

# Workshop on the Protection of Groundwater as a Source of Drinking Water in Karst Areas

Physical and chemical parameters of underground waters of Tajikistan and aspects of the integrated water resources management of the Central Asia on use of underground waters

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The concept Central Asia (the former name is Middle Asia and Kazakhstan) that is used nowadays includes the republics of CIS: Kazakhstan, Kyrgyzstan, Tajikistan, Turkmenistan and Afghanistan. Hydrographically the Central Asia Region (CAR) is distinguished as the Aral Sea basin, which in its turn consists of two basins – the Syrdarya and the Amudarya Rivers.



# Indicators of macroeconomic development of CAR

<b>Country</b>	Territory, th. km <sup>2</sup>	Pop-on, mln. people	Per capita gross inland output by purchasing capacity parity, th. dollars/man	Per capita energy consumption, tons of conventional fuel /man
<b>Kazakhstan</b>	2636,20	14,95	3,56	3,67
<b>Kyrgyzstan</b>	198,50	4,90	0,68	0,66
<b>Tajikistan</b>	143,10	6,20	0,99	0,84
<b>Turkmenistan</b>	488,00	4,70	1,52	3,30
<b>Uzbekistan</b>	447,36	24,60	2,26	2,70
<b>CA</b>	3913,16	55,35	2,22	2,64

# Surface water resources of the Aral Sea basin

Country	The Amudarya River basin, km <sup>3</sup> /year	The Syrdarya River basin, km <sup>3</sup> /year	The Aral Sea basin	
			km <sup>3</sup> /year	%
Kazakhstan	—	4,50	4,50	3,9
Kyrgyzstan	1,90	27,4	29,30	25,3
Tajikistan	62,9	1,1	64,00	55,4
Turkmenistan	2,78	—	2,78	2,4
Uzbekistan	4,70	4,14	8,84	7,6
Afghanistan	6,18	—	6,18	5,4
CA	78,46	37,14	115,6	100,0

On the territory of Central Asia Region in the basins of two great Transboundary Rivers of Aral Sea basin –Syrdarya and Amudarya are recommended and approved to use of water of 339 deposits. The general regional stocks of underground waters are estimated in 43. 49 km<sup>3</sup>/year.

- Amudarya River Basin -25.09 km<sup>3</sup>/year
- Syrdarya River Basin -18.40 km<sup>3</sup>/year

The part of underground water deposits is formed in territory of the adjacent countries and have transboundary character:

- Golodnostepskii basin Tajikistan - Uzbekistan
- Kafarniganskii basin Tajikistan - Uzbekistan
- Ferganskii basin Tajikistan - Kyrgyzstan -Uzbekistan

# Underground water stocks and their used by state of Aral Sea Basin (km<sup>3</sup>/year)

State	Estimate of regional stock	Approval stocks for used	Actual pump out in 1999 year	Were used to branch			
				Drinking	Industry	Agriculture	Vertical drainage
<b>Kazakhstan*</b>	1,846	1,27	0,293	0,2	0,081	0	0
<b>Kyrgyzstan*</b>	1,595	0,632	0,244	0,043	0,056	0,145	0
<b>Tajikistan*</b>	18,7	6,02	2,294	0,485	0,2	0,428	0,018
<b>Turkmenistan</b>	3,36	1,22	0,457	0,210	0,036	0,15	0,06
<b>Uzbekistan</b>	18,455	7,796	7,749	3,369	0,715	2,156	1,349
<b>In all Aral Sea Basin</b>	43,486	16,938	11,037	4,307	1,088	4,045	1,409

\* on the data of SPEKA Project



Deposits of underground waters have appreciable hydraulic interrelation with a superficial drain. It is shown by means of reduction of a superficial drain at excessive to pump out of underground waters. In view of it the national state commissions approve the operational stocks of underground waters resolved for to pump out. The general volume of pump out of underground waters is 11.04 km<sup>3</sup>/year.

In process of increase of volumes of water pump out from underground water sources necessity of expansion of the international cooperation on regulation of use of similar deposits, prevention of their pollution and exhaustion.

