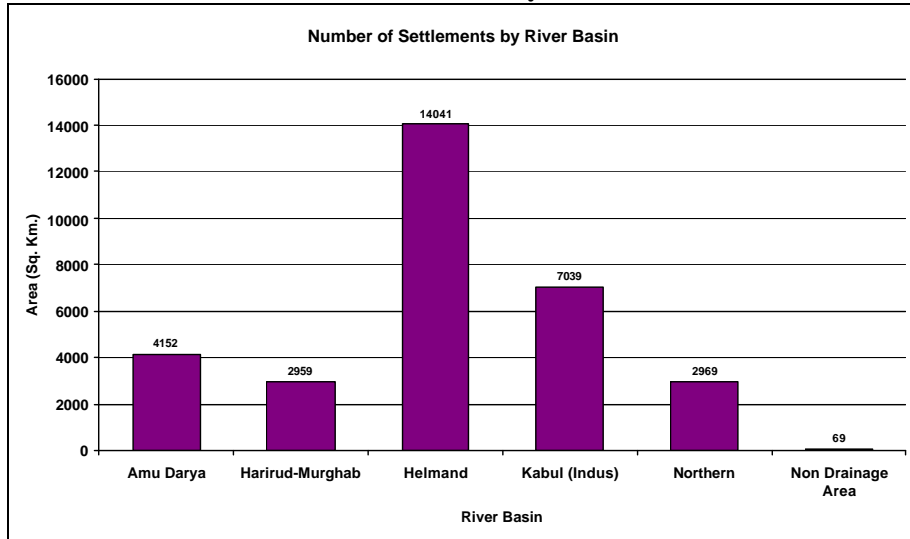
The graphs 10, 11 and 12 show that the largest number of settlements are located in the Hilmand river basin, however the largest settled population density is found in the Kabul (Indus) river basin with 93 inhabitant/Sq. km. The national average is 32 inhabitants per Sq. km. (nomadic population not included). None-drainage areas have the lowest population density with 2 inhabitant per Sq. km. Pressure on natural resources are likely to be highest in the Kabul (Indus) river basin.

The graphs 13 to 20 show different landcover classes area by river basins. The permanent snow cover is most important in the Amu Darya river basin and the Kabul (Indus) river basin and close to nil in other river basins. The water bodies and marchlands are chiefly found in the Hilmand river basin (Hamum-i Hilmand). A significant proportion of marchlands are found in the Amu Daria river basin and the none-drainage areas. Forests are chiefly found in the Kabul (Indus) river basin (pistachio forests are not reflected in the graph 18). Irrigated land is found in a good proportion of all river basins. The Hilmand river basin includes the highest acreage of irrigated land, both intensively and intermittently cultivated while the lowest is the Harirod-Murghab river basin. The Northern rain-fed belt lies across the Amu Daria, Northern and Harirod-Murghab river basins, with the highest acreage in the Northern river basins. Rangeland is found in all river basins, but mostly in the Hilmand river basin.

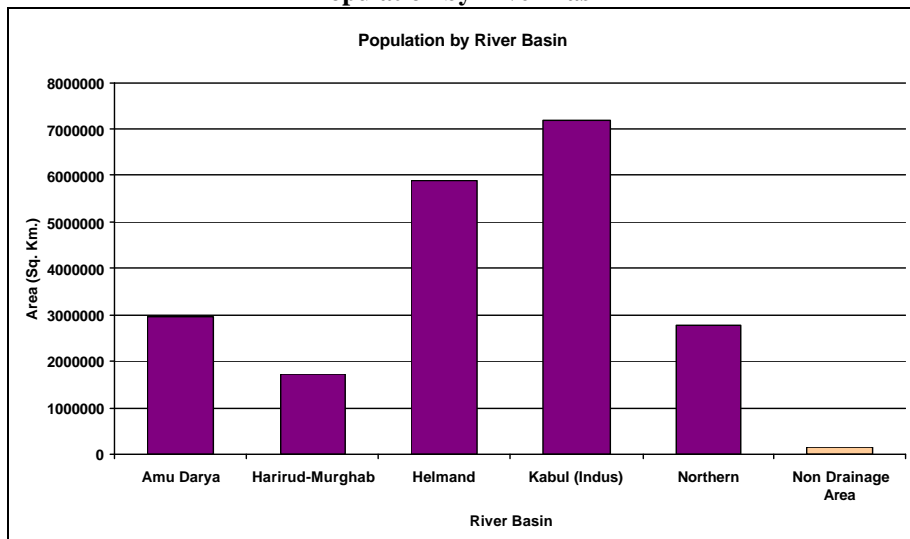
**Graph 9**  
**Area (S. Km.) of each River Basin**



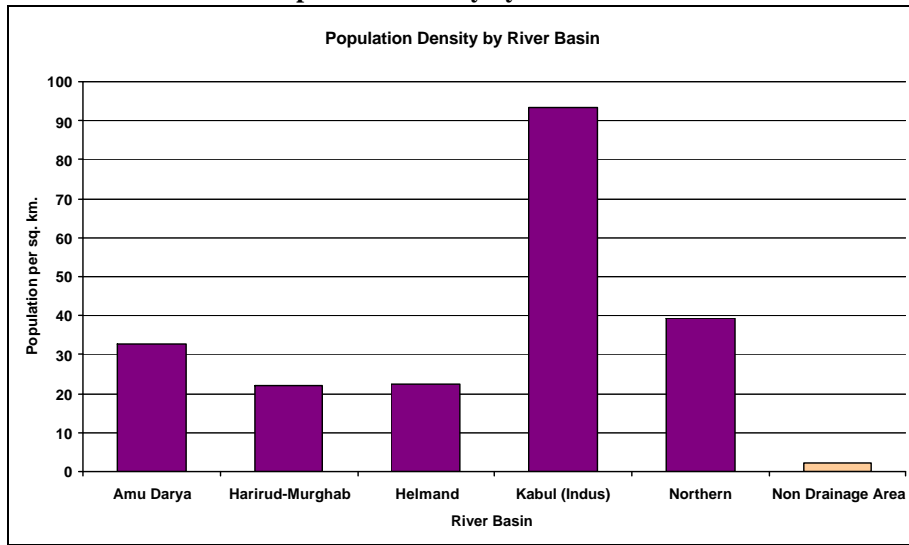
**Graph 10**  
**Number of Settlements by River Basin**



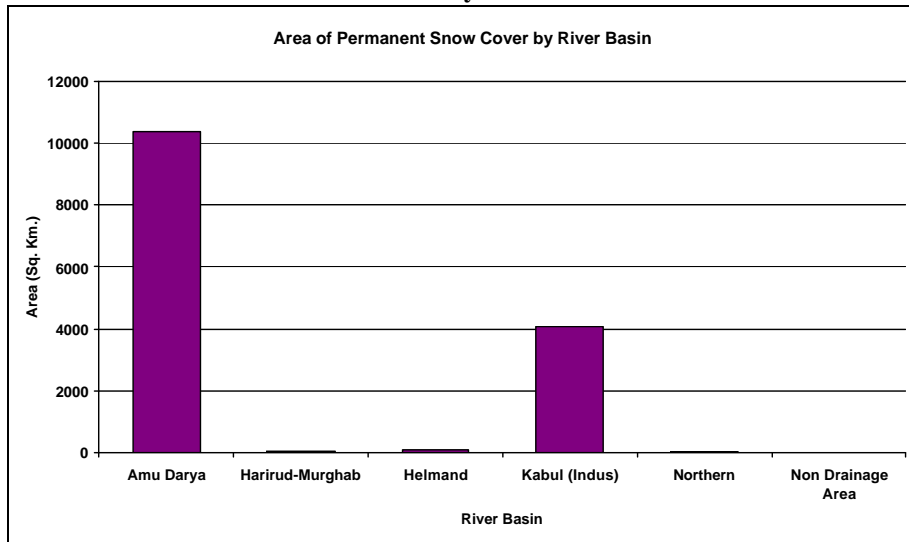
**Graph 11**  
**Population by River Basin**



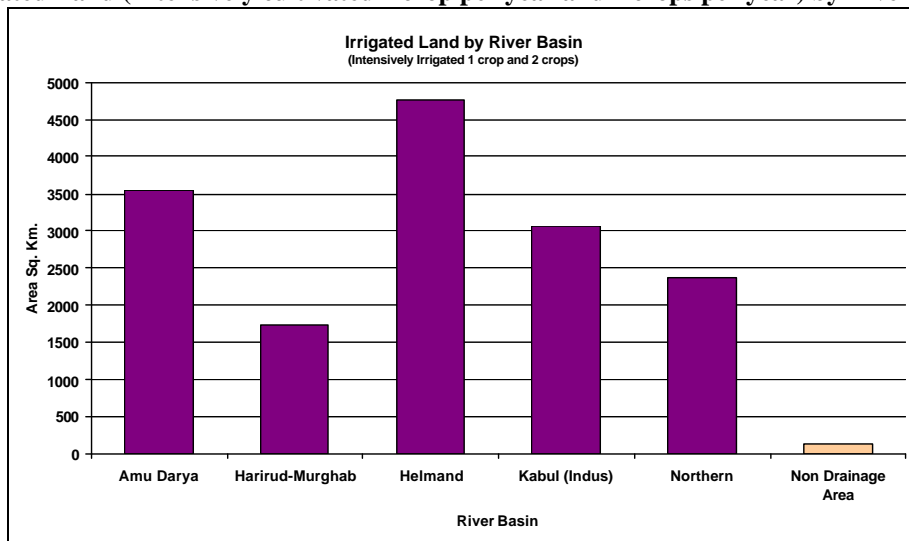
**Graph 12**  
**Population Density by River Basin**



**Graph 13**  
**Snow Cover by River Basin**

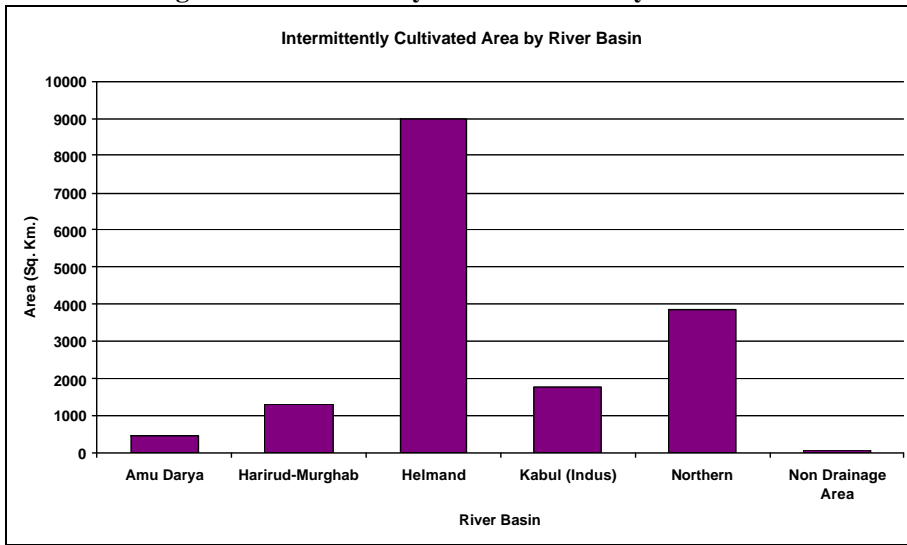


**Graph 14**  
**Irrigated Land (Intensively cultivated 1 crop per year and 2 crops per year) by River Basin**

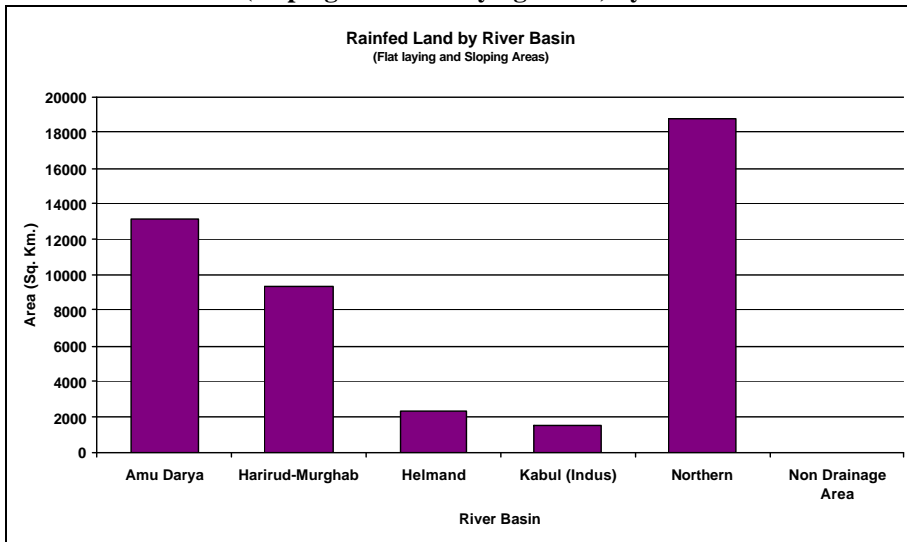




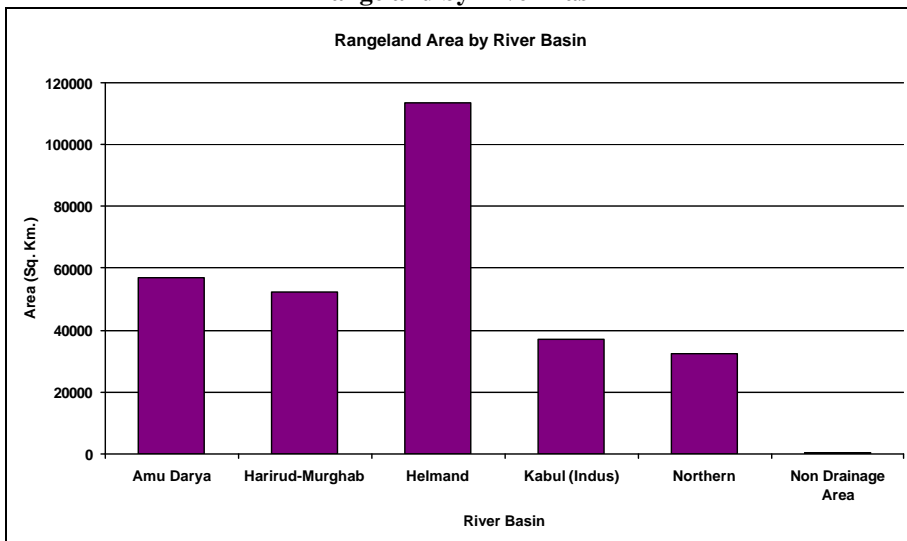
**Graph 15**  
**Irrigated – Intermittently cultivated Land by River Basin**



