

CHAPTER 2

Water

WATER is the key to the distribution, proliferation, and perpetuation of animal and plant life, and its absence limits agricultural and pasture land (see Map 4). Its source in Afghanistan lies in the high watershed of the Central Mountains. Afghanistan's problem is not insufficient water, for enough exists to increase productivity of current acreage and to add many thousands of marginal acres to production. Control, not amount, is the difficulty. Most of the millions of acre-feet of water which seasonally pour down from the mountains disappears into the deserts, or is pirated away by the many uncoordinated irrigation intakes lining the rivers and tributaries.

Since all the rivers get their water from the same source at approximately the same time, seasonal fluctuations occur almost simultaneously. Most rivers have maximum flow in spring and early summer and minimum in late summer and winter. Minimum often means complete drying-up, or such a drastic reduction that rivers like the Khash Rud in the southwest shrink to unconnected pools in the stream beds.

Four main river systems exist: Amu Darya, Hari Rud, Hilmand-Arghandab, and Kabul. Only the Kabul River has an outlet to the sea; it joins the Indus system at Attock, Pakistan, but the other three are entirely inland systems.

The major perennial rivers are Amu Darya, Kabul, Hilmand, Arghandab, Panjsher, Logar, Hari Rud, and Kunar. Perennial tributaries are Laghman, Surkh Ab, Kunduz, Kokcha, Rud-i-Band-i-Amir (called Balkh Ab in its lower course).

Disastrous floods can occur anytime between February and July, washing away fields, drowning livestock and people.

Amu Darya (Oxus) System

The Amu Darya (the classical Oxus River), principal boundary with the U.S.S.R. (determined as middle of *thalweg*—deepest channel—in 1946), runs for about 680 miles (1,100 kilometers) before it pushes north into Russia and empties into the Aral Sea; its total length is about 1,500 miles (2,400 kilometers). Before becoming the Amu Darya, it



13. Eastern Mountains. Tajik village at north end of Khord Kabul Pass



14. Northern Mountains and Foothills. Eroded arroyo near Aq Kupruk south of Mazar-i-Sharif. Sheep-goat trails plainly visible. Hillsides bloom in late spring. October, 1959

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has several local names. At its headwaters in the Pamirs, it is known as the Ab-i-Wakhan, but the name changes to Ab-i-Panja when the Ab-i-Pamir joins the Ab-i-Wakhan. In Russian Tajikistan, its name is Pyandzh. The Afghans call it Amu Darya when it is joined by the Kokcha. The Russians, however, reserve the name Amu Darya for the river when a more important tributary, the Vakhsh, runs into the Ab-i-Panja from the Soviet side.

Practically all along the course of the Amu Darya up to Kunduz the extremely precipitous and rocky Russian bank lies higher than the Afghan bank. Since 1955, the Russians have helped the Afghans develop three river ports, Sher Khan Bandar, Tashgozar, and Dagla Arosa (also called Kelift) opposite the Russian railheads of Nizhniy Pyandzh, Termez, and a Soviet town also named Kelift. The major Afghan port is Sher Khan Bandar (formerly called Qizil Qala and Imam Sahib), north of Kunduz. Goods to and from Afghanistan are transported across the Amu Darya by river steamer (some are paddlewheelers) and tugs pulling *ferrahot* (barges) which ply between the ports. Goods to and from Pakistan and India increasingly flow along these routes.

The Kokcha, 200 miles (320 kilometers) long and major tributary of the Amu Darya, rises on the eastern flanks of the Central Mountains and flows northerly, then westerly to join the Amu Darya. Several small tributaries empty into the Kokcha, among them, the Anjuman and Munjan at 'Iskarzar and the Warduj near Barak, or Baharak.

The 300-mile-long (480 kilometers) Kunduz, only other tributary of the Amu Darya in Afghanistan, has several local names. It is Bamiyan Rud from its source to Bulola, then Surkh Ab between Bulola and Doshi. Joined by the Andarab at Doshi, the stream becomes the Kunduz River. Other minor tributaries which join the Kunduz are the Khanabad, just south of Chahar Darra; the Kamard, which comes in from the west at Doab (Doab Mekh-i-Zarin); Saighan, a main headwaters tributary coming in a little south of the Kamard.

