

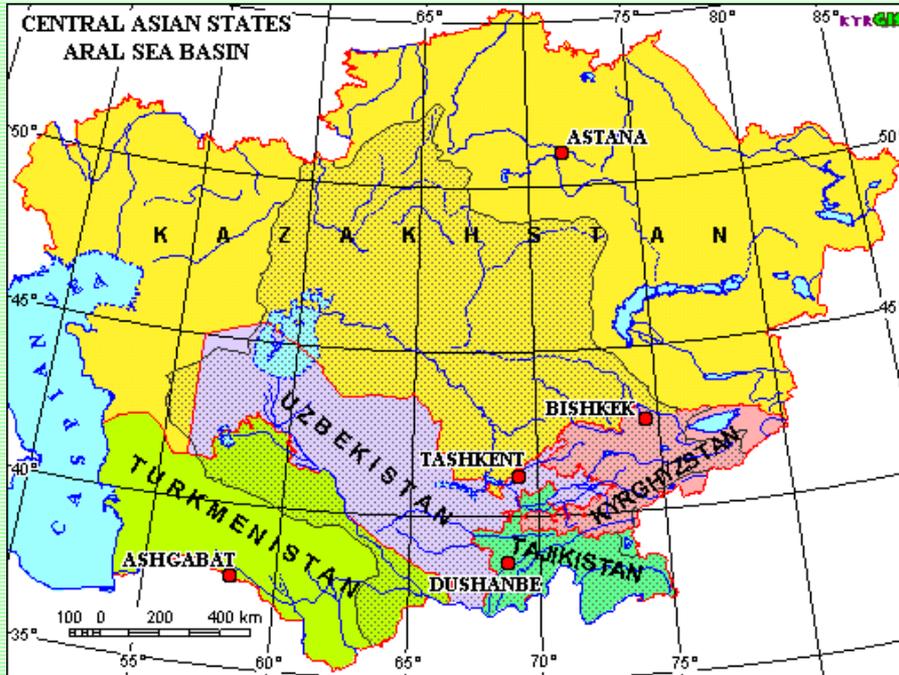
Water and Energy Nexus



in Central Asia

27-30 October 2011, Porto, Portugal

CENTRAL ASIA: GENERAL INFORMATION



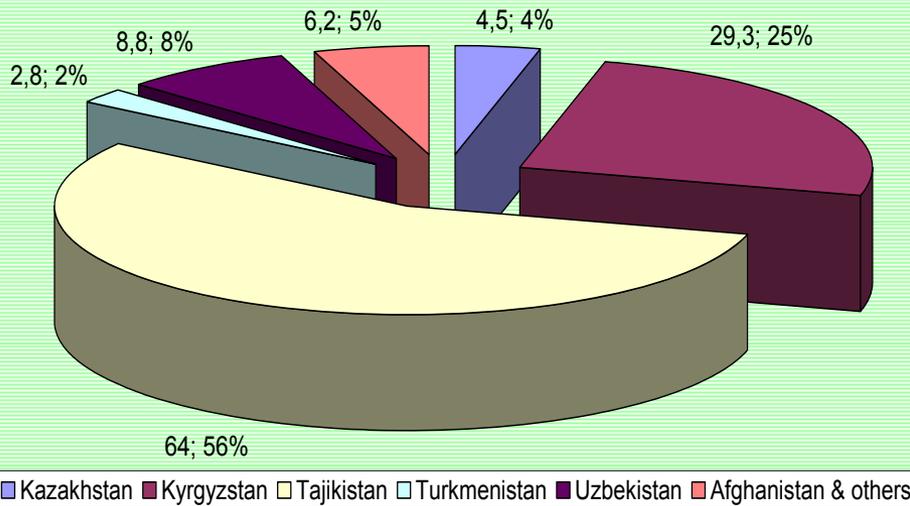
Area:	about 4mln. km ²
Population:	about 60 mln. people
Irrigated area:	8,3 mln.ha
Main rivers:	Amu-Darya & Sir-Darya
Seas :	Aral, Caspian
Climate:	continental, arid & semiarid

CENTRAL ASIA: WATER RESOURCES



- Major link of national and regional security;**
- Key factor of socio-economic development;**
- About 30% of the regional GDP (only at the expense of irrigation);**
- About 30% of electricity consuming by the region (at the expense of HPP);**
- Maintenance of ecosystems;**