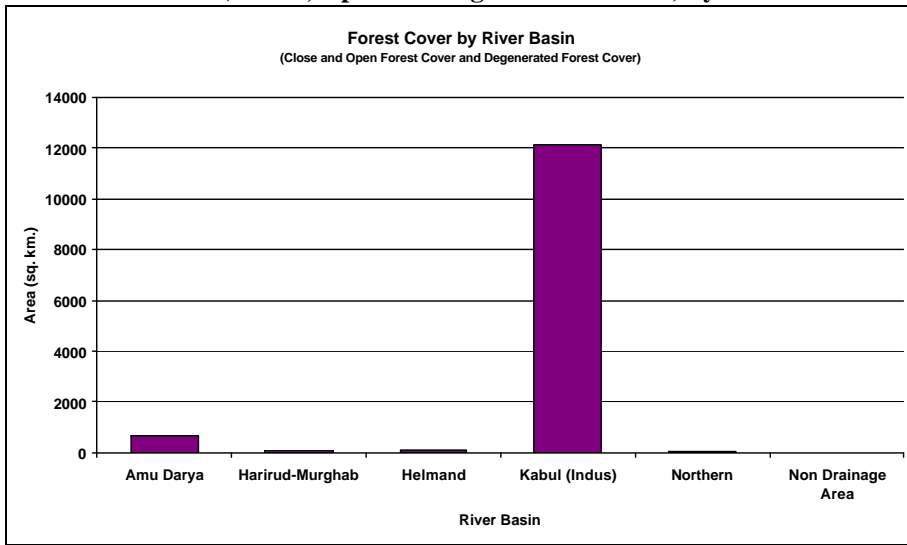
**Graph 16**  
**Rain-fed (Sloping and Flat Laying Areas) by River Basin**



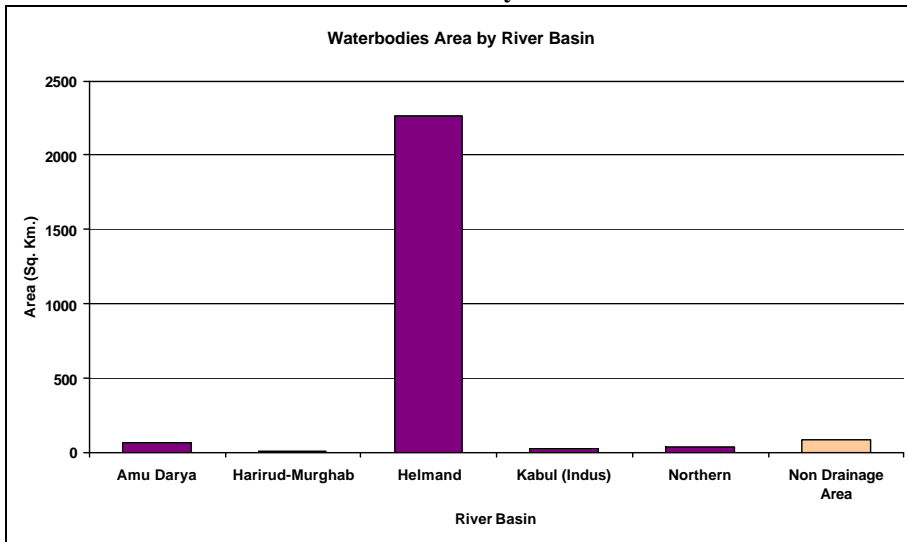
**Graph 17**  
**Rangeland by River Basin**



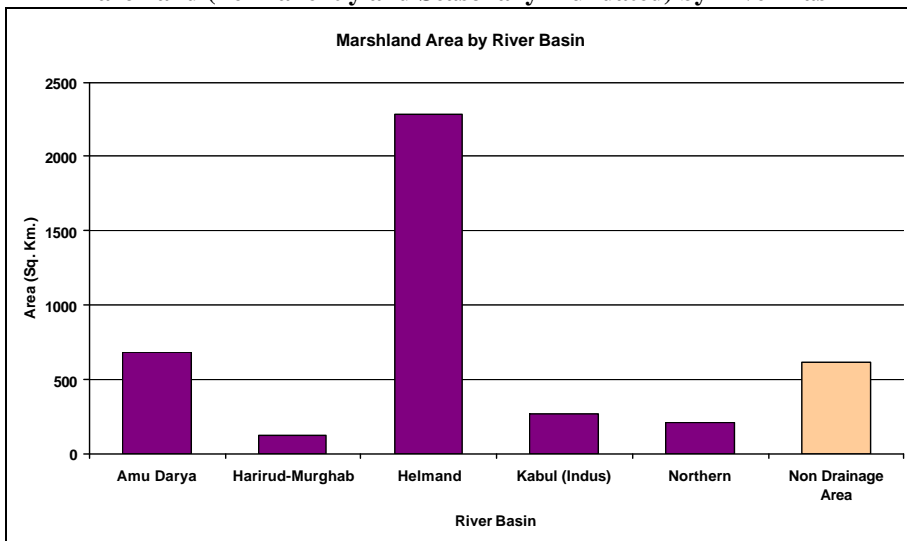
**Graph 18**  
**Forest Cover (Closed, Open and Degenerated Classes) by River Basin**



**Graph 19**  
**Water Bodies Area by River Basin**



**Graph 20**  
**Marshland (Permanently and Seasonally Inundated) by River Basin**



## II. NOTE ON TRANSBOUNDARIES RIPARIAN ISSUES

Most rivers in Afghanistan – and almost the entire supply of the country’s water for irrigation, drinking, and maintenance of wetland ecosystems – are derived from precipitation falling within the country’s own borders, and the seasonal melting of snow and glaciers in mountainous areas. All the important rivers in Afghanistan originate in the Central Highlands region or the North-Eastern Mountains. The only notable exception is the Kunar river which takes its source in the Karakoram Mountains across the border in Pakistan.

However, most rivers are shared with Afghanistan’s neighbouring countries, with the exception of the Northern river basin<sup>1</sup>. Therefore, the use of water from rivers taking their source in Afghanistan has a regional dimension. The table 12 presents the riparian countries and existing treaties for the river basins of Afghanistan based on the FAO/UNEP & OSU Atlas of International Freshwater Agreements<sup>2</sup> and related publications. Most Afghan rivers drain into inland lakes or dry up in sandy deserts or irrigation canals. The only exception is the Kabul (Indus) River Basin which flows into the Indian Ocean. Natural wetlands and lakes with high environmental importance exist in Afghanistan. Therefore, water use for irrigation has a direct impact on the maintenance of the wetlands.

The Landsat satellite image (map 9) illustrates - amongst other features - vegetation, lakes and snow cover in Afghanistan and surrounding countries. The river basin boundaries (red lines) have been overlaid on the satellite image. The image illustrates the regional dimension of rivers taking their source in Afghanistan.

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<sup>1</sup> The issue of transboundaries aquifers is not addressed in this section as this would require more research.

<sup>2</sup> FAO/UNEP and OSU, “*The Atlas of International Freshwater Agreements*”, 2003. <http://www.transboundarywaters.orst.edu/publications/atlas/>

**Table 11**

**River Basins and Treaties in Afghanistan. The acreage for each river basins presented here originates from the International River Basins of Asia<sup>3</sup>. Therefore, they may slightly differ from the river basin data computed for the Atlas as finer boundaries delineation and the recognition of none drainage areas in the classification of water catchments result in some differences**

RIVER BASINS	RIPARIAN COUNTRIES	Area '000 sqm	TREATIES with AFGHANISTAN	COMMENTS
<b>Aral Sea</b>  (includes both Amu Darya and Northern river basins)	Kazakhstan	424	Frontier Agreement between Afghanistan and the USSR, 13 June 1946. Treaty concerning the regime to the Soviet-Afghan frontier, 18 January 1958. Protocol between the USSR and Afghanistan concerning the joint execution of works for the integrated utilization of the water resources in the frontier section of the Amu Darya, 25 June 1958	Countries : Afghanistan, Iran
	Uzbekistan	383		The 1946 Agreement subjects all matters associated with the water use to specific agreements between the two countries and provides for the establishment of a joint commission. Under it, Afghanistan is entitled to use up to 9 km <sup>3</sup> of water from the Pyandj river. Under the Treaty of 18 January 1958, the two countries commit themselves to take joint measures to prevent changes in the course of frontier rivers, streams or canals and to correct the effects of such changes and share the costs equally. Furthermore, they commit themselves to prevent water pollution, to exchange regular information on the level and volume of water and meteorological data and to adopt a flood warning system. Finally, the 1958 Protocol envisages the joint integrated utilization of the frontier sections of the Amu Darya <sup>4</sup> .
	Tajikistan	136		
	Kyrgyzstan	112		
	Afghanistan	105		
	Turkmenistan	70		
	China	2		
	Pakistan	(0.2)		
<b>Hilmand</b>	Afghanistan	288	Terms of reference of the Hilmand River Delta Commission and an interpretive statement relative thereto, agreed by Afghanistan and Iran, 7 September 1950	Countries : Iran, Afghanistan
	Iran	55		Principal issue : Water Quantity
	Pakistan	10		The Hilmand River Delta Commission was created and given the task to measure and divide the river flows between the two signatories
<b>Indus (Kabul river basin)</b>	Pakistan	598	Treaty between the government of Afghanistan and His Britannic Majesty's Government for the establishment of neighbouring relations, 22 November 1921.	Countries: Afghanistan, Great Britain
	India	382		Principal issue : Water Quantity
	China	76		Allocation : None
	Afghanistan	72		Britain agrees to permit Afghanistan to draw water from pipe for use of residents of Tor Kham. Afghanistan agrees to permit British officers and tribesmen on British side of boundary to use Kabul River for navigation and to maintain existing rights of irrigation.
	Chinese control*	10		
	Indian control**	2		
	Nepal	(0.01)		
<b>Harirod wa Murghab</b>	Afghanistan		No	Some treaties on the Amu Darya basin may cover the Harirod-Murghab basin.
	Turkmenistan			
	Iran			
<b>Namaksar</b>	Afghanistan		No	None- drainage area. Salt lake in the border area between Afghanistan and Iran.
	Iran			

\* Claimed by India

\*\* Claimed by China

<sup>3</sup> FAO/UNEP and OSU., *Ibid*, 2002.

<sup>4</sup> Votrin, Valery "Transboundary Water Disputes in Central Asia: Using Indicators of Water Conflict in Identifying Water Conflict Potential", Master's thesis Vrije Universiteit Brussel, Faculty of Medicine and Pharmacy, Master program in Human Ecology, Academic year 2002-2003.  
[http://www.transboundarywaters.orst.edu/publications/related\\_research/votrin/votrin\\_thesis.html](http://www.transboundarywaters.orst.edu/publications/related_research/votrin/votrin_thesis.html)

### III. DESCRIPTION OF THE 5 RIVER BASINS OF AFGHANISTAN

#### 1. Amu Darya River Basin

##### 1.1 General

The Amu Darya basin has its headwater in the High Pamir Mountains of Afghanistan and Tajikistan. The northern branch of the Amu Darya, the Ab-i Pamir river has its source in the Zor Kul Lake, which is shared between Tajikistan and Afghanistan. The southern branch, the Wakhan River, flows out of Chakmatin Lake. The Amu Darya river (the classical Oxus river) runs for 2,400 kilometres and receives a large number of tributaries in central Asia, but yet dries up in the Turan lowlands in Turkmenistan and Uzbekistan. The main reason for this is the excessive use of the water for irrigation for cotton production. Less than 20 years ago the river ran as far as the Aral Sea. Today's lack of inflow has been a major factor for the dramatic reduction in the surface area and volume of the Aral Sea. Huge international efforts are presently mobilized by UN, the World Bank and other donors to try to halt or improve the situation on the Aral Sea. The MWP notes that "up stream activities that might counteract these efforts will most likely not be well received in the international community"<sup>5</sup>.

The Amu Darya basin covers 14% of the national territory, but alone it drains more than half (57%) of the total annual water flow of Afghanistan. Therefore, the basin has a very important hydro-power potential which is largely unused. The basin comprises five watersheds:

1. Panj watershed
2. Kokcha watershed
3. Ab-i Rustaq watershed
4. Khanabad watershed
5. Kunduz watershed

##### 1.2 Transboundaries Riparian Issues

The environmental problems of the Aral Sea basin are among the worst in the World. Water diversions, farming methods, and industrial waste have resulted in a disappearing sea, salinization, and organic and inorganic pollution. The problems of the Aral, which previously had been an internal issue of the Soviet Union, became internationalized after its collapse in 1991. On the 18 February 1992, five major riparian countries - Kazakhstan, Kyrgyzstan, Tajikistan, Turkmenistan, and Uzbekistan - signed an agreement to coordinate policies on their transboundary waters and established the Interstate Commission for Water Management coordination to manage, monitor, and facilitate the Agreement on 18 February. Due to conflicts, Afghanistan, a fundamental partner to any future transboundary water management agreement, has so far not yet participated in any of the discussions.