**Capital - Dushanbe.**

**The population - 6187,8 thousand person.**

**Population density - 42 persons on km<sup>2</sup>**

**The territory - 143,1 thousand km<sup>2</sup>**

**State language - Tajik.**

**Religion - an islam**

**Monetary unit: = 1 somoni**

**UZBEKISTAN**

XINJIANG UYIGUR  
AUTONOMOUS REGION  
**CHINA**

**TAJIKISTAN**

**GBAO**

**AFGHANISTAN**

NORTH-WEST  
FRONTIER  
PROVINCE

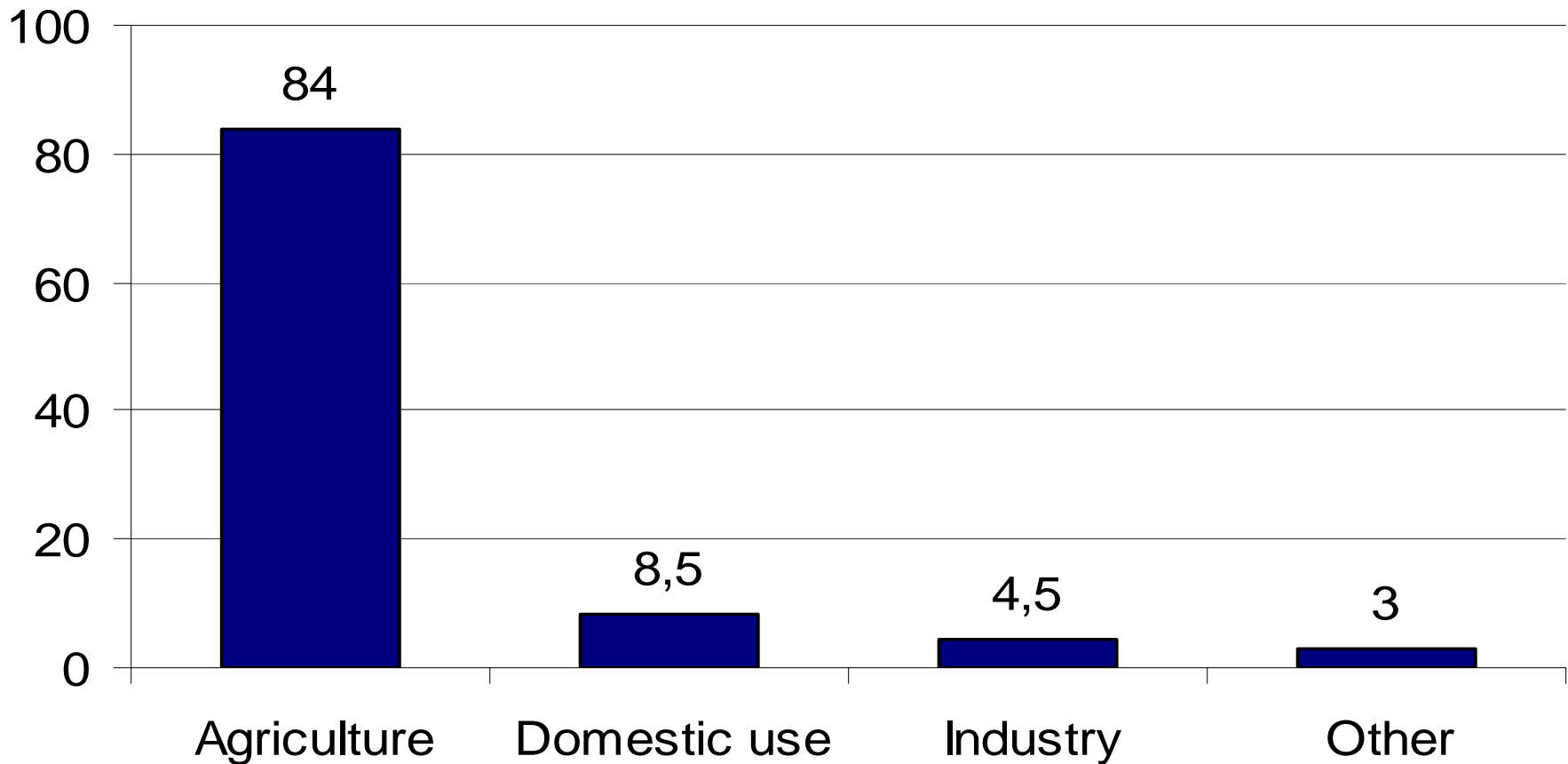
**PAKISTAN**

NORTHERN AREAS  
(DISPUTED)