WATER RESOURCES OF THE ARAL SEA BASIN

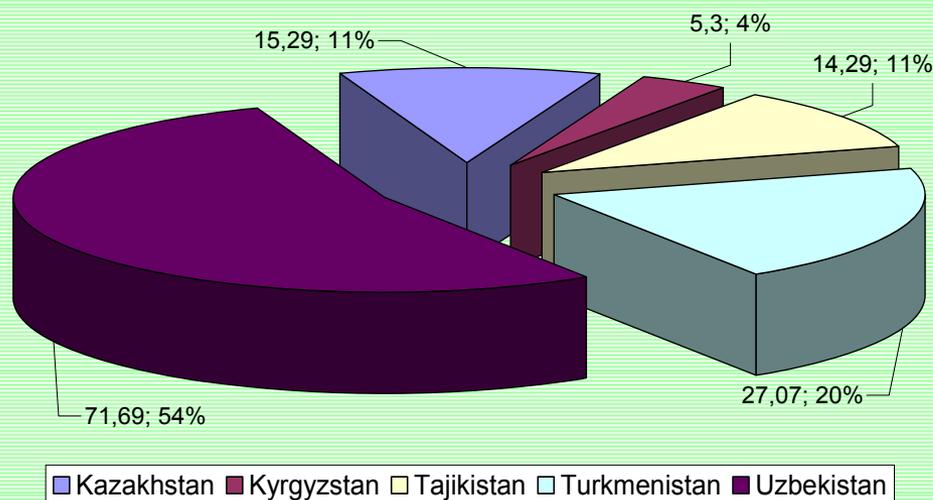


A unique mountainous nature of Tajikistan generates 64 km³ per year or 55,4% from the total runoff in the Aral Sea Basin including the Amu Darya 62.9 km³ (80.17%) and Syr Darya 1.1 km³ (3%).

Formation of water resources in the Aral Sea Basin

Country	Amu Darya		Syr Darya		Total	
	km3	%	km3	%	km3	%
Kazakhstan	-	-	4,50	12,12	4,50	3,89
Kyrgyzstan	1,90	2,42	27,40	73,77	29,30	25,35
Tajikistan	62,90	80,17	1,10	2,96	64,00	55,36
Turkmenistan (with Iran)	2,78	3,54	-	-	2,78	2,40
Uzbekistan	4,70	5,99	4,14	11,15	8,84	7,65
Afghanistan	6,18	7,88	0,00	0,00	6,18	5,35
Total	78,46	100,00	37,14	100,00	115,60	100,00

INTERSTATE WATER SHARING IN THE ARAL SEA BASIN



The distribution of water resources in the Aral Sea basin based on **Master Plans** of use and protection of water resources of **Amudarya (1987)** and **Syrdarya (1984)**.

According to calculations, the amount of **available water resources**, which are composed of surface water, groundwater and recycled waste and drainage water, made **133.64 km³ per year**.

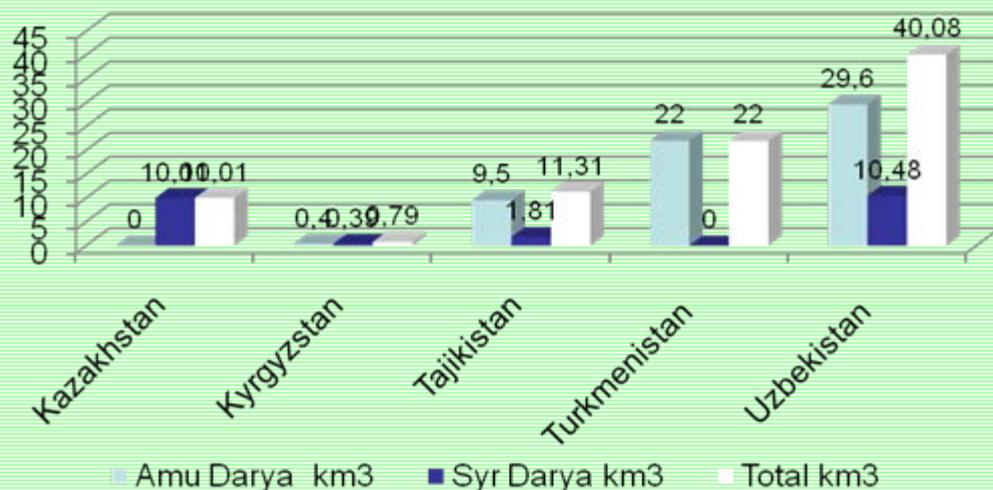
Water resources sharing in the Aral Sea Basin

