



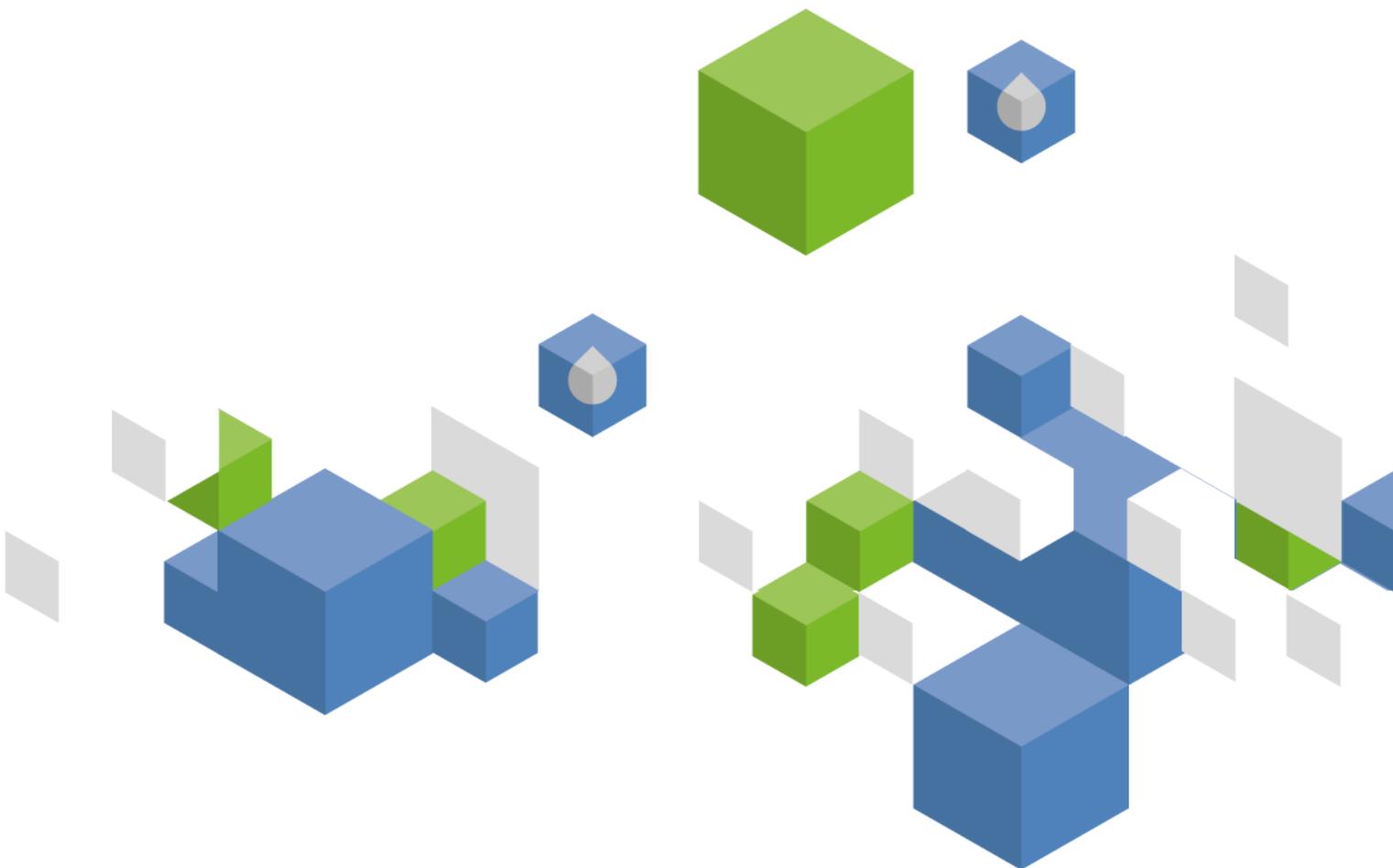
Food and Agriculture Organization  
of the United Nations

FAO  
AQUASTAT  
Reports

# Transboundary River Basin Overview – Kura Araks

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Version 2009





Recommended citation: FAO. 2009. AQUASTAT Transboundary River Basins – Kura Araks River Basin. Food and Agriculture Organization of the United Nations (FAO). Rome, Italy

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# Kura Araks transboundary river basin