Several important local rivers flow into the Turkestan Plains between Tashkurghan and Aq Chah, but die out before reaching the Amu Darya. The Tashkurghan River, about 120 miles (190 kilometers) long, flows almost due north out of the northern slopes of the Hindu Kush, through the spectacular Tang-i-Tashkurghan, a steep, half-mile-long gorge, before it peters out in the Turkestan Plains north of Khulm (the new name for Tashkurghan; Khulm had been its medieval name).

A winding river, the Balkh Ab (about 300 miles, or 480 kilometers, long) originates in the Zard Sang (Sang-i-Zard) region of the Central

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Mountains. Known as the Rud-i-Band-i-Amir until its confluence with the Darra Yusuf, the Balkh Ab twists down the mountains, surrounded by high cliffs most of the way, to the Turkestan Plains, where about twenty irrigation canals (each 12 feet, or 4 meters, wide and 45 feet, or 14 meters, deep), locally known as the Ishkabad canal system, drain off the water before it reaches the Amu Darya. The canal system embraces an area 25 miles (40 kilometers) north-south and 75 miles (121 kilometers) east-west.

The beautiful Band-i-Amir lakes sit near the source of this river.

The Sar-i-Pul River (about 200 miles, or 320 kilometers, long) rises northwest of the Balkh Ab near Qala Shahar (also called Faoghan), being milked dry by irrigation ditches before it reaches Shibarghan. Several smaller rivers feed the winding Sar-i-Pul as it approaches the Ab-i-Safed Tangi. From the right fork, the Darya-yi-Siah enters; from the left fork, the Sazai River enters south of Sar-i-Pul town. The Ab-i-Safed River departs the Sar-i-Pul River at Saiyidabad, then flows north-northwest and dies out a little beyond Shibarghan.

The final important river flowing toward the Amu Darya is the Ab-i-Qaisar, a 200-mile-long (320 kilometers) stream originating near Barqi Rajan (11,473 feet, or 3,500 meters, above sea level). It follows narrow valleys and high cliffs before pouring into the 28-canal Mirabad system of the Turkestan Plains near Daulatabad. From the southwest the Shirin Tagao joins the Ab-i-Qaisar north of Daulatabad; the Maimana River comes in south of Jalaogir.

Hari Rud System

The Hari Rud (about 420 miles, or 650 kilometers, long in Afghanistan) flows almost due west out of a narrow trough between two ranges of the central Hindu Kush mountains, cutting a fertile valley out of the rocks. North of Islam Qala, it turns north, becomes a part of the Afghan-Iranian border for about 100 miles (161 kilometers), and continues into the U.S.S.R. as the Tedzhen.

A single important tributary, the Kao Rud runs west and southwest through alpine meadow lands and enters the Hari Rud from the south near Obeh.

The other major river in the Hari Rud system, the Murghab (about 250 miles, or 350 kilometers, in Afghanistan; another 250 miles in the U.S.S.R.) does not join the Hari Rud but rises in the western Hindu Kush, flowing first north and then west. At Darband-i-Kilrekhta, the

river leaves the Band-i-Turkestan mountains through a 180-foot-wide (60 meters) gap. At Bala Murghab the valley has widened to 2 miles (3.2 kilometers), surrounded by low hills to the northeast and high cliffs to the southwest. As Michel (1968) correctly points out, including the Murghab in the Hari Rud system is somewhat contradictory, since the two rivers do not meet. However, once again I plead that I have divided Afghan geographic zones and water systems with an emphasis on integrating culture and ecology.

Several tributaries (mainly the Karawal Khana from the east) meet in confluence south of Maruchak; the Kashan and the Kushk join the Murghab in Russian territory.

Hilmand–Arghandab System

The Hilmand system drains about 40 percent of Afghanistan's land area and may have great potential for development. Many believe that until the Turco–Mongol devastations of the fourteenth century A.D. the Hilmand Valley had been a great bread-basket, but recent unpublished research questions this contention.