The table 12 presents the diverse agreement with the Afghan Government on the Amu Darya river basin. Nanni (1996) and Vinogradov and Langford (2001)<sup>6</sup> note that since 'localisable' international agreements (i.e. those relating to identifiable parts of the territory of states) are

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<sup>5</sup> MWP, "Power Sector Master Plan Update, Draft Final Report", report prepared by Norconsult-Norplan for MWP (Ministry of Water and Power), October 2003.

<sup>6</sup> Nanni Marcella. 1996. "The Aral Sea Basin: Legal and Institutional Issues". Review of European Community and International Environmental Law, 5(2): 130-137 and Langford P.E., Vinogradov Sergei and Vance P.E. Langford. 2001. Managing Transboundary Resources in the Aral Sea Basin: In Search of a Solution. *International Journal of Global Environmental Issues* 1(3/4). In : Valery Votrin, "Transboundary Water Disputes in Central Asia: Using Indicators of Water Conflict in Identifying Water Conflict Potential", Master's thesis Vrije Universiteit Brussel, Faculty of Medicine and Pharmacy, Master program in Human Ecology, Academic year 2002-2003. [http://www.transboundarywaters.orst.edu/publications/related\\_research/votrin/votrin\\_thesis.html](http://www.transboundarywaters.orst.edu/publications/related_research/votrin/votrin_thesis.html)

subject to state succession under international law, these agreements remain in force for the newly independent Central Asian states.

According to Valery Votrin<sup>7</sup>, until now, Afghanistan has used only about 2 km<sup>3</sup> of the 9 km<sup>3</sup> of water it is entitled to use under the treaties. Meanwhile, the Pyandj river has the annual flow of 19 km<sup>3</sup>, and Afghanistan's fresh involvement into the process of water use would radically change the Amu Darya flow if the new Afghan government decides to develop agriculture in the North. Further Votrin notes "given that Afghanistan's rehabilitation is unlikely without increasing its intake from the Amu Darya, Afghanistan's water demands will have to be taken into consideration when negotiating the water situation in the Basin". Votrin recommends that "Interstate legislative co-ordination for the Amu Darya water resources should be tailored to fit sustainable development of the Amu Darya Basin before proceeding with reconstruction assistance in Afghanistan. Fuchinoue, Tsukatani, and Toderich recommends that promoting consensus on principles of regional co-operation, a major role could belong to international donor agencies that may try to convince Uzbekistan and Turkmenistan that Afghanistan's demands will have to be taken into account when negotiating the water situation in the Basin"<sup>8</sup>.

### 1.3 Environment Highlights

#### *Pamir-i Buzurg:*

More than 700 years ago, one of the world's renowned explorers wrote of a spectacular species of wild sheep that inhabited mountains of the 'Roof of the World'. The now famous Marco Polo sheep (*Ovis ammon poli*) is still followed by the legendary aura of its namesake. In Afghanistan, interest in these sheep began when the former king, Mohammad Zahir shah, visited the '*Pamir-i Buzurg*' or Big Pamir and successfully hunted a trophy ram. By royal prerogative, the king ordered that the wild sheep be protected in a single large valley of the Wakhan Corridor<sup>9</sup>. The Big Pamir was designated a wildlife reserve in 1978.

Picture 39  
Wall painting of a Marco Polo Sheep in Khandud. Wakhan,  
2 September 2003 (N36.95, E72.32, N)



The recent UNEP report<sup>10</sup> notes that the Wakhan Corridor contains healthy populations of endangered snow leopards and other mammals including Marco Polo sheep. However, active hunting is occurring in many regions of the country, either for sport, for meat, or in order to supply furs for sale to foreigners in Kabul. Sadly, snow leopard furs are sold openly in Kabul's main tourist shops along the famous Chicken Street.

<sup>7</sup> Votrin, Valery, *Ibid.*, 2003.

[http://www.transboundarywaters.orst.edu/publications/related\\_research/votrin/votrin\\_thesis.html](http://www.transboundarywaters.orst.edu/publications/related_research/votrin/votrin_thesis.html)

<sup>8</sup> Fuchinoue, H., T. Tsukatani, and K.N. Toderich. 2002. "*Afghanistan Revival: Irrigation on the Right and Left Banks of Amu Darya, Discussion Paper No. 554*". Institute of Economic Research, Kyoto University, Kyoto: <http://www.kier.kyoto-u.ac.jp/DPindex.html>

<sup>9</sup> Petocz G. Ronald, Habibi Khushal., Jamil Abdul, Wassey Abdul, "*Report on the Afghan Pamir. Part 11. Biology of Marco Polo Sheep (Ovis ammon poli)*", FAO and Ministry of Agriculture, 1978.

<sup>10</sup> UNEP, "*Afghanistan. Post-Conflict Environment Assessment*", 2002. [www.unep.org](http://www.unep.org).

### **Ajar Valley:**

The Ajar Canyon, deep in Afghanistan's Hindu Kush range, was once the hunting estate of former King Mohammed Zahir. The area was declared a national wildlife reserve in 1977. The canyon is exquisite; the river has eroded its way through colorful limestone strata and formed a narrow, twined canyon of a kilometer high. Part

of the Ajar river in Dara-i Jawzari where Zahir Shah build a hunting lodge is subterranean. The royal hunting lodge lies in ruins. The site was an important grazing area for ibex (*Capra ibex*), wild goat (*Capra aegagrus*), and urial sheep (*Ovis orientalis*). Bactrian deer (*Cervus elaphus bactrianus*), feral yaks (*Bos grunniens*) are present. The main carnivores are snow leopard (*Panthera uncia*), leopard (*Panthera pardus*), lynx (*Felis lynx*), wolf (*Canis lupus*), and jackal (*Canis aureus*)<sup>11</sup>.

**Picture 40**  
**Koh-i Sunduq mountain (2500 m) in Doab at the doorstep of the Ajar valley wild life reserve. Note the red conglomerate (Devonian period) as it is in these sediments that iron ore are found in Afghanistan. Kahmard district, Baghlan, 15 September 2003**



### **Tugai Forests:**

Tugai is an important and characteristic wetland ecosystem type in the dry lands of central Asia. The wetlands along the Amu Darya river consist of networks of braided river channels and creeks with numerous large and small islands, vast tracts of reeds *Phragmites* interspersed with thickets of *Tamarix* and *Salix* trees, and quite large stands of *Elaeagnus* woodland<sup>12</sup>. The main Tugai forests in Afghanistan are riparian are found along the Amu Darya river in Imam Sahib in Kunduz province and Yangi Qala/Darqad district in Takhar province. Because of the rarity of this ecosystem within Afghanistan, two island chains with tugai forest, Imam Sahib and Darqad, were proposed for protected area status in 1981 (UNEP, 2002). An important Tugai forest is also found along the Kokcha river in Kuran wa Munjan district of Badakhshan province. These sites have significant eco-tourism potential.

## **1.4. Agriculture Highlights**

The Amu Darya Basin is one of the main production areas of Afghanistan. From an agro-ecological point of view the Amu Darya Basin is divided in to three major agro-ecological zones:

1. The valley floor irrigation in mountainous areas
2. The intensively irrigated areas of the Qataghan zone (Baghlan-Kunduz-Khanabad)
3. The North-Eastern rain-fed area

<sup>11</sup> International Center for Mountains Development, "Protected Areas in Afghanistan", [http://www.icimod.org.np/focus/biodiversity/afg\\_prot.htm](http://www.icimod.org.np/focus/biodiversity/afg_prot.htm)

<sup>12</sup> D. A. Scott, "A Directory of wetlands in the Middles East", Wetlands International Publication, 1995. <http://www.wetlands.org/inventory&/MiddleEastDir/AFGHANISTAN.htm>

***Valley Floor Irrigation in Mountainous Areas:***

Most of the Amu Darya basin is mountainous with snow/glacier fed rivers flowing in steep gradient. Valley floor irrigation system has developed in narrow valleys, sometimes between high cliffs with dramatic scenery (picture 41). In low elevation valleys, input intensive double crop growing is practiced while in the higher elevations, less intensive spring crops are cultivated. The rangeland on the mountain side is grazed by farm animals and nomads during the warm summer months.

**Picture 41**

**Valley floor irrigated farming near Bamyan centre. 4 June 2003 (N34.82, E67.95, SW)**



***Intensive Irrigated Area:***

The intensively irrigated zone of the Qataghan zone is a major production area in Afghanistan. Two main rivers are feeding the intensive irrigated area; the Kunduz and Khanabad rivers (picture 42), which take their source from among the highest mountains in Afghanistan. These mountains are generally covered by snow until late summer, allowing for second crops in the lowland (paddy, mung beans or maize) after the June wheat harvest.

**Picture 42**

**View of the intensive irrigated plain planted with rice in Takhar province, near Taluqan. 6 September 2003 (N36.74, E69.34, N)**





### ***North-Eastern Rain-fed Area:***

Rain-fed farming is annually practiced in the Amu Darya basin (see picture 43) up to an approximate elevation of 2500 meters. Compared the North and West of Afghanistan, rain-fed areas in the Amu Darya basin benefit from a higher level of rainfall (see description of rain-fed farming in the Northern river basin section below).

**Picture 43**

**Rain-fed wheat fields (above the settlement) not harvested in September 2003 due to low wheat prices in the market - after a record harvest - and high labour wages. Paddy rice fields can be seen in the plain.  
Takhar province, 6 September 2003 (N36.74, E69.36, S)**



### **1.5 Historical Highlights**

Abundance of water and availability of fertile land have resulted in early rural and urban settlements with extremely rich historical developments. In the western upper part of the river basin lays the superb large valley of Bamyan where Buddhist devotees created - in the 3<sup>rd</sup> and 4<sup>th</sup> century A.D. - the most spectacular images of the Buddha ever devised. The name of its ancient capital, '*Shar-i Gholghola*', 'City of Noise', refers to the tumult of the massacre by Genghis Khan's army in the valley. The colossal Buddha survived and continued to tower from their red pastel cliff over the exquisite beauty of the green valley of Bamyan until their destruction by the Taleban in March 2001.

Further downstream, Surkh Kotal near Pul-i Khumri (Baghlan province) is the site of a great religious temple founded by Kanishka, Great King of the Kushan where early Greco-Buddhist art developed in Afghanistan. Baghlan province, which means sanctuary, takes its name from Kanishka's temple which flourished in the 2<sup>nd</sup> century A.D.

In the lowlands, Kunduz, which lies at the centre of intensively irrigated area in the North is labelled with two local adages reflecting its historical past and present; "If you want to get rich,

go to Kunduz”. The soils of irrigated area of the Qataghan province (today Baghlan, Kunduz and Takhar provinces) have a rare fertility that gave rise to densely populated region before the total devastation of Ghengis Khan in 1220. The region never recovered and when in the 19<sup>th</sup> century Murad Beg, an Uzbek Amir in Kunduz, depopulated the mountains of Badakhshan to colonize the fertile plains, most of the population was decimated by malaria. Malaria is still today endemic in these plains. “If you want to die, go to Kunduz”.

At the turn of the last century, the ‘Iron Amir’ of Afghanistan, Abdur Rahman, transmigrated Pashtuns from the South of the Hindu Kush in order to colonize the fertile, but hostile plains in the North. Some irrigation work was initiated. However, it is later in the 1930s, that irrigation canals started to be built in the Khanabad region. That movement was followed up to Pul-i Khumri. Land was available at a very low price and resulted in two major movements of population, from the southern part of the Hindu Kush (mostly from Jalalabad and Kandahar) and then the Northern population fleeing the Russian revolution. This resulted in rapid economic development and this region is today one of the most populated, ethnically complex and intensively cultivated land in Afghanistan<sup>13</sup>. Thus the maxim; “If you want to get rich, go to Kunduz”.

Because of its abundance of water and apocalyptic historical events (Ghengis Khan destructions), archaeologists consider that discoveries of large cities such as the Great Ai Khanum ( Moon Lady)<sup>14</sup> discovered in 1965 by the French archaeologists may still happen<sup>15</sup> in the Northern lowlands of the Amu Darya River Basin. Ai Khanum is located at the confluence of the Amu Darya and the Kokcha rivers in Khwaja Ghar district (Dasht-i Qala) of Takhar.

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<sup>13</sup> The survey of the Société Grenobloise d’Etudes et d’Applications Hydroliques (SOGREAH) in 1965-66 showed a population density of 300 to 400 inhabitant/km<sup>2</sup> in the Kunduz-Khanabad region!

<sup>14</sup> Ai Khanum was established by Greek kingdom perhaps ordered by Alexander the Great himself in Bactria and its real name has yet to be revealed. The site was studied by the French Archaeological delegation as from 1964.

<sup>15</sup> Etienne, G., *Ibid.*, 1972

## 2. Northern River Basin

### 2.1 General

The Northern basin has the smallest annual flow contribution in Afghanistan with only 2% of the total, but all of the water is used within the national boundaries of the country. The basin is composed of watersheds of short perimeters that take their source in high mountains of the central highlands (picture 44). The rivers dry up in irrigation canals or desert sands long before reaching the Afghan border and the Amu Darya river. It should be noted that in the event of exceptional floods, the Balkhab river may at times drain water into Turkmenistan lowlands just on the other side of the border. Historically, in the Northern Turkistan plain, rivers' delta were close to the Amu Darya while with the development of traditional irrigation schemes centuries ago, these rivers are no longer contributing to the Amu Darya and dry in canals 50 to 100 km afar<sup>16</sup>. Therefore, an area of none-drainage exists between the Northern River Basin (Shirin Tagab, Sare Pul, Balkhab and Tashkurghan rivers) and the Amu Darya river.