## GEOGRAPHY, CLIMATE AND POPULATION

### Geography

The Kura-Araks River Basin is a transboundary basin with a total area of about 190 110 km<sup>2</sup> of which 65 percent is located in the South Caucasus countries: 31.5 percent in Azerbaijan, 18.2 percent in Georgia and 15.7 percent in Armenia. The remaining part is distributed between the Islamic Republic of Iran (19.5 percent of the basin) and Turkey (15.1 percent) (Lehner et al, 2008) (Table 1). The Kura-Araks River Basin is situated south of the Caucasus Mountains. Its borders are northeastern Turkey, central and eastern Georgia, and the northwestern part of the Islamic Republic of Iran. It contains all the territory of Armenia and more than two-thirds of Azerbaijan. The Kura River rises in Georgia and the Araks River in Turkey and both join in Azerbaijan about 150 km before its mouth at the Caspian Sea.

TABLE 1  
Country areas in the Kura-Araks River Basin

Basin	Area		Countries included	Area of country in basin (km <sup>2</sup> )	As % of total area of the basin	As % of total are of the country
	km <sup>2</sup>	% of the Middle East				
Kura-Araks	190 250	2.90	Azerbaijan	60 020	31.5	69.3
			Iran (Islamic Republic of)	37 080	19.5	2.1
			Georgia	34 560	18.2	49.6
			Armenia	29 800	15.7	100.0
			Turkey	28 790	15.1	3.7

### Climate

The geographical location of the South Caucasus at the border where the humid Mediterranean and dry continental air masses meet, the complex mountainous relief and other factors have conditioned the diversity of climate zones across the region, from everlasting snow caps and glaciers to warm humid subtropical forests and humid semi-desert steppes. Average annual precipitation in the basin is estimated at 565 mm, although it varies all along the basin territory. The annual average temperature of the entire Kura–Araks River Basin is estimated at 9 °C. Average temperature in January is –4 °C although it can drop to –13 °C in the coldest places of the basin. In July, average temperature reaches 22 °C, although in the hottest places it can increase to 28 °C (New et al, 2002). The climate of Armenia, which is entirely located in the basin, is highland continental: hot summers and cold winters. Average annual temperature is 5.5 °C. Summer in Armenia is moderate, with the average temperature for July at 16.7 °C, and in the Ararat Valley it varies in the range of 24–26 °C. Winters are quite cold, with an average temperature of –6.7 °C. Total annual precipitation in Armenia is 592 mm. The driest regions are the Ararat Valley and the Meghri region, where the annual precipitation is 200–250 mm. The maximum precipitation, observed in high mountainous areas, is more than 1 000 mm annually. Azerbaijan is situated at the northern extremity of the subtropical zone and two-thirds of the country is located in the Kura–Araks River Basin. Its climatic diversity is caused by the complicated geographical location and landscape, the proximity of the Caspian Sea, the effect of the sun’s radiation, and air masses of different origin. The climate in Azerbaijan is continental. Arid weather with average summer temperatures above 22 °C is observed in the lowlands. In the mountain regions, temperatures may be below 0 °C in winter.

Figure 1  
Kura Araks River Basin



Humid tropical weather is observed in the coastal zone near the Caspian Sea, mainly in the Lankaran lowlands in the southeast. The average precipitation is estimated at 447 mm/year. Almost half of Georgia, the eastern part, is located in the Kura–Araks River Basin, which has a subtropical dry climate with relatively cold winters and arid, hot summers. The average precipitation varies between 500 and 1 100 mm/year. About 80 percent of the rainfall occurs from March to October, while the longest dry period is about 50–60 days. Drought years are common. There is a need for irrigation in the areas where precipitation is less than 800 mm/year. Average temperatures vary between  $-1^{\circ}\text{C}$  in January and  $22^{\circ}\text{C}$  in July.

Finally, as far as Turkey and the Islamic Republic of Iran are concerned, only a small part of the country, 4 and 2 percent respectively, is located in the Kura–Araks River Basin.

### Population

Average population densities are 128 persons/km<sup>2</sup> in Armenia, 93 persons/km<sup>2</sup> in Azerbaijan, and 78 persons/km<sup>2</sup> in Georgia. There are three cities with an excess of 1 million inhabitants in the South Caucasus: Baku (Azerbaijan), Tbilisi (Georgia), and Yerevan (Armenia) (Ewing, 2003).

A majority of the population of the Caucasus still lives below the poverty line. Gross Domestic Product (GDP) has decreased roughly by 50 percent since 1991, poverty levels have reached 60–80 percent, and unemployment has skyrocketed. Even though all three countries have shown signs of macroeconomic recovery and progress in the implementation of structural reforms, there has been emigration from the region to the Russian Federation, Turkey, the Persian Gulf, and the West (Vener, 2006).