The 800-mile-long (1300 kilometers) Hilmand rises out of the southern watershed by the Koh-i-Baba Range near Kabul, and flows in a generally southwesterly direction until it approaches the Iranian border, where it takes a sharp turn north and empties into the marsh lakes and lagoons of the Hamun-i-Hilmand, lying mainly in Iran. Distribution of the Hilmand water is still a major point of controversy between Iran and Afghanistan.

The Hilmand has no outlet to the sea, and millennia of evaporation have produced many salt flats, such as the Gaud-i-Zirreh in the Sistan Basin. Seasonal increments of snow-melt keep the rivers of the Hamun-i-Hilmand fresh, but the lakes overflow and spread salts to other parts of the depression.

The mountains of the Hazarajat hem the Hilmand into narrow valleys with gorge-like cliffs. Above Girishk, the topography changes and wide terraces or former flood plains dominate, until the river breaks out into the deserts of southwestern Afghanistan and flows to and across the Iranian border.

Several tributaries join the Hilmand: Kaj Rud and Tirin in the Hazarajat, Rud-i-Musa Qala south of Kajakai, and several intermittent streams south of Girishk.

The only other major river in the system is the Arghandab (about

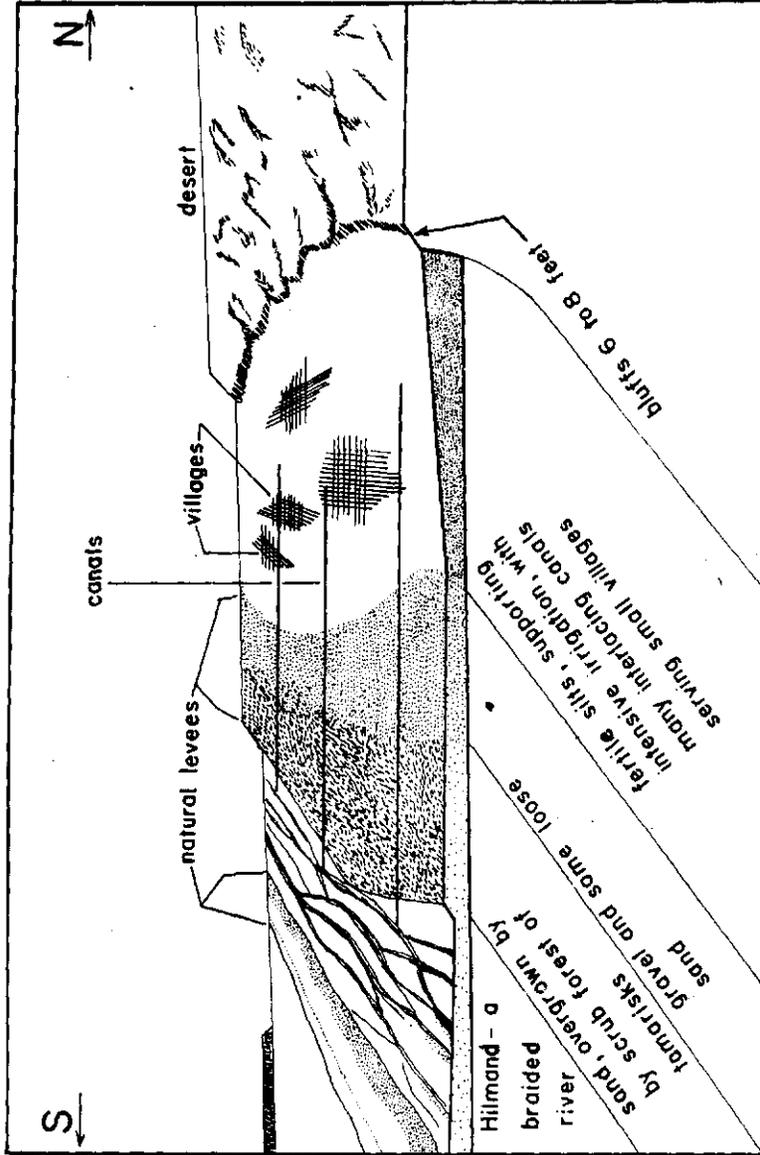


DIAGRAM 2
Idealized Cross-Section of the Hilmand Valley

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350 miles, 560 kilometers, long). The headwaters of the Arghandab squat in the granitic masses of the eastern Hazarajat. Less than 50 miles (80 kilometers) north of Qandahar, the Arghandab flows into open country. A low line of hills separates the river from Qandahar and the Patao canal-system which supplies the city with water. The Arghandab eventually reaches the Hilmand at Qala Bist, considerably drained off by intensive irrigation along the way.