The Northern River Basin in the North is comprised of four watersheds:

1. Kulm watershed
2. Balkhab watershed
3. Sari Pul watershed
4. Shirin Tagab watershed

**Picture 44**

**Chaman valley in near Yakaolang district centre and view on the Koh-i Baba Mountains in the background. Bamyan province, 3 June 2003 (N34.74, E67.00, W)**



### 2.2 Transboundaries Riparian Issues

Not applicable as rivers remains within the national boundaries.

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<sup>16</sup> J. Humlum, *Ibid.*, 1959.

### 2.3 Environmental Highlights

#### ***Band-i Amir Lakes:***

The Band-i Amir's lakes in the upper part (approximately 2900 metres elevation) of the Northern River Basin comprise one of the world's uniquely beautiful natural landscapes. Band-i Amir consists of a chain of six 'lapis lazuli' lakes nestled between 300 m high magenta rock walls (picture 46). From west to east, these are Band-i Gholaman (Dam of the Slave), Band-i Qambar (The Groom's Dam), Band-i Haibat (Dam of Awe; picture 45), Band-i Panir (Dam of Cheese), Band-i Pudina (The Mint Dam) and Band-i Zulfiqar (Dam of the Sword of Ali). The two largest lakes, Haibat and Zulfiqar, cover 490 ha and 90 ha, respectively. Panir Lake with only 100 m in diameter, is the smallest. The white travertine dams (about 10 meters high and 3 metres thick) which separate the lakes, are formed when gaseous carbon dioxide from calcium rich spring water is driven out by bacterial or algal activity, forming the mineral deposits that create the dams. The waters of the lakes are oligotrophic and calcareous, with a pH of 7.8<sup>17</sup>. Their stunning deep blue color is a result of the water's purity and high lime content. Surface water temperature reaches 14-17°C during summer. In winter, the lakes freeze over. The site became Afghanistan's first national park in 1973. UNEP reports that Band-i Amir National Park is in good hydrological condition and generally unchanged since studies conducted in 1977 by FAO and UNDP, despite the recent drought. This natural treasure has all of the characteristics of a World Heritage Site, and could become an important destination for nature tourism if given proper management and community support<sup>18</sup>.

**Picture 45**

**Band-i Haibat, the last lake in the West with the most impressive travertine. Bamyan province, 3 June 2003  
(N34.82, E67.19, W)**



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<sup>17</sup> D. A. Scott, *Ibid.*, 1995.

<sup>18</sup> UNEP, *Ibid.*, 2002..

**Picture 46**

**Band-i Haibat (lowest), Band-i Panir, Band-i Pudina and Band-i Zulfiqar. Bamyan province, 3 June 2003  
(N34.84, E67.21, S)**



***Pistachio Woodlands:***

The UNEP reports notes that pistachio woodlands in the provinces of Northern Afghanistan were found to be highly degraded with 50-70% of the forest cover lost over the past 3 decades. With the loss of forests and vegetation, overgrazing and rain-fed cultivation (picture 47), soils are being exposed to serious erosion from wind and rain. Pistachio used to provide a significant income to local people and traditionally, the forests were managed locally. As early as the 17<sup>th</sup> century, Montsuart Elphinstone<sup>19</sup> wrote about traditional communal pistachio forest management and observed that pistachio was one of the main exports of Afghanistan.

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<sup>19</sup> Elphinstone Montsuart, “*An account of the Kingdom of Caubul*”, Indus. Publ., Karachi, first public. 1815, reprint 1992.

Picture 47

Encroachment of rain-fed farming in pistachio forest has taken place for several decades. Ab-Kamari district, Badghis, 22 may 2003 (N34.94, E62.81, SW)



***Pastureland:***

Between irrigated oases and on the foot hills of the Northern plains, numerous grazing lands exist such as Dasth-i Laili pasture (picture 48). These pastures in lowlands are essential to the Northern livestock economy as they provide grasses in winter and spring when animal feed availability is low. A case study<sup>20</sup> showed that Dasht-i Laili pastureland is extensively being encroached for rain-fed wheat cultivation. This is reducing grazing areas for livestock owners, and increasing water and wind erosion (picture 49). In the area of Dasht-i Laili, grazing land encroachment is endangering the quality of Ankhoi salt lakes.

According to a Russian schematic map (1:500,000)<sup>21</sup> of underground water composition for Northern Afghanistan, underground water in the Northern Turkistan plain is saline and cannot be used for irrigation purposes. Indeed, in most of the plain salinity varies between 3 to 35 g/lt. However, along and near the main rivers beds, the salinity is lower and varies between 1 to 3 g/lt.

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<sup>20</sup> Raphy Favre, "Grazing Land Encroachment. Joint Helicopter Mission to Dasth-i Laili. 25-27 March 2003", Kabul 23 July 2003.

<sup>21</sup> Anonyme, "Underground Water Composition in Northern Afghanistan", (in Russian), 1968.

**Picture 48**

**View of pastureland in Dasht-i Laili. Jawzjan, 25 March 2003 (N36.46, E65.21, SW)**



**Picture 49**

**Aerial view of pastureland encroached for rain-fed cultivation in Dasth-i Laili. Note the sand dunes created by wind erosions that are the first signs of desertification of the Northern pasturelands. After ploughing, the denuded sandy/loamy soils of Dasht-i Laili are exposed to wind erosion. 25 March 2003 (N36.53, E65.54, N)**



## 2.4 Agriculture Highlights

From an agro-ecological point of view the Northern basin is divided into two major agro-ecological zones:

1. The Northern rain-fed area
2. The Northern irrigated oases

### *Northern Rain-fed Area:*

Much of the rain-fed land is located in the Northern River Basin. A vast area of rolling hills carry huge layers of Quaternary Loess deposited along the entire northern mountain slopes, from the Hari Rod river in the north-west corner of Afghanistan (Western Basin) to the foot hills of Badakhshan (Amu Darya basin). The Loess are fine soil particles that are transported every year during the summer period by the Northern wind (*Shamal*) from the Central Asian plains and place them on the foot of the mountains where wind speed is frustrated by the relief (pictures 50 and 51). The abrasion of the wind and its deposits shape the relief in amazingly smooth undulating hills, on which even rain erosion does not manage to cut sharp edges.

These loess soils have an excellent permeability and can absorb large quantities of water. The water absorbed is slowly released to feed the rivers and to irrigate gently the fields below. In addition, the huge layers of loess (several dozens of meters in places) store water and make the growing of plants with deep root systems possible. The pistachio (*Pistacia vera*) forests grow in these hills and are situated in elevations between 600 to 1400 metres. They once covered almost all of the entire lower hills. In higher elevations, juniper (*Juniperus seravtschanica*) trees are replacing the pistachio. Wild almonds (*Amygdalus communis*) are also growing at various elevations in similar areas. The figure 9 shows the distribution of pistachio and Juniperus mostly growing on Loess soils in Northern Afghanistan. Rain-fed crops (mainly wheat, barley, flax, sesame, cumin and the renowned Afghan melons 'kharbuza' and water-melons 'tarbuza') are widely cultivated on these hills.

### Pictures 50 and 51

**On the left, Loess soil profile. The frame on the left of the picture is 1 meter high. The first layer, richer in organic matter constitutes approximately 60-70 cm (dotted line). Then, the profile is homogenous up to deep layers of the soil (several meters). This type of soil profile is consistent to the whole Northern Loess hills in Afghanistan. Kushk-i Kuna district, Badghis province, 23 May 2003 (N34.88, E62.48, S). On the right, view of rain-fed wheat (below) and land ploughed for melon/water melon intercropped with sesame planting in early summer (above). Sholgara district, Balkh province, 14 May 2003**





### ***Northern Irrigated Oases:***

The rivers (Khulm, Balkh-Ab, Ab-i Safid and Shirin Tagab) that take their source from Northern Afghanistan above the Loess hills are short in distance. Their flow follows seasonal patterns. When these rivers reach the open lowland of the Turkistan plain (which is a prolongation of the Central Asian plain south of the Amu Darya), they form a delta and end their course in irrigation canals or desert sands (picture 54). These rivers end long before reaching the Afghan border or the Amu Darya river (see picture 52). In the oasis system, a mechanism of land rotation has developed in the past to take advantage of the availability of land and to maintain its fertility. The land in rotation is called '*zamin-i paikaly*'. Today, with the use of fertilizers (which allows yearly cultivation of the same soil) and the whims of local commanders who control water distribution, '*zamin-i paikaly*' exists solely at the tail of the irrigation canals, when and if water is available (see picture 53)<sup>22</sup>. The 'intermittently irrigated land' of the FAO Landcover Atlas, 1993 corresponds to the traditional irrigated '*zamin-i paikaly*'.

**Picture 52**

**Aerial view of Khulm oasis. The river opens into the Turkistan desert and forms an irrigated delta. The upper part is irrigated every year and a large variety of fruits are planted (particularly pomegranate, almond, apricot and fig trees) while in the lowest part, mainly cereal is cultivated and land is rotated (*zamin-i paikali*). Khulm district, Balkh province, 25 March 2003 (N36.63, E67.71, N)**



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<sup>22</sup> On the issue of irrigation water access in Northern Afghanistan, see Hector Maletta and Raphy Favre, "Agriculture and Food Production in Post-war Afghanistan. A Report of the Winter Agriculture Survey 2002-2003", FAO, Kabul, August 2003.

**Picture 53**

**View of a lowest section of Khulm irrigation delta where land is intermittently cultivated ('zamin-i paikali'). Different sections of the land will be irrigated in the following year (2004). Khulm district, Balkh province, 25 March 2003 (N36.75, E67.67, NE)**



**Picture 54**

**In Sheberghan, the irrigated land borders the sand dunes of the Turkistan desert. Note the Khwaja Du Koh water channel bordering the sand dunes. Part of Sheberghan town is visible on the right side of the picture. Jawzjan province, 3 March 2003 (N36.65, E65.70, N)**



**Picture 55**

**With the collapsed of traditional water management regulation during the past two and half decades of war, farmers at the end of the irrigation structures faces insecurity over irrigation water. The land is used as pastureland for small stocks. As a result, large tracks of the Turkistan plain are no longer cultivated. Note the mound in the background of the picture (see Historical Highlights section).  
Dawlatabad district, Balkh province, 13 May 2003 (N36.97, E66.76, N)**



**Pictures 56 and 57**

**In location far from the water source of the Turkistan desert, farmers have developed practices aiming at storing water whenever the river flow is sufficient to reach the far location in the desert. This normally occurs at the peak of the river flow in April/May/June as snow is fast melting in high elevation and rainfalls are more common. On the left, farmers are digging ditches to store water for melon and water-melon cultivation. Jawzjan, Khwaja Du Koh district, 14 May 2003 (N36.83, E65.65, E). On the right, almond orchard planted in deep trenches in Dawlatabad district. Balkh province, 13 May 2003 (N36.90, E66.77, NE)**



## 2.5 Historical Highlights

South of the Amu Darya, extremely rich concentrations of Mesolithic and Neolithic settlements as far back as 10,000 B.C. have been found. Traveling in the Turkistan plain, one would note mounds which seem artificial and alien to the surrounding flat area. Neolithic men built monumental palaces and complex circular temples. The Neolithic revolution also took place in Northern Afghanistan about 9000 years ago which indicates that northern Afghanistan may indeed have been one of the earliest centres for the domestication of plants and animals<sup>23</sup>.

Prosperity continued throughout the centuries, and Balkh in particular is a town of prodigious antiquity. Here Zoroaster preached sometime between 1000 to 600 B.C., Alexander the Great chose it as his base between 329-327 B.C., and the city then remained the capital of Greco-Bactrian kingdoms. The French Archaeology mission in Afghanistan (DAFA<sup>24</sup>) which worked in Northern Afghanistan as early as the 1920s had searched in vain for the foundation of the city captured and enlarged by Alexander the Great. Short of success, the site was thought to be mythical city. Then in May 2002, a French archaeologist made by chance an important discovery. The foundation of the legendary city was found in a nearby village.<sup>25</sup> Buddhism flourished under the Kushan dynasty in the early centuries A.D. The Arabs, the bearers of Islam, called Balkh the 'Mother of Towns', so impressed were they with its importance and magnificence. The finest Islamic art and poetry flourished in Balkh before its period of glorious history closed in 1220 when the fearsome Genghis Khan and his army rode through and left the plain utterly desolated. It won some recovery during the Teimorid period but never to the same extent.

The small oases of the Turkistan plain - irrigated by several short parallel rivers and separated by large stretches of deserts - have hosted the development of fiercely independent Uzbek Khanates. Maimana, Gurziwan, Andkhoy, Shiberghan, Saripul, Aqcha, Balkh and Khulm were the main Khanates of the Turkistan plain. These Khanates varied in size and form from year to year and from ruler to ruler, mirroring the personal charisma of each Khan, competing for supremacy. Maimana, the last of the Uzbek Khanates of Afghan Turkistan submitted to the Afghan King Abder Rahman in April 1884.

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<sup>23</sup> Nancy Hatch Dupree, "An Historical Guide to Afghanistan", Afghan Air Authority and Tourist Organization, Kabul, 1977.

<sup>24</sup> Délégation Archéologique Française en Afghanistan.

<sup>25</sup> Afghanistan Info, "Importante découvertes Archéologiques", No 51, Sept. 2002.