Source: Master Plans of use and protection of water resources of Amudarya and Syrdarya river basins

Country	Amu Darya		Syr Darya		Total	
	km3	%	km3	%	km3	%
Kazakhstan	-	-	15,29	31	15,29	11,44
Kyrgyzstan	0,42	0,5	4,88	9,89	5,3	3,97
Tajikistan	10,63	12,607	3,66	7,42	14,29	10,69
Turkmenistan (with Iran)	27,07	32,1	-	-	27,07	20,26
Uzbekistan	46,2	54,79	25,49	51,68	71,69	53,64
Total	84,32	100	49,32	100	133,64	100

WATER INTAKE FROM THE AMUDARYA AND SYRDARYA BY THE CENTRAL ASIAN COUNTRIES

Source: Master Plans of use and protection of water resources of Amudarya and Syrdarya river basins

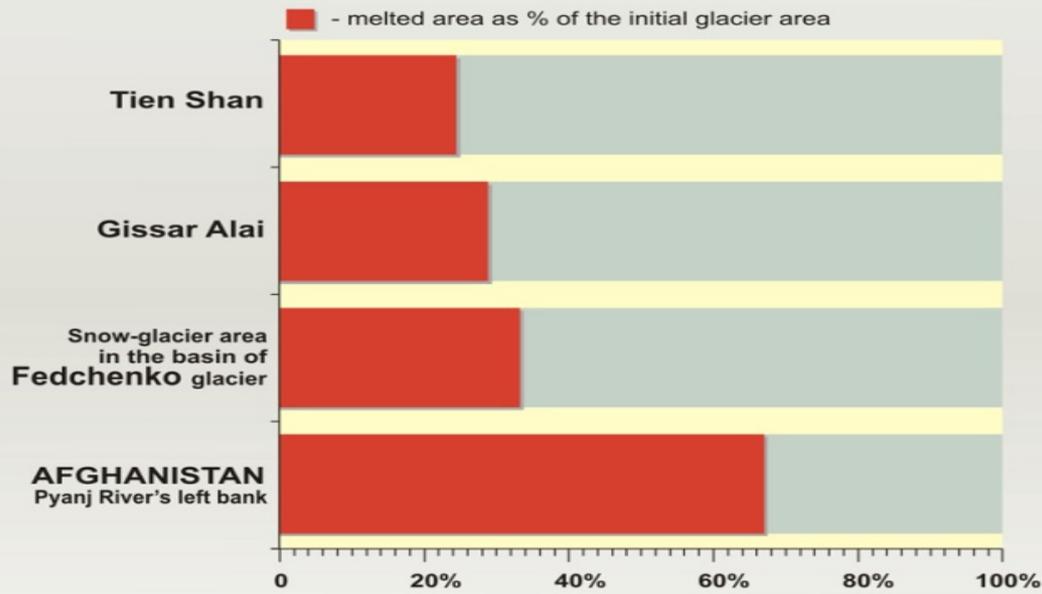


*Water allocation with the direct intake of water from the the Amu Darya and Syr Darya rivers intended water withdrawals in the amount of **84.19 km³** (63% of available water resources).*

Country	Amu Darya		Syr Darya		Total	
	km3	%	km3	%	km3	%
Kazakhstan	-	-	10,01	44,12	10,01	11,9
Kyrgyzstan	0,40	0,60	0,39	1,72	0,79	0,9
Tajikistan	9,50	15,40	1,81	7,98	11,31	13,4
Turkmenistan	22,0	35,80	-	-	22,0	26,1
Uzbekistan	29,60	48,20	10,48	46,19	40,08	47,6
Total	61,50	100	22,69	100	84,19	100