Two intermittent streams, the Kushk-i-Nakhud (colloquially pronounced "Kishk-i-Nakhud") and the Garm Ab west of Qandahar, feed into the Arghandab from the north. The Arghastan River, about 175 miles (280 kilometers) long, sits east of and parallel to the Arghandab. Joined by the Lora no. 1 and Kushk-i-Rud, the Arghastan hits the Dori River southeast of Qandahar, and the Dori then flows on to join the Arghandab west of Panjwai.

The Dori, about 200 miles (320 kilometers) long, is called the Lora (a second Lora) near its source in Pakistan. Its name changes to Kadanai as it enters Afghanistan, and the name Dori applies east of Spin Baldak. Irrigation largely dissipates both the Dori and Arghastan before they unite.

The Tarnak, about 200 miles (320 kilometers) long and sandwiched between the Arghandab and Arghastan, waters the Kalat-i-Ghilzai region. Most of the Tarnak has been diverted for irrigation before it joins the Dori.

The Ghazni Rud, about 150 miles (240 kilometers) long, mainly waters the Ghazni area, and its principal tributary, the Jilga, flows out of Paktya.

A brackish lake, Ab-i-Istada, 17 miles (27 kilometers) long by 5 miles (8 kilometers) wide, receives the runoff from the Ghazni Rud. The Ab-i-Istada, the source of Lora no. 1, freezes over in winter.

Farther west and north, the Farah Rud (about 200 miles, or 320 kilometers, long), which has its watershed in the Paropamisus Mountains, flows through the desert to the Hamun-i-Sabari (or Sabiri). The Rud-i-Ghor joins the Farah Rud near Kumrak before it debouches into the stony desert of the Dasht-i-Narmung. Near 32°50' N., 63°15' E., the Malmun River joins the Farah Rud.

Originating in the mountains southeast of Herat, the Harut Rud flows past Shindand and in spate reaches the Hamun-i-Sabari. The Rud-i-Gaz joins the Harut at Shindand, and the Khushk Rud, an intermittent stream, dribbles into the Harut during the flood season (December-March). Intensive irrigation by the Persian-speaking farmers considerably milks the Harut and its meager tributaries.

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A final important, intermittent river, the Khash Rud (about 300 miles, or 480 kilometers; active only during the melt-water season), flows from its source in the western Hazarajat to Chakansur during the flood season. Near Dilaram, the Khash Rud becomes a series of isolated pools during the dry season. Even the more affluent Arghandab can dry up into a series of unconnected pools in unusually dry years.

Manmade water-systems called *qanat* (an Arabic term) in Iran and Afghanistan, and *karez* in Pashto,¹ exist throughout eastern, southern, and southwestern Afghanistan. Open-ditch irrigation is much easier to implement in the northern Turkestan Plains with its relatively shallow water-table. From the air, the *qanat* of Iran, Afghanistan, and West Pakistan look like neat lines of anthills leading from the foothills across the desert zones to the greenery of the villages and towns. Actually a line of "wells" (shafts) connected by tunnels to intercept the water table, the *qanat*-system brings water to the surface for use in irrigation (see Diagram 3). Part-time specialists (they are farmers first), such as the Andar Pushtun of eastern Afghanistan, dig the wells and tunnels, using lighted candles or lanterns to line up the excavators as they dig toward the next well. Excavators use hard ceramic hoops to reenforce weak strata. The *qanat* system must be cleaned annually because of silt accumulation. Goatskin buckets attached to a windless contraption haul the originally excavated dirt and the later accumulated silts to the surface.