### 3. Harirod-Murghab River Basin

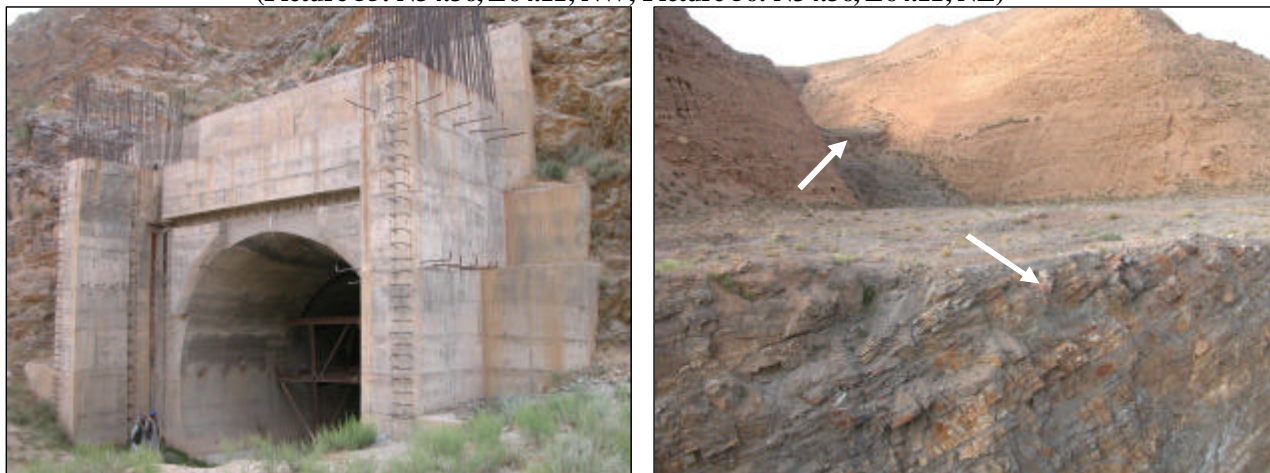
#### 3.1 General

The Harirod-Murghab River Basin contributes to a tiny 4% of the total annual flow in Afghanistan. The main rivers are the Hari Rod, which takes its source from the Western slope of the Koh-i Baba mountains in the central highlands and the Murghab from the Tir Band-i Turkistan mountains. However, only part of the water from both rivers remains within the national boundaries of the country. Indeed, the Hari Rod and Murghab dry in the irrigation canals of Mary<sup>26</sup> and Tejen oases of the Garagum desert in Turkmenistan. A water channel, the Garagum channel, linking the oases to the Amu Darya river was constructed across more than a thousand kilometres of desert in Turkmenistan to add water in the Mery and Tejen oases (from the Amu Darya river)<sup>27</sup>.

Along the Hari Rod river, a 547 million m<sup>3</sup> capacity dam - Bandi Salma - was planned near Cheshti Sharif district center (Herat province). The project was designed by WAPCOS, India, and construction at the dam site had started in 1980 to supply a further 25,500 hectares of land from the Hari Rod river as well as hydro-power. However, the construction of the Bandi Salma dam was interrupted at its initial stage. Excavation of the dam foundation had reached a relatively advanced stage, but foundation cleaning was not completed. The diversion tunnel was completed (picture 58) and a trench excavated at approximately mid dam height, seemingly intended for intake and draw-off structures (picture 59).

**Pictures 58 and 59**

**Diversion tunnel (left) and excavation on Salma dam (harrow) near Cheshti Sharif. Herat, 31 May 2003**  
(Picture 55: N34.36, E64.11, NW; Picture 56: N34.36, E64.11, NE)



The Harirod-Murghab basin includes four main watersheds:

1. Bala Murghab watershed
2. Kushk wa Kashan Rod watershed
3. Upper Hari Rod watershed
4. Lower Hari Rod watershed

#### 3.2 Transboundaries Riparian Issues

No treaties have been signed on the Harirod and Murghab watershed<sup>28</sup>. However, some treaties on the Amu Darya basin may cover the Harirod-Murghab basin.

<sup>26</sup> Historically called Merv.

<sup>27</sup> An estimated 1 million hectare is irrigated from the canal.

<sup>28</sup> FAO/UNEP and OSU., *Ibid*, 2002.

### 3.3 Environmental Highlights

#### *Pistachio and Juniperus Forests:*

The Northern part of the river basin is a main centre of biodiversity for pistachio trees. See description under the “Northern River Basin” section.

Picture 60

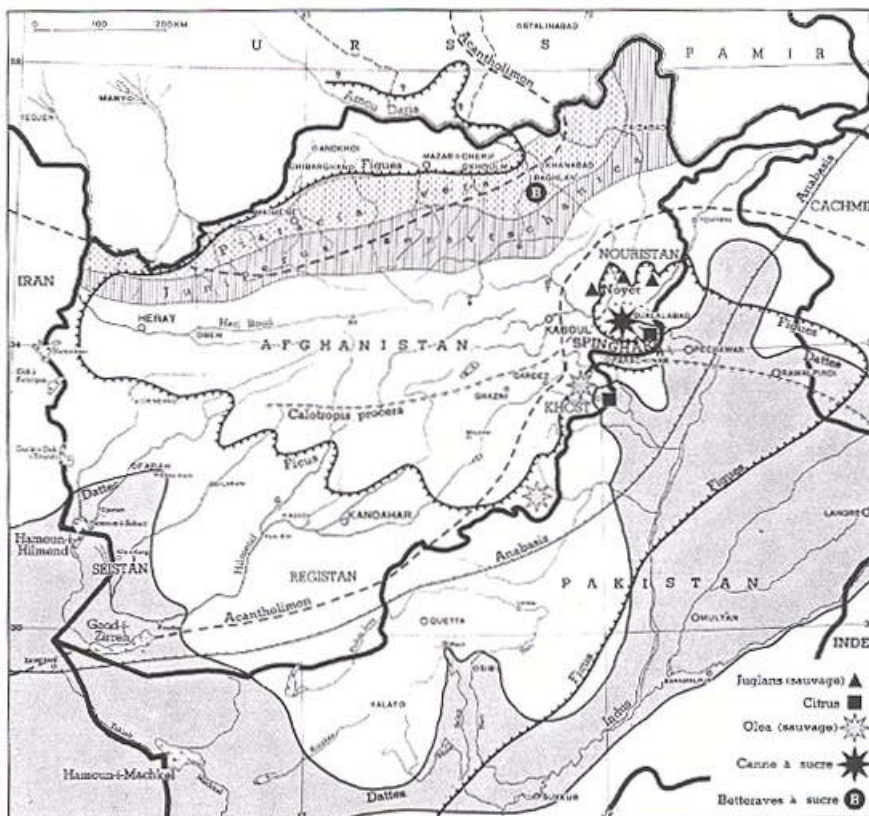
View of rain-fed cultivated hills in Badghis. According to local authorities, these hills were covered with pistachio trees decades ago. Ab-Kamari district, Badghis province, 22 May 2003 (N34.91; E62.71, NE)



*Juniperus (Juniperus seravtschanica)* forest once grew in the Northern belt above to the pistachio woods as illustrated in the figure 9. Now only pockets of isolated trees remain as *Juniperus* wood is highly appreciated as a fuel material. In Kotal-i Sabzac pass, which links Badghis province to Herat, a beautiful *Juniperus* forests remains and can be seen along the road (picture 61).

Figure 9

Map on vegetation in Afghanistan<sup>29</sup>. Note the Pistachio (*Pista vera*) and Juniperus (*Juniperus seravtschanica*) belt in Northern Afghanistan.



<sup>29</sup> J. Humlum, “La géographie de l’Afghanistan”, 1959.

### 3.4 Agriculture Highlights

From an agro-ecological point of view the Western basin is divided into 3 major agro-ecological zones:

1. The intensive irrigated area of Herat lowland
2. The valley floor irrigation in mountainous areas
3. The Western rain-fed area

#### ***Intensive Irrigated Area of Herat Lowland:***

Irrigated production in the Harirod-Murghab basin is concentrated along the Hari Rod river in Herat (picture 62). The traditional irrigation management systems along the Hari Rod river in Herat which is still effective today was codified during the Teimourid time in the 15<sup>th</sup> century. The irrigated perimeter of Herat allows one crop per year, however, at the head of irrigation structures and depending on water availability in early summer, a second crop is cultivated (mainly mung beans, maize and paddy rice). In Herat, most of the paddy rice is sown directly as opposed to the Qataghan zone (North-east) where it is transplanted, which results in a lower average yield (picture 114)<sup>30</sup>.

**Picture 62**

**Intensive irrigated plain in the district of Pashtun Zargun. Note the meandering Hari Rod river below. Herat province, 31 May 2003 (N34.31, E62.63, SW)**



#### ***Valley Floor Irrigation in Mountainous Area:***

Most of the Western basin is mountainous with rain/snow fed rivers flowing in narrow valleys. Valley floor irrigation system of various intensity has developed mostly along the *Murghab* (picture 107), *Ghormach*, *Hari Rod* and *Kawgan Rod* rivers. In Ghor a number of valley systems in high elevations (above 2600 meters) are not cultivated, but kept as summer pastureland for the Aimaq semi-nomadic camps. Simple canals have been built for the water to irrigate the pasture for the whole valleys. However, there is an increased pressure for this land to be transformed into irrigated fields for cereal production (picture 63). Crop planting in the central Highlands is usually later than in other regions due to high elevation. Up to an elevation of approximately 2500 metres, winter cereal is mostly cultivated. Above that spring cereals dominate.

<sup>30</sup> Raphy Favre, "MAAH/FAO National Crop Output Assessment – Second Phase. Second Crops in Lowlands and First Crop in Highlands. 27<sup>th</sup> August to 26<sup>th</sup> September 2003", FAO, Kabul, 23 October, 2003.

Picture 63

Valley floor grassland in Ghor province. On the foreground, part of the grassland is being cultivated for cereal production. Shaharak, Ghor, 2 June 2003 (N34.27, E64.39, S)



**Western Rain-fed Area:**

Rain-fed farming is practiced in the Western basin up to an approximate elevation of 3200 meters. In Herat province in particular, mechanized rain-fed cultivation has encroached on fragile low slope gradient pasture land mostly for black cumin (*zira*), wheat and melon crops (picture 64).

In high elevation, rain-fed farming production is very low and depends on late rainfall that waters in good years the Central Highlands in late spring/early summer (picture 65).

Picture 64

Strip ploughing (tractor) for melon/water melon cultivation in Kushk-i Kuna district, Herat province, 24 May 2003 (N34.89, E62.16, W)



Rain-fed alfalfa is cultivated in Lal district of Ghor province. Thanks to its deep rooting system, rain-fed alfalfa is more productive than indigenous annual rangeland grass species as it reportedly produces two cuts in a normal year (see pictures 27 and 28). Alfalfa remains established for a minimum of 15-20 years. Fresh leaves are reportedly consumed in soup or salad in spring.



Picture 65

Rain-fed farming on steep slopes in high elevation. Here at 3200 meters at Kotal-i Sat bark on the border between Bamyan and Ghor provinces. Lal wa Sarjangal district, 3 June 2003 (N34.52, E66.71, SW)



### 3.5 Historical Highlights

The city of Herat supported by its fertile irrigated plain is one of the richest cultural centres in the region. It reflects the cultures of Iran, Central Asia and Afghanistan for it is a pivot around which these areas spin. Herat contains vestiges of a brilliant past when kings and queens entertained other sovereigns from China's border to the Tigris River, lavishing their loving attention on this city. Much of the evidence of which can be seen today.

In the high mountains east of Herat the Ghorid dynasty (1148-1202) emerged from local chieftains. The location of Firuzkoh, the great capital of the Ghorid Dynasty, which once ruled from India to Iraq and from Kashgar in China to the Persian Gulf, still remains an enigma. One clan of the local Aimaq population still bears the name of Firuzkohi. The fantastic Minar-i Jam monument was first announced in 1943 by the Governor of Herat. It was an astonishing discovery. The purpose of this 65 metres high minaret is still unknown, but built in a gorge at the confluence of the powerful Hari Rod and its tributary, the Jam river (picture 66). For some 800 years it has defied the powerful forces of hydrology. We learn from that period that the area was covered with timbers which were used to fuel the prized Ahangaran (literally Blacksmiths), arms factories, used by the Ghorid warriors.<sup>31</sup> Today the whole region is barren.



Picture 66  
Minar-i Jam, Ghor province. Note the Jam and Hari Rod  
rivers meeting on the feet of the Minar.  
1 June 2003 (N34.39, E64.52, N)

<sup>31</sup> Nancy Hatch Dupree, *Ibid.*, 2002

## 4. Hilmand River Basin

### 4.1 General

The Hilmand basin, meaning '*abundant water*' in old Persian, is the largest in Afghanistan as it covers almost half (43%) of the national territory. Despite its name, it drains comparatively a smaller proportion of the total annual flow with an 11% contribution. The Hilmand basin covers the Southern half of the country as it drains water from the Sia Koh mountains in Herat province to the Eastern Mountains in Gardez province and the Parwan mountains North-West of Kabul to the Unique Sistan depression between Iran and Afghanistan. The Sistan depression is a large complex of shallow wetlands, lakes and lagoons which are divided into at least, four separate sheets of water locally known as Hamun-i Saberi to the North which is the deepest, Hamun-i Puzak to the north-east and in Afghan territory, Hamun-i Shapour to the South and a central pool known as Hamun-i Hilmand. These separate sheets of Hamun water become one at flood times and can reach an area of about 3,200 Sq. km. when the level of the lake rises. The surplus water flows out, at the southern end of the lake, through the channel of Shileh Shallaq into the depression of Gaod-i Zirreh inside Afghanistan.