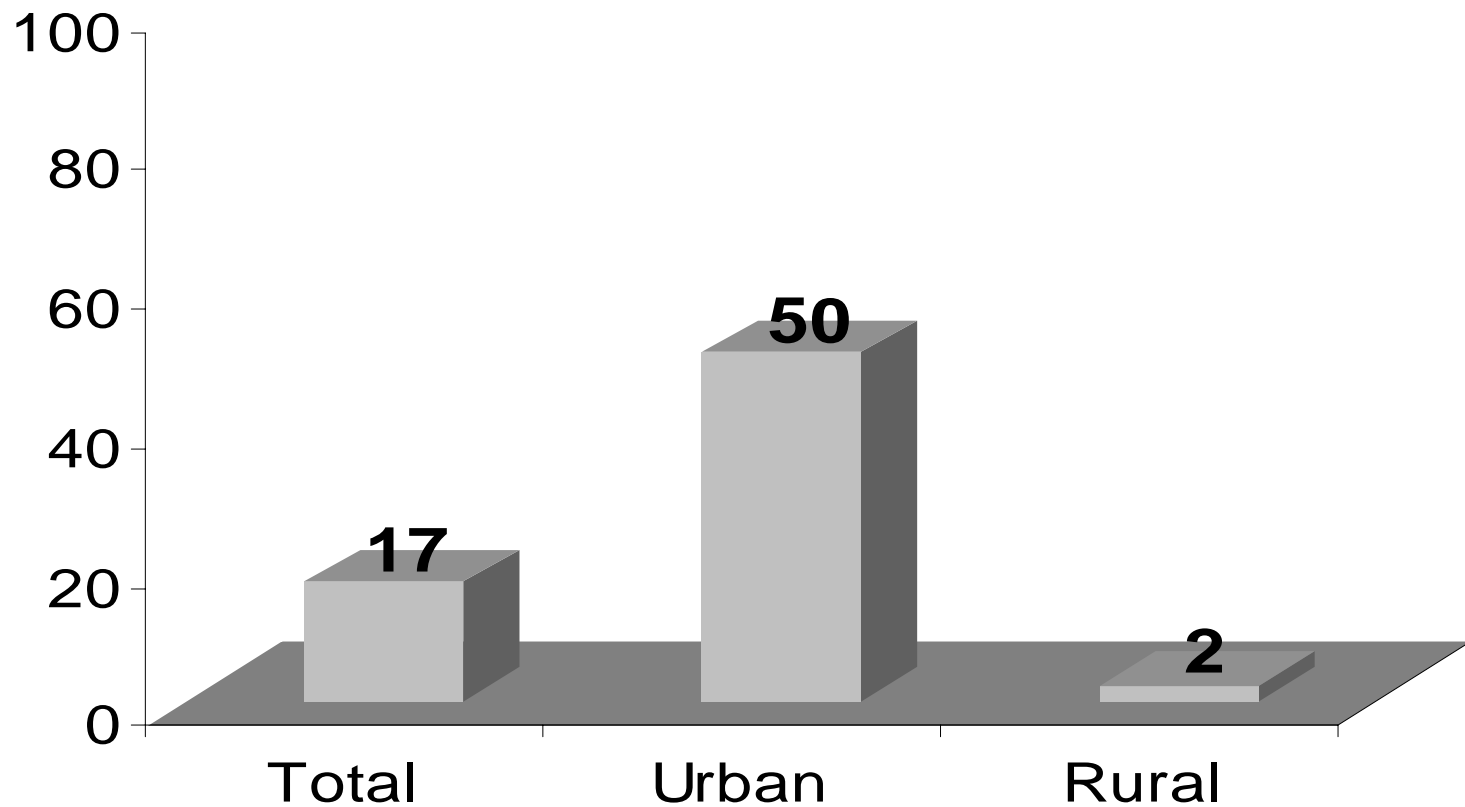


# Water uses in Tajikistan



Source: Ministry of Irrigation and Water Resources

# Access of population to a sewage system



Source:UNICEF

## I. Northeast – Tajikistan's region

In mesozo-cainozoic and palaeozoic breeds of the region are developed crack-soil, crack –venous, course-pore and course- cracks waters. The water-bearing horizons are without of pressure and pressure head .In radical breeds - springs are constantly worked and seasonal with debit 0.1-0.5 up to 1.0-5.0 L/sec. In quaternary deposit underground waters flowed on depths from 15.5 up to 100 m and more. Debit of chinks up to 20 L/sec. Waters of this region is Ca, Mg- hydrocarbonate and Ca, Mg-hydrosulphates with the mineralization of 0.5-0.8 up to 7.5 g/dm<sup>3</sup>.

## **II. Northeast region**

In region following types of waters are developed:

Course-pore waters of the quaternary deposit (capacity of 500 m and more). Depth of bedding from 0.5-3.0 up to 10-30 m, and on intercone watersheds up to 80-90 m. Waters is without and pressure head by debit of 0.1-0.5 up to 15 L/sec and more. Waters of this region is Ca, Mg- hydrocarbonate and Ca, Mg- hydrosulphates with the mineralization of 1.0 g/dm<sup>3</sup>.

## **III. Central-Tajik region**

- Course-pore waters of the quaternary deposit
- Cracks (course, soils, karstic) mesozo-cainozoic
- Cracks (soil and sometimes karstic) palaeozoic

Waters of this region is Ca, Na- hydrocarbonate and Ca, Na-hydrosulphates with the mineralization up to 1.0-1.3/dm<sup>3</sup>.

# Water-bearing complexes of Tajikistan

Name	Mineralization, g/dm <sup>3</sup>	pH	Chemical type of water
<b>EOCENE WATER-BEARING COMPLEX</b>			
Luchobskaya	11.9 – 33.8	7.0	Sulphates
Shaambarinskaya	5.7 - 44.6	7.1	Sulphates
<b>SENON- PALEOCENE WATER-BEARING COMPLEX</b>			
Andigenskaya	3.5	7.0	Sulphates
Luchobskaya	17.0 – 89.9	6.4 – 7.0	Chlorides
Shaambarinskaya	5.4 – 19.4	7.0	Sulphates, Chlorides
<b>SENOMAN – TURONSKI WATER-BEARING COMPLEX</b>			
Andigenskaya	45.0 – 55.0	6.7	Chlorides