### WATER RESOURCES

The Kura River, with a total length of 1 515 km, rises in Georgia and flows into Azerbaijan before entering the Caspian Sea. It has an average discharge of 575 million m<sup>3</sup> per year. Two of its tributaries rise in Turkey: the Mtkvari, with an inflow from Turkey estimated at 0.91 km<sup>3</sup>/year, and the Potskhovi, with an inflow estimated at 0.25 km<sup>3</sup>/year. The inflow of the Debet River, a southern tributary of the Kura River, is estimated at 0.89 km<sup>3</sup>/year from Armenia to Georgia. The annual flow from Georgia to Azerbaijan of the Kura Basin is 11.9 km<sup>3</sup> and the annual flow of the Agstay from Armenia to Azerbaijan is about 0.35 km<sup>3</sup>/year.

The Araks River originates in Turkey and after 300 km forms part of the international border between Armenia and Turkey, then for a very short distance between Azerbaijan and Turkey, between Armenia and the Islamic Republic of Iran, and between Azerbaijan and the Islamic Republic of Iran. The Araks River is about 1 072 km long and it has an average discharge of 210 million m<sup>3</sup> per year (Berrin and Campana, 2008). The total annual flow from Armenia to Azerbaijan through the Araks River and its tributaries (Arpa, Vorotan, and Vokhchi) is estimated at about 5.62 km<sup>3</sup>, and from the Islamic Republic of Iran is estimated at 7.5 km<sup>3</sup>. The Araks River joins the Kura River in Azerbaijan about 150 km before its mouth at the Caspian Sea.

With respect to storm water and sewage effluent discharges, the Kura–Araks River Basin receives 100 percent of Armenia's, 60 percent of Georgia's, and 50 percent of Azerbaijan's deficit (Berrin and Campana, 2008).

The South Caucasus countries are faced with water quantity and quality problems. In general terms, Georgia has a lot of water, Armenia has some shortages due to poor management, and Azerbaijan has a lack of water; moreover, its groundwater is of poor quality. In Georgia, the main use of the Kura–Araks water is agriculture. In Armenia it is agriculture and industry whereas in Georgia drinking water is withdrawn from a large fresh groundwater stock. In Azerbaijan, the Kura–Araks water is the primary source of freshwater, and 70 percent of drinking water comes from these rivers. In general, water is used

for municipal, industrial, irrigation, fishery, recreation, and transportation purposes. The main water use is agriculture, followed by industry and households uses (Berrin and Campana, 2008).

### Water quality

During the Soviet era and also in the post-Soviet period, large volumes of effluents were discharged into surface water bodies by the municipal, industrial and agriculture sectors, causing pollution of both surface water and groundwater. The largest source of pollution is municipal wastewater, which pollutes the rivers downstream of large cities with organic matter, suspended solids, surfactants, etc. Industrial wastewater discharges also are high, polluting surface water with heavy metals, oil products, phenols and other hazardous substances. In Georgia, for example, large industrial facilities producing manganese, ammonia, machinery, etc. together with arsenic, copper and gold mining and processing plants, oil refineries and power plants pollute the river bodies of the Black Sea and the Caspian Sea basins with heavy metals, oil products, phenols and other toxic substances. In Armenia and Azerbaijan, different industries also have discharged high loads of pollutants into the Kura and Araks rivers and their tributaries (UNEP, 2002). Agricultural return flows also contribute to the Kura–Araks pollution with pesticides such as DDT (Berrin and Campana, 2008). On its way through Turkey and the Islamic Republic of Iran, there is also a large populated area with an advanced industry, which increases the pollution in the Kura–Arak rivers.

### WATER-RELATED DEVELOPMENTS IN THE BASIN

The total area equipped for irrigation in the Kura–Araks River Basin is estimated at between 2 and 2.5 million ha, of which Azerbaijan accounts for approximately 45 percent, the Islamic Republic of Iran 21 percent, Georgia 14 percent, Armenia 11 percent and Turkey 8 percent. Agricultural water withdrawal is about 19 km<sup>3</sup>.