The Sistan-Hilmand basin includes fifteen watersheds:

1. Adraskan Rod watershed
2. Farah Rod watershed
3. Khuspas Rod watershed
4. Khash Rod watershed
5. Upper Hilmand watershed (above the Kajaki dam)
6. Middle Hilmand watershed
7. Lower Hilmand watershed (Intensively irrigated perimeters below the Kajaki dam)
8. Sistan-Hilmand watershed (below the intensively irrigated perimeter in the Sistan zone)
9. Chagay watershed
10. Upper Arghandab watershed (above the Dahla dam)
11. Lower Arghandab watershed (intensively irrigated perimeter below the Argandab dam)
12. Tarnac Rod watershed
13. Arghistan Rod watershed
14. Sardih wa Ghazni Rod watershed
15. Dasht-i Nawur watershed

### 4.2 Transboundaries Riparian Issues

The environmental problems in the Sistan depression wetlands are of similar nature as the Aral Sea in the Amu Darya River Basins. The water of the Hilmand River Basin was the scene of disputes between Afghanistan and Iran in the past century. Piruz (1995)<sup>32</sup> describes in details the evolution of the water dispute in the Hilmand basin which, according to the author, has yet to be resolved in spite of several attempts in the past 120 years. One of the more recent episodes occurred in 2001, when Iran wrote to the UN Secretary General, Kofi Annan, alleging that the Taleban had blocked the Hilmand River, causing some 140,000 hectares of land in the neighbouring regions of Iran to dry up. However, a UN investigation found drought to be the main cause, as the Hilmand River was flowing at only 2 per cent of its annual average.

According to Piruz (1995), the actual problem began when British boundary arbitration officer, General F. Goldsmid decided in 1872 to put the Iran-Afghanistan boundary in Sistan on the main

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<sup>32</sup> Pirouz Mojtahed-Zadeh, Ph.D., "*Lake Hamun, a Disaster in the Making. Hydropolitics of Hirmand and Hamun*", University of London, UNEP, March 1995.

branch of the Hilmand in the delta region, without making any arrangement or recommendation for water division between the two sides. Disputes occurred between the two countries, mainly because the river changed its course in the border area in 1896. British arbitration was sought and Colonel Henry McMahon was assigned in 1903 to demarcate new boundaries. Having decided to divide the Hilmand water at the border area, equally between the two sides in 1903-4, for reasons unknown Colonel McMahon then changed his decision in 1905 and allocated two-thirds of Hilmand water in the delta to Afghanistan and one-third to Iranian Sistan, which is much more fertile and a great deal more populous than the corresponding Afghan border district of Nimroz. The Iranians, however, found McMahon's 1905 water award of one-third to Iran, two-third to Afghanistan unacceptable and refused to ratify it.

In the 1930s, as friendly relations developed between the new and centralized government of Reza Shah Pahlavi in Iran and the independent government of Mohammad Nader Shah in Afghanistan, fresh attempts for the settlement of Hilmand water disputes resulted in the conclusion of the 1939 treaty. However, Afghans could not agree amongst themselves and refused to ratify the treaty, reviving the dispute.

The construction of the Kajaki reservoir and Boghra diversion in Afghanistan in 1949 caused great uproar among Iranians. The two countries eventually sent representatives to Washington in 1959 for negotiation through American mediation. These negotiations failed to achieve and the disputes continued until 1973 when the two countries prepared a draft agreement regulating their respective water share of the delta region. Once again this failed to be ratified. According to the abortive 1973 treaty, Iran was to receive a 22 cubic metres per second of Hilmand water in the delta region as its share, and was to purchase an additional four cubic metres per second from the Afghans, summing up to 26 cubic metres per second. Although this amount per second of Hilmand water for Sistan was even less than the amount of one-third determined by Colonel McMahon's arbitration award of 1905, the Afghans declined to accept it. The quota, nevertheless, became the cornerstone of their argument at any negotiation and thereafter Iran constructed the Shahname the 0.7 million m<sup>3</sup> water reservoirs. The Iranian monarchy was overthrown by the Islamic Revolution of February 1979. Then Afghanistan was occupied by the former Soviet Union, resulting in civil war and preventing from making any fresh efforts for the settlement of Hilmand water disputes.

### **4.3 Environmental Highlights**

#### ***Sistan Depression Wetlands:***

The Sistan depression is important for agricultural production and fishing but more importantly it is an internationally recognized site for wetland fauna. Iran had it declared a Ramsar site in 1975<sup>33</sup>. It is a centre for migration of Central Asian birds. Hamoun-i-Puzak was one of the most important wetland in Afghanistan for migrating waterfowl; up-to half a million waterfowl were counted in the seventies representing roughly 150 species of migrating and non-migrating birds and among them were the Dalmatian pelican (*Pelecanus crispus*) and marbled teal (*Marmaronetta angustirostris*). The diversity of bird life in the wetlands was almost matched by nearly 140 species of fish that supported bird, mammal and human populations<sup>34</sup>. Eight globally threatened waterfowl species used to spend the winter in the lakes.

Since 1998 the water inflow to Sistan has been dramatically reduced and caused desiccation of the wetlands. The maps 3, 4 and 5 illustrate the low level of replenishment of the Sistan

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<sup>33</sup> Ramsar, "Convention on Wetlands of International Importance especially as Waterfowl Habitat", Ramsar List of Wetlands of International Importance, Gland, Switzerland, 2002.

<sup>34</sup> UNEP, *Ibid.*, 2002.

depression wetlands despite good rain-fall<sup>35</sup> in 2003. Some replenishment is visible following the rain/snow fall in early December 2003, however, the wetlands appear completely dry by the end of September 2003. The wetland had earlier experienced years of dry-up. UNEP notes that the Boundary Commission found the lakes and the lower Hilmand dry in 1902 and witnessed their refilling in 1903. In the past it has shown ability to cope with natural climatic changes, and been able to recover when the water flow was back to normal. It is an open question, however, if the additional stress caused by extensive water withdrawals for irrigation, evaporation from reservoirs or manipulation of the seasonal flow regime from irrigation (both in Iran and Afghanistan) and hydropower production has now overtopped the recovery capacity of the wetlands. The Post Conflict Environmental Assessment (UNEP, 2003) underlines the need for an improved water management system to safeguard the protection and sustainable use of the wetlands.

Observers have compared the geographical catastrophe taking place regarding Sistan lakes and lagoons as a repetition of the major environmental disaster of the Aral Sea in another corner of Central Asia. Historical documents show that the wetlands covered a much larger area as the lakes were described at the turn of the twentieth century as something like 150,000 square miles<sup>36</sup>.

#### ***Ab-i Istada:***

Ab-i Istada is a large saline lake located at about 2000 meters elevation in the South corner of Ghazni province (Nawa district). Ab-i Istada drains the water from the Ghazni, Sardeh and Nahara Rod and it overflows into the Arghistan river - itself a tributary of the Arghandab river - in good rainfall years. The site is remarkable for the migratory greater flamingos arriving at high water level in spring (late March or April), breeding in summer on the islands and departing when water level is low in September or early October. More than 100 other bird species also occur. The site was once a critical stopover point for the central population of Siberian cranes which bred in the Russian tundra and wintered in north-central India. The last reliable report of a Siberian crane at Ab-i Istada was of one shot dead by a hunter in 1986. Local residents reported that no flamingos had bred successfully since 1999.<sup>37</sup>

#### ***Dasht-i Nawur:***

Dasht-i Nawur is an extensive high-altitude plain in southeast Afghanistan (see picture 127). Some 600 km<sup>2</sup> in area, the plain lies at about 3 350 m elevation, with surrounding peaks, holding ibex and urial, rising to 4800 m. A narrow brackish lake, more than 10 km long, occurs in the plain. Dasht-i Nawur serves as an important breeding and staging ground for a large number of migratory waterfowl. There are records of breeding populations of avocets (*Recurvirosta avocetta*), redshanks (*Tringa totanus*), greater sandpipers (*Charadrius leschenaultia*), and common terns (*Sterna hirundo*). The area is also a unique, high elevation breeding ground for greater flamingo. In contrast with Ab-i Istada, local population in Dasht-i Nawur do not hunt flamingos. Rather they revere them because they associate the pink color of the plumage with the blood of the martyred Imam Hussain. The villagers of Qarya said that they had seen one flamingo in 2002 and eight in 2001, but that no flamingos had successfully bred since.<sup>38</sup>

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<sup>35</sup> For an overview of the climatic and agriculture situation in 2003, see FAO/WFP, "Food and Crops Supply Assessment", 13 August 2003.

<sup>36</sup> Pirouz Mojtahed-Zadeh, Ph.D., "Lake Hamun, a Disaster in the Making. Hydropolitics of Hirmand and Hamun", University of London, UNEP, March 1995.

<sup>37</sup> UNEP, *Ibid.*, 2002.

<sup>38</sup> UNEP, *Ibid.*, 2002.

#### 4.4 Agricultural Highlights

From an agro-ecological point of view the Sistan-Hilmand basin is divided into five major agro-ecological zones:

1. The intensively irrigated area with water from the large storage dams – formal irrigation
2. The intermittently irrigated land in the Sistan depression (below Khairabad - Reg district)
3. The western irrigated oases
4. The valley floor irrigation in mountainous area
5. The *karez* and Spring irrigated area

##### ***Formal Irrigation Schemes from large Storage Dams:***

Two major dams were constructed along the Hilmand river basins by the HAVA (Hilmand-Arghandab valley Authority) program. The Hilmand/Arghandab irrigated zone is the largest formal irrigation scheme in Afghanistan and a major production area. In April 1953 the rock fill Kajaki Dam (picture 67) located 70 kilometers miles above Girishk on the Hilmand River was inaugurated. Kajaki dam is 91 meters high, 270 meters long and hold 1700 million cubic meters of water to feed the Hilmand valley. The rock fill Band-i Dahla dam on the Argandab, located 50 km north of the city of Kandahar, was completed in 1952 and is 44 meters high, 530 meters long and holds up to 470 million cubic feet of water. However, according to the irrigation department in Kandahar, 12 to 15 meters are filled with silt, reducing sensibly the retention capacity of the dam.

**Picture 67**  
**Kajaki dam. Hilmand province. 15 January 2003 (N32.32, E65.12, SE**



The HAVA was an ‘integrated’ development scheme, with education, industry, agriculture, medicine and marketing under a single controlling authority. The HAVA had its base at Lashkar Gah, a modern planned city, locally known as the New York of Afghanistan.<sup>39</sup>

The Figure 10<sup>40</sup> depicts the Hilmand Valley<sup>41</sup> as envisioned in 1956. The Zahir Shah canal cut across the Arghandab river to irrigate regions around Kandahar. The Darweshan and Shamalan canals paralleled the river, watering surrounding areas, while other canals traversed the desert to feed islands of reclaimed land at Marja and Nad-i-Ali.

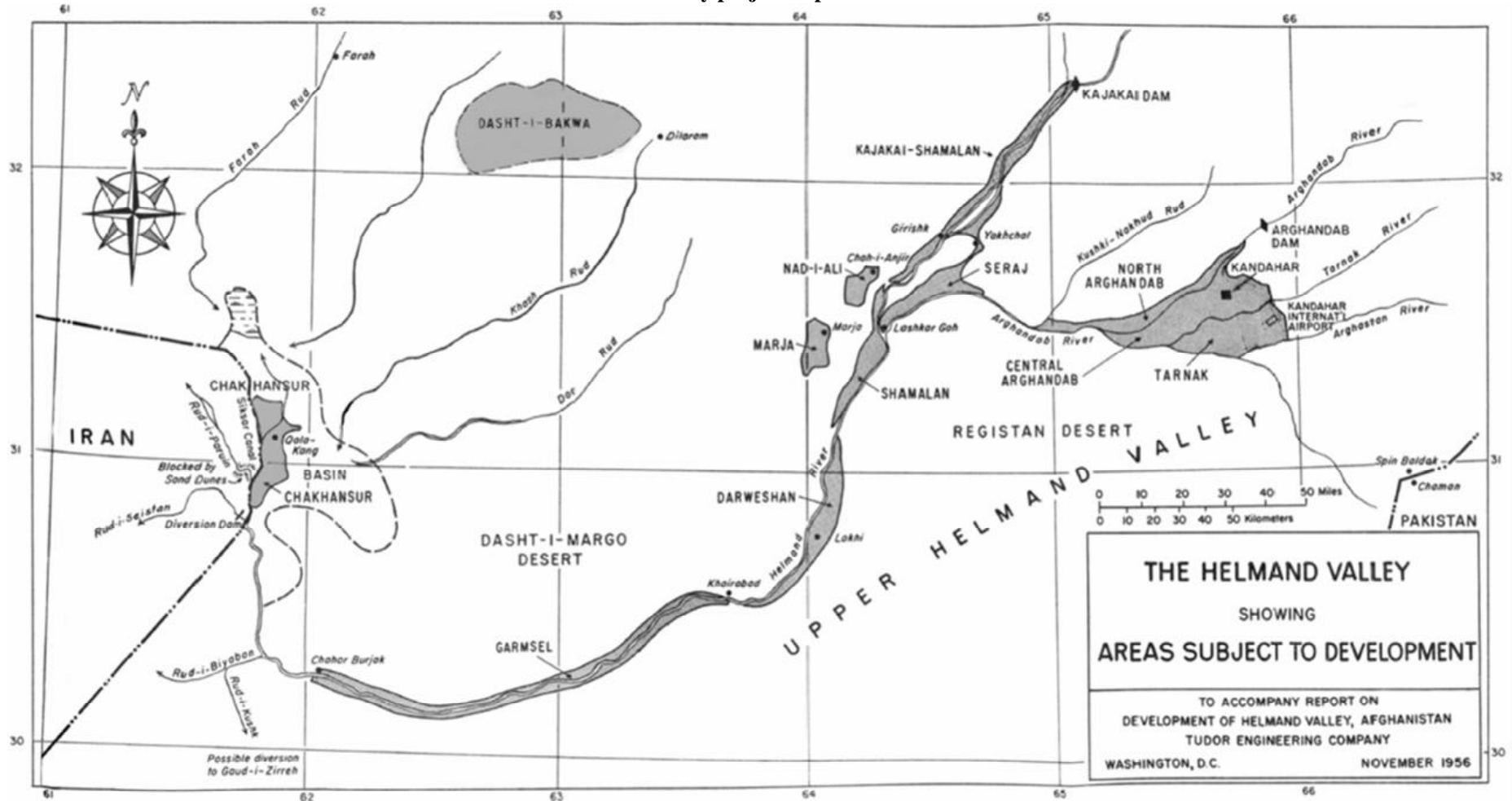
The Arghandab irrigated scheme around Kandahar is renowned for its succulent pomegranates and grapes, while in the Hilmand valley cotton and cereals are produced. The Hilmand/Arghandab irrigated zone is a major poppy production area. A major agricultural problem in the Hilmand and Arghandab irrigated valleys is soil salinity accumulating over the years with irrigation and increased by soil capillary action pulling soluble salts and alkalis to the surface. Snowy crusts of salt can be observed in various areas.