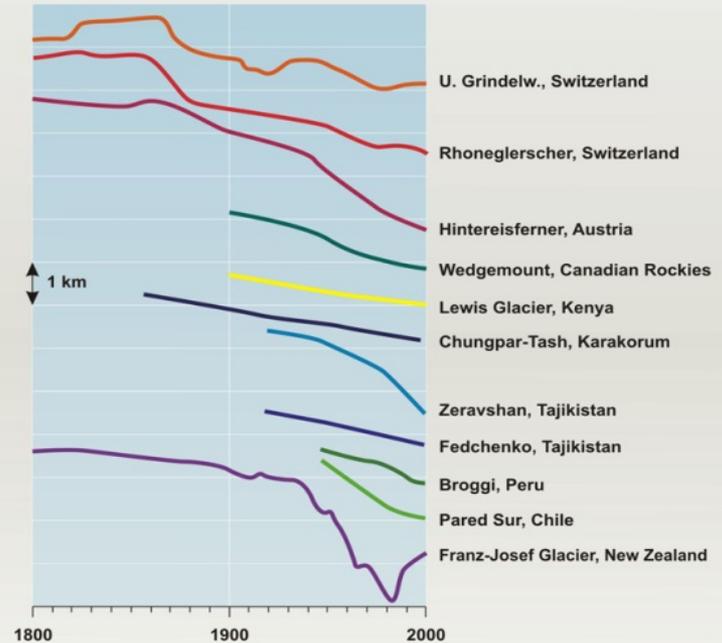
CLIMATE CHANGE IMPACTS ON GLACIERS

Change in surface area of Central Asian glaciers in the last half of the 20th century



Compilation of data from V. Dikih, U. Pilgui, A. Yablokov

Degradation of world glaciers



Source: Cambridge University, Tajik Agency on Hydrometeorology and Environmental Research

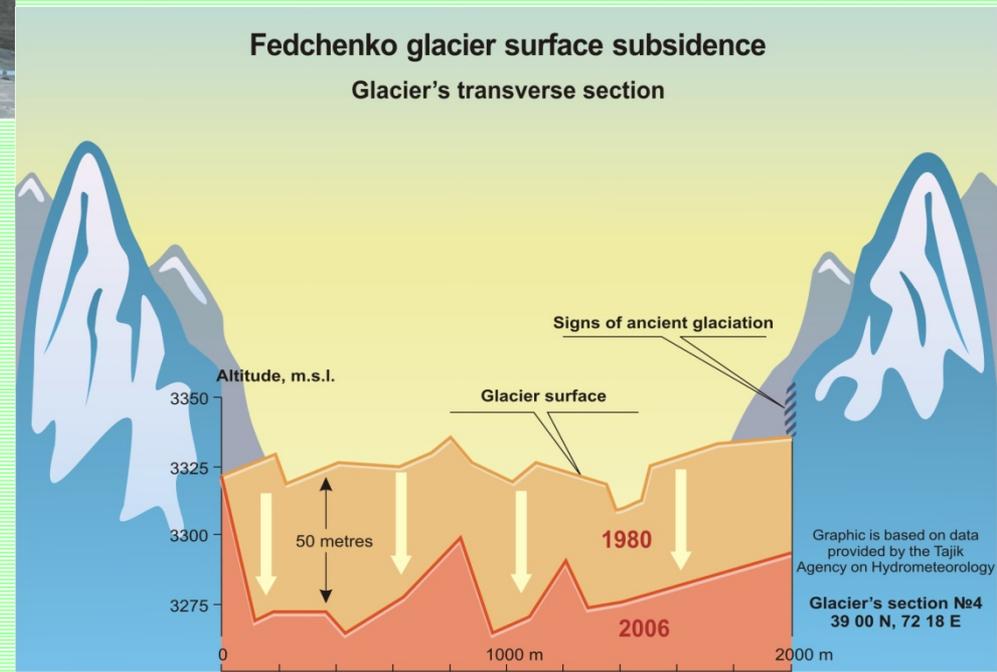
In the period from 1956 till 2000 the glacial resources of Central Asia lost more than 25% of their volume. Due to some experts by 2025 thousands of small glaciers will disappear, the glaciation area will reduce for 20% and glacier volume - for 25%. By 2050 the river annual flow will decrease: for Amudarya – 10-15% and for Syrdarya – 6-10%.