During the Soviet era, the Caucasus was an important agricultural region that supported the entire USSR. Soviet agriculture was highly inefficient and suffered from poorly equipped infrastructure. At present, agriculture remains the main sector in the region, employing a significant amount of the population. In the Soviet period, from the 1970s to 1980s, industry in the Caucasus was well developed. The major industrial sectors were oil and gas, chemicals and machinery, ferrous and non-ferrous metals, cement, fertilizer, light manufacturing, and food processing. This rapid industrial development resulted in increased environmental pressures. After the USSR was dismantled, industrial production declined sharply because of the energy crisis and the dissolution of economic ties among the former Soviet Republics. Recently, some signs of industrial revival have appeared. However, the growth rate is still insignificant (Vener, 2006).

The main Kura and Araks rivers have only two reservoirs but the tributaries have more than 130 major reservoirs. Table 2 shows the large dams in the Kura–Araks River Basin, i.e. dams with a height of more than 15 metres or with a height of 5–15 metres and a reservoir capacity greater than 3 million m<sup>3</sup> according to the International Commission on Large Dams (ICOLD).

TABLE 2  
Large dams in the Kura-Araks River Basin

Country	Name	Nearest City	River	Year	Height (m)	Capacity (million m <sup>3</sup> )	Main use *
Armenia	Spandaryan	Sisian	Vorotan	1989	83	257	I, H, O
	Azat	Artashat	Azat	1976	76	70	I, H, O
	Her-her	Vayk	Arpa	1993	74	26	I, H
	Tolors	Sisian	Sisian	1975	69	96	I, H
	Akhuryan	Maralik	Akhuryan	1981	59	525	I
	Aparan	Aparan	Qasakh	1966	52	91	I
	Kechut	Jermuk	Arpa	1981	50	25	I, O
	Hakhum	Berd (Ijevan)	Hakhum	1985	45	12	I
	Shamb	Sisian	Vorotan	1970	41	14	H
	Tavush	Berd	Tavush	1973	37	5	I
	Karnut	Gyumri	Akhuryan	1973	35	25	I
				<b>Total</b>		<b>1 146</b>	
Azerbaijan	Sarsang	Tertter	Tertter	1976	125	565	I, F, H
	Mingechevir	Mingechevir	Kura	1953	80	15 730	I, W, F, H, N, R
	Shamkir	Shamkir	Kura	1983	70	2 677	I, W, F, H
	Agstafachay	Kazax	Agstafachay	1969	53	120	I, F
	Araz	Nakhchivan	Araz	1971	40	1 350	I, W, F, H
	Xachinchay	Agdam	Xachinchay	1964	38	23	I, F
	Ayrichay	Sheki	Ayrichay	1986	23	81	I, F
				<b>Total</b>		<b>20 546</b>	
Georgia	Jinvali	Dusheti	Pshavis Aragvi	1985	102	520	I, W, H
	Sioni	Tianeti	Iori	1963	85	325	I, H
	Dalis Mta	Dedoplistskaro	Iori	0	38	180	I
	Tblisi-Samgori	Tbilisi	Iori	1956	15	308	I, W, R
				<b>Total</b>		<b>1 333</b>	
Iran (Islamic Republic of)	Sabalan	Meshkin shahr	Ghare Sou	2006	89	105	I, W
	Makou	Makou	Zangmar	0	78	150	I, W, H
	Satarkhan	Ahar	Ahar Chay	1998	78	135	I, W
	Yamchi	Ardebil	Balkhli Chay	2004	67	82	I, W
	Zenouz	Zenouz	Zenouz Chay	2004	60	6	I
	Aras	Jolfa	Aras	0	42	1 350	I, H
	Arasbaran	Kalibar	Silinchay	2003	34	25	I
	Ghourichay	Ardebil	Ghourichay	1996	33	20	I
	Shourabil	Ardebil	Balkhli	2001	10	14	I
				<b>Total</b>		<b>1 887</b>	
Turkey	Arpacay	Kars	ArpaCay	1983	59	525	
	Catoren	Eskisehir	Harami	1987	45	47	
	Beyler	Kastamonu	Incesu	1994	42	25	
	Patnos	Agri	Gevi	1992	38	33	
					<b>Total</b>		<b>630</b>
				<b>TOTAL</b>		<b>25 542</b>	

\* I = irrigation; H = Hydropower, W = water supply; F = Flood protection; N = Navigation; R = Recreation

## TRANSBOUNDARY WATER ISSUES

During the Soviet era, water resources management of the basin was contingent upon the policy that the USSR was implementing at the time. In the 1960s and 1970s, surface water quality standards for a broad spectrum of substances were established. Domestic sewage was required to enter wastewater treatment facilities and undergo both mechanical and biological treatment. Meanwhile, no standards, guidelines or management practices existed for controlling diffused source pollution. Until 1991, there were no taxes on water pollution. Only water use fees were employed, introduced in 1982. In essence, they served more to finance state water protection programmes rather than to give an incentive to water users to conserve a resource. Legal requirements, existing laws, regulations and standards were frequently ignored or violated, because of their strictness and unfeasibility (UNEP, 2002). In the Soviet period the USSR signed an agreement with Turkey concerning the use of the Araks River, according to which the water of this transboundary river is divided equally between the countries. According to another agreement signed between the USSR and the Islamic Republic of Iran, the water of the Araks River is divided equally between them.