<sup>39</sup> Cullather, Nick, ‘*Damming Afghanistan: Modernization in a Buffer State*’, The Journal of American History, September 2002. <http://www.indiana.edu/~jah/teaching/404.shtml>

<sup>40</sup> From Nick Cullather, *Ibid.*, 2002.

<sup>41</sup> Precursor of the HAVA.

Figure 10  
Hilmand Valley project as planned in 1956



***Intermittently Irrigated Land in the Sistan Depression:***

Works on the lower river, below Khairabad (Reg district), were never completed. Therefore, below Khairabad, a narrow strip of traditional intermittently irrigated along the banks of the Hilmand river has maintained. Intermittently irrigation system extends up to the border of Iran in Chahar Burjak district (Nimroz province).

***Valley Floor Irrigation in Mountainous Area:***

The provinces of Bamyan, Ghor, Ghazni and Uruzgan high in the Hindu Kush, are made up of networks of high valleys and vast pastureland plateaus. The Central Highland mountains are the source of most of the rivers flowing into the lowland irrigation scheme in the North, West and particularly South-West regions. On the floor of these valley networks, irrigated agriculture is practiced and sustains the livelihood of local population (along with rain-fed agriculture and animal husbandry in high elevation).

***Western Irrigated Oases:***

In the West of Hilmand, short rivers (Adraskan Rod, Farah Rod, Khuspas Rod) which depends mostly on nearby mountains are flowing through deserts in the South into the Sistan depression. As in the Northern irrigated oases (see paragraph 2.4 above), land availability for irrigation surpasses the water supply capacity from the existing rivers (picture 69). Therefore, traditional land rotation system is practiced in order to maintain soil fertility. The land in rotation in these regions is called '*zamin-i Bawri*'. At the head of the irrigation system (i.e. Bala Buluk district along the Farah Rod), soil rotation is little practiced due to good access to irrigation water, but at the middle and the tail of the irrigation system, soil is rotated up to a 12-15 years rotation system such as in Khaq-i Safid (white dust) district of Farah province.

Close to the wetlands in the district of Lash wa Joweyn sand dunes have encroached into irrigated infrastructures during the drought reducing the possibility of utilizing the irrigated water supply for irrigation purposes (picture 68).

**Picture 68**

**Sand dune encroachment in Lash wa Joweyn, Farah province. 27 May 2003 (N31.71, E61.62, S)**



Picture 69  
Irrigated land in the desert. Farah, 25 May 2003



***Karez and Spring Irrigated Area:***

Most of the *karez*<sup>42</sup> in Afghanistan are included in the Hilmand basin. Water from *karez* is brought by free flow via underground tunnels from alluvial aquifers for surface irrigation (see figure 11). Dug by local craftsmen from shafts at close intervals, *karez* are usually small in dimensions but may be many kilometers in length. *karez* water is used for irrigation purposes (irrigated area ranges from 10 ha to 200 ha) as well as for drinking water supply. The figure 12 shows the main location irrigated by *karez* in Afghanistan.

*Karez* and spring irrigated areas are similar to oasis farming systems. The possible irrigated perimeters are wide, while the availability of water is limited. Therefore, soil rotation systems were practiced for centuries in order to maintain soil fertility. In the Pirzada oasis, 60 km West of Kandahar, J. Humlum<sup>43</sup> noted that the soil is cultivated on average every third year.

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<sup>42</sup> ‘*Karez*’ (called ‘*qanat*’ in Iran) are gently sloping tunnels dug nearly horizontally into an alluvial fan until the water filters into the channel, runs down its gentle slope, and emerges at the surface as a stream. Water from *karez* is used for irrigation and household consumption. In excavating these tunnels, diggers must have air and tunnels spoil must be removed, so the tunnels are connected to the surface with a series of vertical shafts spaced every 50 to 150 meters along its course. The top of these shafts are rimmed by piles of excavated dirt to form a “chain of wells” on the surface, a distinctive feature of the arid Afghan landscapes. The maximum gradient in a short *karez* is approximately 1:1,000 or 1: 1,500; in a long *karez*, the canal is almost horizontal. If the gradient is too steep, the tunnel will erode the walls and soon destroy it. See, English, P. W., “*The Origin and Spread of Qanats in the Old World*”, Proceedings American Philosophical Society, Vol. 112, No 3, June, 1968. Dug by local craftsmen from shafts at close intervals, they are small in size but may be many kilometres in length. *Karez* typically are constructed and maintained by a specialized group of artisans called *karezkan*. The task is demanding and dangerous, and *karezkan* are generally well paid by local standards.

<sup>43</sup> J. Humlum, *Ibid.*, 1959.



Figure 11  
 Sketches of a *karez*<sup>44</sup>

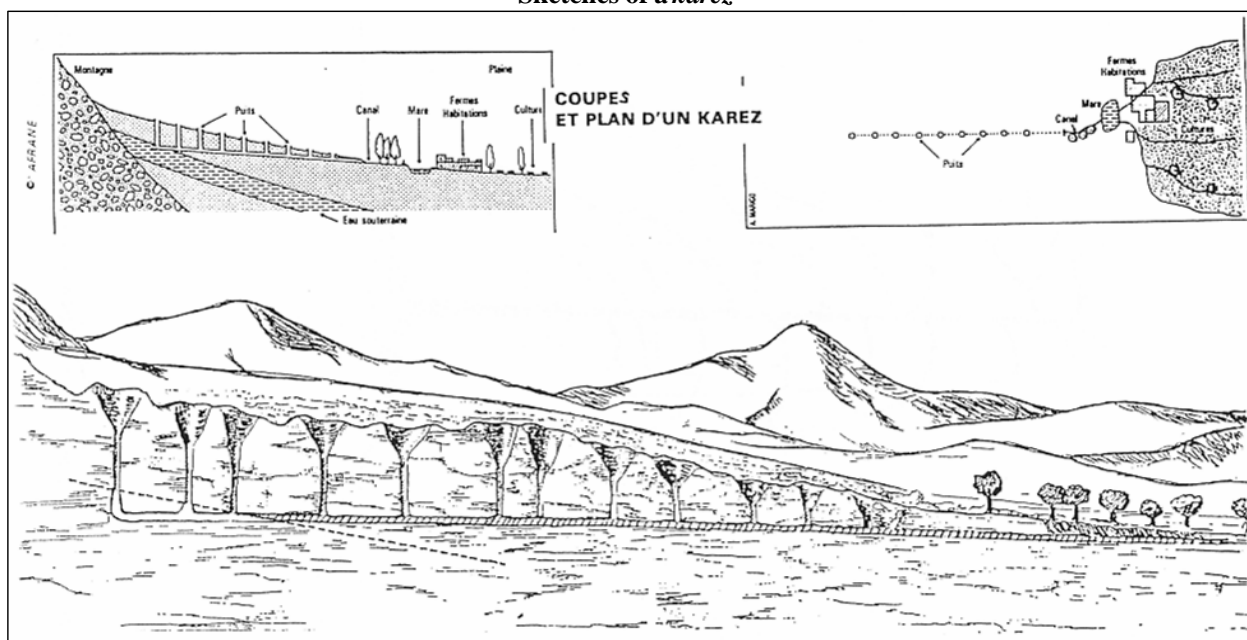


Figure 12  
 Map of the major *karez* irrigated areas in Afghanistan<sup>45</sup>.  
 The black squares indicate the main *karez* irrigated locations.



<sup>44</sup> AFRANE, "Les karez d'Afghanistan", 1994.

<sup>45</sup> J. Humlum, *Ibid.*, 1959.

Sheladia Associate Inc.(2003)<sup>46</sup> reports that “the recent drought, along with donor and remittance finance coupled with a gradual disintegration of communities’ shared sense of responsibility, has led some to use groundwater through tube-wells with turbine pumps. There is evidence of groundwater levels dropping in some areas, jeopardizing traditional springs and *karez* fed supplies. The apparent overuse of ground water in the *karez* belt of the country appears to represent a classic case of the ‘tragedy of the commons’ with individuals over-exploiting a commonly owned natural resource”.

However, English (1968) notes that although *karez* provides ground water without extraction energy requirement, deep wells have several advantages over *karez*; “deep wells are not limited by slope of soil conditions and can be placed at locations convenient in terms of transportation, market, or other considerations, they draw water from the permanent aquifer thereby eliminating seasonal variations in flow. Nor is water wasted when demand falls short of supply”<sup>47</sup>. The same author notes that replacing *karez* by deep wells requires major adjustments in social patterns, customs, and customary laws that have developed around this water-supply system. Thus a conflict between these two technologies is developing.

However, these uncontrolled developments of tube-wells in Afghanistan raise a fundamental question of equity and transfer of water from poor to rich<sup>48</sup>.

***Pastureland:***

The Central Highland have numerous pasturelands (picture 70) which are grazed in summer by local flocks as well as nomadic population groups travelling long distances from southern Afghanistan with their herds.

**Picture 70**  
**Pastureland in Ghor highlands grazed by local stocks and ‘*kuchi*’ nomads travelling from Southern Afghanistan. Ghor, 1 June 2003 (N34.18, E64.82, NE)**



<sup>46</sup> Sheladia Associate Inc., *Ibid.*, 2003.

<sup>47</sup> English, P. W., “*The Origin and Spread of Qanats in the Old World*”, Proceedings American Philosophical Society, Vol. 112, No 3, June, 1968.

<sup>48</sup> Thierry Facon, FAO Water Management Officer, Communication Personnelle.

#### 4.5 Historical Highlights

It is in the Hilmand basin that one of the oldest settlements of agricultural and urban communities was found in Afghanistan. The Bronze Age site of Mundigak in Kandahar province evolved into complex agricultural communities contributed to the prosperity of large cities in the Indus valley such as Mohenjo-daro and Harrapa.

In a more recent past along the Hilmand-Argandab rivers, flourishing prosperous civilizations developed. The Sistan was home of the legendary Rustam, mightiest hero of the *Shahname*, the classic story composed by Firdowsi 1000 years ago. Kandahari speaks with pride of Sistan past prosperity; “Once there were so many fine buildings and palaces that one could easily walk from Bost to Zarang on the rooftops without once touching the ground”<sup>49</sup>. Medieval geographers speak of the ‘garden of Asia’ or ‘granary of the East’. The prosperity of the Sistan region was seriously damaged after the invasion of King Timur in the 14th century. However, various authors consider that its decline was a combined effect of sedimentation, salinization and changes in the course of the Hilmand basins rivers. Today, various parts of the once prosperous Sistan are known by dreadful names such as Dasht-i Margo (Desert of Death), Dasht-i Jehanum (Desert of Hell) and Sar-o Tar (Desolation and emptiness). Sar-oTar is covered with the fastest moving sand dunes in the world with an average of 15 centimetres per day (Bonn University, 1968-73 Sistan studies)<sup>50</sup>. From this past prosperity, a rich heritage of fruits has managed to survived historical tumults; mostly pomegranates and grapes/raisins. They are potentially major export commodities.

The HAVA (Hilmand-Argandab Valley Authority) program aimed to transform desert into irrigated field as during the Sistan glory, before it was consigned to barren darkness, by the construction of two major retention dams on the Hilmand and Argandab rivers. The HAVA built a modern city next to colossal ruins of Qala-i Bost, the summer capital of the Ghaznevid.

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<sup>49</sup> Nancy Hatch Dupree, “*An Historical Guide to Afghanistan*”, Afghan Air Authority and Tourist Organization, Kabul, 1977.

<sup>50</sup> In : Nancy Hatch Dupree, “*An Historical Guide to Afghanistan*”, Afghan Air Authority and Tourist Organization, Kabul, 1977.

## 5. Kabul (Indus) River Basin

### 5.1 General

The Kabul (Indus) River Basin includes all Afghan rivers that join the Indus river in Pakistan. The Indus empties into the Arabian Sea of the Indian Ocean. The basin drains water from the Kotal-i Shibar pass to the Kunar valley in the North and the Paghman mountains to the Spingar (or Koh-i Safid in Persian) in the South of Jalalabad. In the Eastern Mountains, rivers take their sources in high mountains covered by snow and glaciers which are maintaining water flow throughout the summer. The Kabul (Indus) basin also includes the small Pishin Lora river in the South-eastern corner of Afghanistan. The Eastern part of the Kabul (Indus) basin is under the influence of the monsoon reaching the valley systems facing the Indus valley in summer.

The Kabul (Indus) basin cover 12% of the national territory, but alone it drains one fourth (26%) of the total annual water flow of Afghanistan. Therefore, the basin has an important Hydro-power potential which is already partly developed:

1. The first hydro-electric station was built in Jabul Seraj between 1911-1918 by American engineers (picture 71). In the absence of a road network, all the heavy equipment was brought from India on the backs of elephants.

**Picture 71**

**View of the oldest hydro-power equipment brought from India on elephant back up to Jabul Seraj in the early 20<sup>th</sup> century. Parwan, 17 June 2003 (N35.12, E69.24)**



2. It was only in 1953 that the second hydro-power station was installed in Surobi with German assistance (picture 72). Norconsult-Norplan notes the equipment is robust and has been comparatively well maintained with the limited means available. The units can still be operated close to their original output and the station has had a regular energy production throughout the years.