Luchobskaya	174 - 230	7.0	Chlorides
Shaambarinskaya	6.7 -154	7.1	Chlorides

The general resources of fresh underground waters of Tajikistan with a mineralization less than 1 g/l and suitable for drinking water supply are estimated in 18,7 km<sup>3</sup>, that makes 43 % in basin of Aral sea. The basic part of deposits of fresh underground waters is in river valleys and cones of carrying out of the basic rivers of republic. According to Tajikglavgeology and Tajikvodocanal stocks of underground waters in Tajikistan it is estimated by following sizes:

- prognosis stocks – 51226 thousand m<sup>3</sup>/day;
- exploited stocks - 7660 thousand m<sup>3</sup>/day ;
- general selection of underground waters- 6451 thousand m<sup>3</sup>/day;
- percent of use from prognosis stocks – 12% .



Mineralization and chemical composition of subterranean and forceful waters on irrigated lands in Tajikistan are also subject to regime changes. According to year seasons the most marked changes in this respect are observed on greatly salinized lands. There in the hot season of the year the groundwater of the surface shallow grounds with sharply increased mineralization is spent on the total evaporation from the ground surface, thus increasing temporarily the salt store in the soil grounds of aeration zone and on the land surface. The waters with lesser mineralization come to their place from the bedding pebbles. By the next vegetation period the adverse effect takes place – salts dissolve in the groundwater due to precipitation.

Mineralization and chemical compound of pressure waters of second, third and more deep horizon (in any case, in limit of high 100-150 m) at action of vertical drainage in upper of them (first) will not subject to essential changes. In them contour with fresh waters in compare with of first horizon town to flow goes further. Water of these horizons as less subject to pollution, expediently to use for centralized water – pipe economical – drinkable water – supply.

Thank You

For Your Attention