When Armenia, Azerbaijan and Georgia became independent states, the three countries had neither water resources management regulations nor water codes. However, each country has adopted water codes within the last 15 years: Armenia in 1992 and revised in 2002 according to the European Union

Water Framework Directives (EU-WFD), and Georgia and Azerbaijan in 1997. Nevertheless, there is no uniform control or management system for the rivers and, in the post-Soviet period, no water quality monitoring by the riparian countries. While the three countries are willing to cooperate on water-related issues since they recognize their dependency on the basin, whose waters they must share, they have not resolved their political, economic, and social issues. Currently no water treaties exist among the three countries, a condition directly related to the difficult political situation in the region.

In 1997, an agreement on environmental protection was signed between the governments of Georgia and Azerbaijan. In 1998, a similar agreement was signed between Georgia and Armenia. According to both agreements, the governments will cooperate in creating specifically protected areas within the transboundary ecosystems.

Azerbaijan and the Islamic Republic of Iran have an agreement on the protection of the Araks River (UNECE, 2004).

In 2002, the Republic of Armenia Commission on Transboundary Water Resources was established, chaired by the Head of the Water Resources Management Agency. This commission, together with corresponding commissions of neighbouring countries, deals with issues related to transboundary water resources use and protection.

Table 3 shows the main historical events in the Kura–Araks River Basin.

TABLE 3  
Chronology of major events in the Kura-Araks River Basin

Year	Plans/Projects/Treaties/Conflicts	Countries involved	Main aspects
<b>Soviet period</b>	Agreement concerning the use of Araks river	USSR and Turkey	The water of the Araks River is divided equally between them
<b>Soviet period</b>	Agreement concerning the use of Araks river	USSR and the Islamic Republic of Iran	The water of the Araks River is divided equally between them
<b>1960s -1970s</b>	Surface water quality standards	USSR	Surface water quality standards for a broad spectrum of substances was established
<b>1982</b>	Water use fees	USSR	
<b>1992</b>	Water code in Armenia	Armenia	In 2002 it was revised according to the European Union Water Framework Directives
<b>1997</b>	Water code in Azerbaijan	Azerbaijan	
<b>1997</b>	Water code in Georgia	Georgia	
<b>1997</b>	Agreement on environmental protection	Georgia and Azerbaijan	Cooperation in creating specifically protected areas within the transboundary ecosystems
<b>1998</b>	Agreement on environmental protection	Georgia and Armenia	Cooperation in creating specifically protected areas within the transboundary ecosystems
<b>1999-2001</b>	Integrated water resources management plan for Armenia	Armenia	World Bank funded the development of this plan
<b>2000-2002</b>	South Caucasus water management project	South Caucasus countries	Strengthening the co-operation among water-related agencies and integrating water resources management
<b>2000-2006</b>	Joint river management programme on monitoring and assessment of water quality on transboundary rivers	South Caucasus countries	Prevention, control and reduction of trans-boundary pollution impact
<b>2002-2007</b>	South Caucasus river monitoring project	South Caucasus countries	Established social and technical infrastructure for an international, cooperative, transboundary river water quality and quantity monitoring, data sharing and watershed management system
<b>2002</b>	Republic of Armenia commission on transboundary water resources was established	Armenia	This commission together with corresponding commissions in neighbouring countries resolved the issues related to transboundary water resources use and protection
<b>2005-2006</b>	Reducing transboundary degradation in the Kura-Araks river basin project	South Caucasus countries, the Islamic Republic of Iran	To ensure that the quality and quantity of the water throughout the Kura-Araks river system meets the short and long-term needs of the ecosystem and the communities relying upon the ecosystem
<b>2004-2008</b>	Caucasus-Georgia strategic plan	Georgia	Support for the South Caucasus regional water management programme as a principal component of its regional conflict prevention and confidence-building objectives

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