**Picture 72**  
**Bandi Surobi dam, Kabul, 5 December 2003 (N34.59, E69.78, NW)**



3. The Mahipar Hydro-electric project was completed in 1966 with German assistance (picture 73). It diverts the Kabul river as it comes off the Kabul Plateau, shooting it down a steep tunnel blasted through the heart of the mountain massif, turning the generator located 32 km beyond Surobi. River flow is largest in the winter months, when there is the largest need of energy. However, the river dries for several months in summer. Norconsult-Norplan consultant notes that the production has dramatically reduced in recent years.

**Picture 73**  
**Band-i Mahipar dam, Kabul, 5 December 2003 (N34.56, E69.48, NE)**



4. The Naghlu Hydro-electric plant, a joint Afghan-Soviet project, was completed in 1967 (picture 74). It is situated at the confluence of the Kabul, Panjshir and Tagao rivers.

Naghlu is the main hydropower project in the Kabul river basin, and the only reservoir project. Norconsult-Norplan note that ageing of the equipment combined with lack of maintenance has created a high risk of problems occurring at any time. This may drastically reduce capacity.

**Picture 74**  
**Bandi Naghlu dam, Kabul, 5 December 2003 (N34.64, E69.72, NW)**



5. The Darunta hydro-power plant was constructed by the USSR and commissioned in 1967 (picture 75). Darunta dam and fish-breeding centre was established in 1965 with the assistance of China.

**Picture 75**  
**Darunta Dam, Nangarhar, 30 December 2003 (N34.48, E70.36, N)**



The existing hydropower plants on the Kabul river form the core of public electricity supply to Kabul city.

The Kabul (Indus) basin is divided in 8 main watersheds:

1. Kabul watershed
2. Chak wa Logar Rod watershed
3. Ghorband wa Panjshir watershed
4. Alingar watershed
5. Kunar watershed
6. Shamal watershed
7. Gomal watershed
8. Pishin Lora watershed

## 5.2 Transboundaries Riparian Issues

The two main riparian countries on the Indus river are Pakistan and India. However the Kabul river is a sizeable tributary of the Indus. The riparian issues on the Indus basin are convoluted with the dispute over the border between Afghanistan and Pakistan. The geographical border is a product of British imperial policy drawn up in 1893 and commonly known as the *Durand Line*. The line was devised by the British to strengthen the status of Afghanistan as a buffer between British India and the Russian Empire.

This border was never ratified by Afghanistan but remains in force today. Review of the border has been under negotiation since 1993 and is becoming an increasing point of tension between the Pakistani and Afghan governments. Pakistan see security of their western frontier as vital to national security, as they also face major problems in the north east against the Indian government and Kashmiri separatists over the disputed territory of Jammu-Kashmir. The Afghan/Pakistan border area has long been known as a '*lawless frontier*' over a thousand miles in length. Religious extremism and civil disorder have built up as a result of two decades of war in Afghanistan, which has now merged with the internal troubles that exist within Pakistan<sup>51</sup>.

Norconsult-Norplan notes that the Government of Afghanistan is planning to reinforce irrigation, fishing and hydropower generation along the Kabul river but, unless an agreement is found, further developments could trigger tensions between Afghanistan and Pakistan.

## 5.3 Environment Highlights

### *Eastern Forests:*

In eastern Afghanistan oak and coniferous forests are growing depending on the amount of monsoon rainfall reaching the area from the Indian subcontinent. The lower valleys have walnut (*Juglans regia*) and birch (*Betula kunaresis*, *B. jacquemontii*) forests and thickets and valley meadows. Between 1500m and 2500m, there is a thick stand of oak forests, dominated by *Quercus baloot* and *Quercus semecarpifolia* on drier slopes and, in more humid places, by *Quercus dilatata*. Above this belt, up to the tree line at 3300m lies a coniferous forest belt (pictures 75 and 76) with cedar (*Cedrus deodara*), spruce (*Picea smithiana*), fir (*Abies spectabilis*), pine (*Pinus gerardiana*, *Pinus wallichiana*), juniper (*Juniperus semiglobosa*), and yew (*Taxus wallichiana*). Above the coniferous forests there is an alpine shrubland dominated by rhododendron (*Rhododendron colletianum*), dwarf juniper (*Juniperus nana*), and alpine heath and alpine meadowland which provides very good summer grazing<sup>52</sup>. These Mountains hold a

<sup>51</sup> Ahmad Rashid, "*Taliban. Militant Islam, Oil and Fundamentalism in Central Asia*", Yale University Press, 2000.

<sup>52</sup> D. A. Scott, "*A Directory of wetlands in the Middles East*", Wetlands International Publication, 1995. <http://www.wetlands.org/inventory&MiddleEastDir/AFGHANISTAN.htm>

rich fauna, including snow leopard, markhor, Asian ibex (*Capra sibirica*), Himalayan black bear (*Ursus thibetanus*) and two species of flying squirrel (*Eoglaucomys fimbriatus* and *Petaurista petaurista*). UNEP's satellite analyses<sup>53</sup> revealed that conifer forests in the provinces of Nangarhar, Kunar and Nuristan have been reduced by an average of 50 per cent since 1978. Deodar cedar (*Cedrus deodara*) is a straight-grained, decay-resistant, aromatic wood and the primary conifer species harvested for decades (picture 20).

**Pictures 76 and 77**

**Left, view of a Cedar (*Cedrus Deodara*) forest in the background. Right, view of a Cedar tree and oak trees forest in the lower background. Barg-i Matal, Nuristan, July 2003**



***Kole Hashmat Khan:***

Kole Hashmat Khan (also known as Lake Chaman) is a small, shallow, slightly saline, eutrophic and reed-covered wetland situated below Bala Hissar fort at the edge of Kabul city. The lake is the only remaining water body and marsh area of the formerly extensive wetlands on the plain of Kabul. It is fed by a tributary of the Logar River, and has no outlet except when the water level is exceptionally high. The lake is L-shaped, about 2.5 km in length and 0.3-1.0 km in width, and has a maximum depth of no more than 1.5 m<sup>54</sup>. Large areas of former wetland have been converted into agricultural land (picture 78). The small wetland valley was a worship centre through the century for followers of Buddhism, Hinduism and Islam. The wetland was long used as a royal hunting area and was declared as a waterfowl reserve in the 1930s by King Zahir Shah. The site is important for migrating and wintering water birds. Many settlements are encroaching into the wetland area and the reeds are cut for sale as roof thatch, destroying nesting habitat for birds (picture 79). The site has an important recreational and educational potential for the city of Kabul.

<sup>53</sup> UNEP, *Ibid.*, 2002.

<sup>54</sup> Derek A. Scott, *Ibid.*, 1995.



**Picture 78**

**View of Kole Hashmat Khan. Note the agricultural land encroaching on the wetland (right hand side of the picture). Kabul, 10 November 2003 (N34.48, E69.20, N)**



**Picture 79**

**Harvesting reeds in Kole Hashmat Khan. Kabul, 10 November 2003 (N34.49, E69.20, N)**



#### **5.4 Agriculture Highlights**

From an agro-ecological point of view the Kabul (Indus) basin is divided into two major agro-ecological zones:

- 1. Intensively irrigated area in mid/high elevation*
- 2. Intensively irrigated area in low elevation*

***Intensively Irrigated Area in mid/high Elevation:***

Recent agriculture surveys showed that the valley floor irrigated areas surrounding Kabul province are one of the most diverse and intensive agricultural areas in Afghanistan (pictures 82 and 83)<sup>55</sup>. Kabuli and neighbouring Pakistani markets provide opportunities for specialist production, such as apples and potatoes (Wardak), vegetables (Kabul and Parwan) and raisins in the Shomali plain (Kabul, Parwan and Kapisa, pictures 80 and 81). Irrigated valleys along the Chak wa Logar Rod and the Upper part of the Kabul river are famous for apples. Modern apple varieties were first introduced here by an Afghan engineer, whose names is given to some of these varieties; Dr. Wakil. The Shomali plain is particularly famous for quality raisins but also host a wide diversity of fruits and nuts growing up into the Ghorband valley. The Southern part of the Shomali plain was entirely destroyed and hundred of thousands inhabitants were forced out of the area in 1997-98<sup>56</sup>. Today the valley still bears the deep scars of war (picture 80).

In the East, mid and high elevation agriculture is practiced in Nuristan, where maize and millet are the main crops. South of Jalalabad, a complex of mountain torrents originating from the Spingar range support piedmont agriculture production both in the North-east of the range (Nangarhar) and the south-west toward Paktiya valleys and the plain of Khost. These streams are seasonal, prone to flash floods and vulnerable to drought, particularly after light snowfall on the Spingar ranges in dry winter.

**Picture 80**  
**Aerial view of vineyard in part of the Shomali plain destroyed in 1998.**  
**Mir Bacha Kot district, Kabul province, 2 April 2003 (N34.70, E69.06, E)**



<sup>55</sup> Raphy Favre, Anthony Fitzherbert, Javier Escobedo, "MAAH/MRRD/FAO/WFP National Crop Output Assessment. First Phase. 10<sup>th</sup> May to 5<sup>th</sup> June 2003", FAO, 25<sup>th</sup> July 2003.

<sup>56</sup> See Ahmad Rashid, *Ibid.*, 2002.

**Picture 81**

**Aerial view of the Shomali plain. The Panjshir river is visible on the left, the Ghorband river on the right and the Salang river in the centre. The Panjshir and Ghorband rivers join in Bagram district (Parwan province). Note the reflection of light from irrigated fields which is revealing an important issue of concern regarding water management in Afghanistan; due to insecurity of access to irrigation water, farmers tend to inundate their fields when they get their irrigation turn. 26 March 2003 (N35.15, E69.19, S)**



***Intensively Irrigated Land in low Elevation:***

The lowland in Nangarhar and lower Kunar valley benefit from a semi-tropical climate, and has the highest proportion of high cropping intensity irrigated land in the country. The riverine farms, situated along valley bottoms of varying widths, produce a range of crops throughout the year. Double cropping is the rule rather than the exception and triple cropping is noted in areas offering 365 growing days per year. Semi-tropical crops such as citrus, sugar canes and henna are produced around Jalalabad. The Nangarhar Valley Authority that aimed at reclaiming desert land divided in 4 state farms planted primarily citrus and olive trees.

**Pictures 82 and 83**

**Double cropping system is practiced in valley floor irrigated land up to an elevation of 2000-2200 meters in the Kabul basin. Winter wheat is the first crop and is cultivated up to 2500 metres. The second crop after wheat is generally maize or pulses. Above; harvesting time in the Panjshir valley on the 18 June 2003  
Below; maize second crop in the same location on the 27 August 2003. Hisa-i Hawal-i Panjshir district (N35.23, E69.38, E)**



## 5.5 Historical Highlights

G. Etienne<sup>57</sup> notes that the Kabul (Indus) River Basin differs geographically from the Northern, Eastern and Western regions. The Kabul river and its numerous tributaries run in narrow valleys separated by Mountainous chains. These rivers do not drain in large open plains as in other parts of the country. These hydro-geography characteristics have prevented any spatial organisation of the territory such as in the Hilmand/Sistan or the Bactrian in the North; local chieftains could not develop large irrigated schemes. The relative simplicity of the irrigation structures contributed to their security and maintenance and thus successive invasions were absorbed despite temporary destructions. Also, thanks to its rugged terrain and pivotal location in Asia, the Kabul basin had a flourishing international trade. From Jalalabd, the Silk Road led to the Indus valley through the Khayber pass. A similar situation exists in the southern part of the Kabul (Indus) River Basin where the Sulaiman Mounts lays.

Observers noted that although no major known historical centres have flourished along the narrow valleys on the Suleiman Mounts (Khost, Paktia, Paktika and Zabul provinces in Afghanistan), this mountainous land has repeatedly influenced the course of regional History. G. Etienne<sup>58</sup> notes that the bellicosity of the Eastern Pashtun tribes has no equivalent in the world and invites the readers to remain attentive over developments on the Suleiman Mounts for signs of future changes in Afghanistan.

Afghanistan is the land of lost Kingdoms and royal gardens enthusiastically described by travellers of the past. Whilst successive invading armies have thrown civilization back into darkness, sometimes for centuries at a time, the rich varieties of royal garden fruits appear to have survived and today represents a genetic heritage of World significance. Afghanistan is the host of a wide number of apple (*Malus spp*), almond (*Prunus amygdalus*), apricot (*Prunus armenica*), and grapes (*Vitis vinifera*) varieties. In addition, Afghanistan is probably the world leader in genetic diversity for mulberry (8 species out of which *Morus nigra* and *Morus alba* are the most important) and pomegranate (*Punica granatum*), while it is the centre of origin for walnuts (*Juglans regia*) and pistachio (*Pista vera*)<sup>59</sup>. Part of this significance is indeed found in the Kabul (Indus) river basin. The first of the great Moghol kings, Babur, described the abundance and variety of Ghorband and Koh-i Daman (Shomali plain) gardens. In the early 19<sup>th</sup> century, Monstuart Elphinstone<sup>60</sup> noted that the habile farmers in the Koh-i Daman are exporting fruits up to India.

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<sup>57</sup> Gilbert Etienne, “*L’Afghanistan ou les Aléas de la Coopération*”, PUF, Paris, 1972.

<sup>58</sup> Gilbert Etienne, “*Imprévisible Afghanistan*”, presses de science PO, La bilbio. du citoyen, 2002.

<sup>59</sup> FAO, “*Food Security through Sustainable Crop Production in Afghanistan. An account of the Achievements of the AFG/96/004 Program 1997-1999 and Opportunities for 2000 and beyond*”, November 1999.

<sup>60</sup> Elphinstone, Monstuart, “*An Account of the kingdom of Caubul*”, Graz, Akademische Druck u. Verlagsanstalt, 1969