The work is dangerous, for shafts of 30 to 50 feet (9 to 15 meters) are common. Some shafts reach depths of over 100 feet (30 meters), but without the extensive *qanat* system, agriculture in marginal areas would be greatly reduced. Only the highest shaft leading up the hillside intercepts the water-table. Then, guided by the tunnels, the water spills out onto the irrigation ditches and fields.

Kabul River System

The Kabul River System forms a part of the greater Indus River system. The Kabul River (about 225 miles, or 350 kilometers, long) flows from its headwaters at Sar Cheshma (or Sar Chisma) just east of the entrance to the Unai Pass (about 14,000 feet, or 4,270 meters, above sea level), through the Kabul Valley and then into some of the more treacherous Afghan territory, including the Tang-i-Gharu, on its way

¹ Called *foggara* in north Africa; *feledj* in Oman; also called *khariz* in Iraq and Iran. See Wolski (1965) for more details.

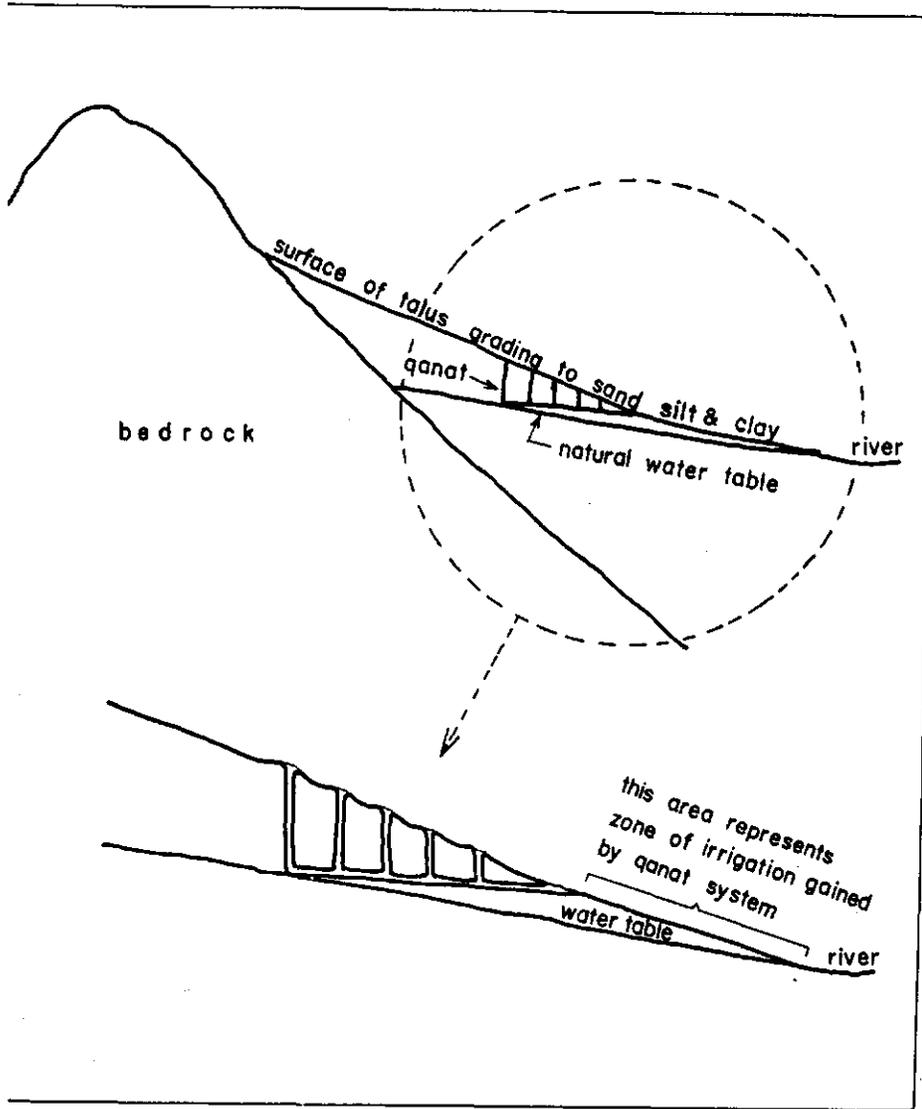


DIAGRAM 3
Idealized Cross-Section of Qanat System

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to the post-World War II German-built dam at Sarobi and the hydroelectric station at Mahipar, and the Russian-built dams at Naghlu and in the Darunta gorge. Through the Jalalabad plains, where a new Soviet project hopes to make the desert and semi-desert bloom, near Dakka southeast of Jalalabad, the Kabul River turns north, then east into the Peshawar Valley. The Kabul River does not flow through the Khyber Pass.

Several tributaries reinforce the strong perennial Kabul River. The Panjsher and two Laghman rivers (Alishang and Alingar) flow into the Kabul River north of Jalalabad, and the Surkh Ab (not to be confused with the other Surkh Ab, part of the Amu Darya system in north Afghanistan) from the south.

Coming from an entirely different direction, the Panjsher River (about 200 miles, 320 kilometers, long) rises near Anjuman Pass. The Panjsher trends southward through alternating narrow gorges with high walls and relatively broad, open ($\frac{1}{3}$ - $\frac{3}{4}$ mile, $\frac{3}{4}$ -1 kilometer, wide) valleys where terraced agriculture flourishes. The valleys are connected by high mountain passes. At Gulbahar, the Panjsher shifts to the south-east and joins the Kabul north of Lataband Pass near Sarobi.

Several tributaries join the Panjsher: the Ghorband near Jabal us-Seraj, the Parian Dara north of Dasht-i-Rewat.

The Logar River (about 125 miles, 200 kilometers, long) flows north out of the mountains of the eastern Hazarajat, courses through the relatively wide Logar Valley, sometimes called the "granary of Kabul," and strikes the Kabul River at 6.2 miles (4 kilometers) east of Kabul. Open irrigation ditches and *qanat* abound. The Shiniz Rud joins the Logar from the south, the Khawat Rud comes from the west, and the Kajao from the southwest.

The Kunar River begins in Afghanistan as the Bashgal River high in Nuristan, and flows lazily through a wide valley until pinched in at Arnawai (Arandu in Pakistan). A raging torrent through its length in Afghanistan, the Bashgal joins the Kunar River proper, pushing through the mountains of Chitral (also the name of a river) in Pakistan. Below Chiga Serai (now Asadabad), the river valley widens about $1\frac{1}{2}$ miles (2.4 kilometers). The flood-plain near the Jalalabad Valley exceeds one mile. The Kunar feeds many canals and *karez*. The Kunar joins the Kabul near Jalalabad.

CHAPTER 3

Areas Drastically Affected by Man

STATISTICS on Afghanistan abound, but most consist of "intelligent estimates," i.e., wild guesses based on inadequate data, and practically all figures given in this book must be considered to be such intelligent estimates. With this caution in mind we can say that the total area (see Map 5) of Afghanistan is about 63 million hectares (245,000 square miles). Of the total area about 12 percent is cultivated annually because of water shortages.¹ The irrigated land is called *abi*, while dry farmed land is *lalmi*. The *lalmi* area consists of about 1.3 million hectares and supports wheat and barley primarily. (One hectare equals 2.47 acres, but some Afghan villagers measure land in *jerib*, or approximately .5 acres. Chart 4 indicates agricultural productivity from 1966 to 1970. For a list of domesticated plants in Afghanistan see Appendix A. Map 5 graphically illustrates the areas of intensive cultivation.)

The most extensive areas of cultivation currently exist north of the Hindu Kush mountains. Irrigation projects now being developed in the south and southwest could possibly change this picture appreciably in the next decade or so. The geology of most inhabitable areas (e.g., the Kabul Valley, Hilmand-Arghandab Valley, Hari Rud Valley, and the Turkestan Plains of the Amu Darya) exhibits reasonably similar Neogene and younger deposits (conglomerates, gravels, sands, and loess), which should make it easier for planners and technicians to integrate regional and national projects.

¹For a detailed discussion see Michel's chapter on "Agriculture" in Wilber (1962, 221-41). Three recent works are extremely important: *Agricultural Development in Afghanistan with Special Emphasis on Wheat* (1967); Pickett (1967); Dada and Pickett (1969). Also see Vavilov and Bukinich (1929) and Voik (1954).