CLIMATE CHANGE IMPACTS ON TAJIKISTAN GLACIERS



Findings of glaciological surveys of 2006 revealed that the average rate of the retreat comprised 16 m/year. In overall, from the whole observation period (1933-2006), Fedchenko Glacier retreated by 1 km and lost more than 15 cub. km (or 1/10) of its mass balance.

The impact assessment showed that during the whole period of instrumental observations (since 1930s), the glaciation area of Tajikistan decreased by around 30%



CLIMATE CHANGE IMPACTS ON TAJIKISTAN GLACIERS



In 1991 the terminus of Zeravshan Glacier was located 200-250 m above. In 2009, however, the indicator is found lower. It is estimated that the glacier continues to retreat and lose its mass balance very rapidly.

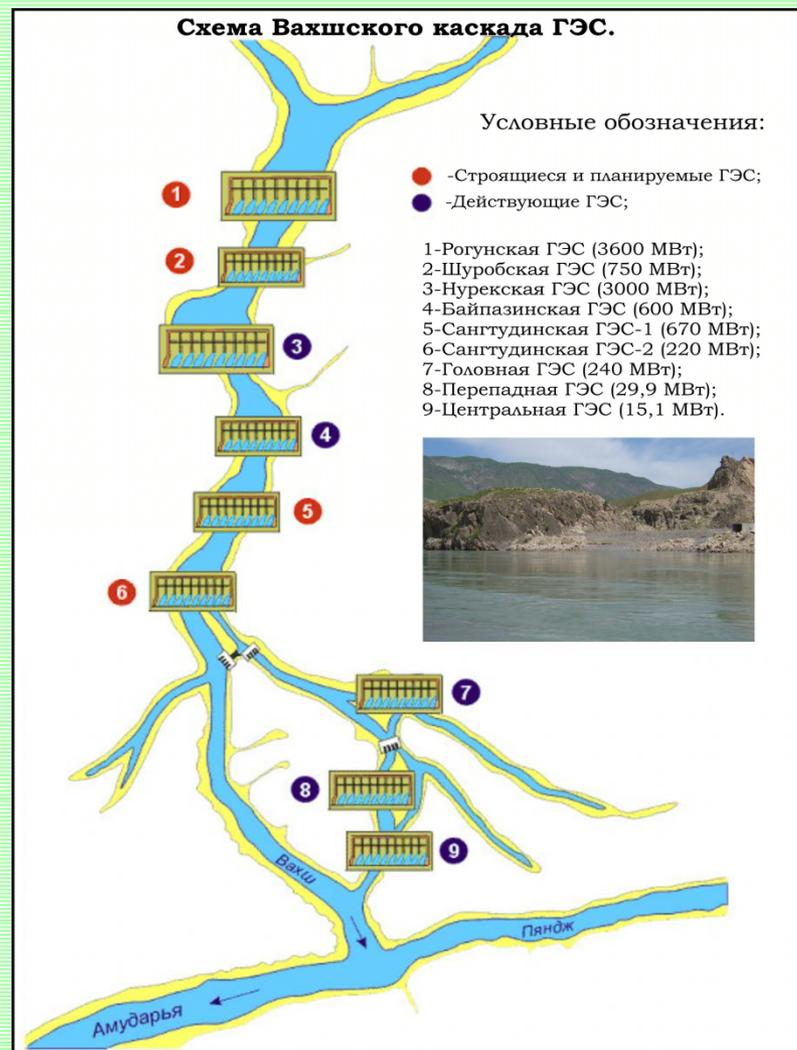
ENERGY RESOURCES OF THE ARAL SEA BASIN

Structure of production of the initial fuel and energy resources, in percent (%)

Countries	Gas	Oil	Coal	Hydro power	Total
Kazakhstan	16	50	33	1	100
Kyrgyzstan	2	5	11	82	100
Tajikistan	2	1	1	96	100
Turkmenistan	83	17	0	0	100
Uzbekistan	84	13	2	1	100
As a whole	48	33	17	2	100

Source: Fuel and energy balances of the countries by IEA, 2004

Republic of Tajikistan among other CA countries has a great hydropower potential equals 527 bln. kW.h. Its economic effective capacity is 317 bln. kW.h



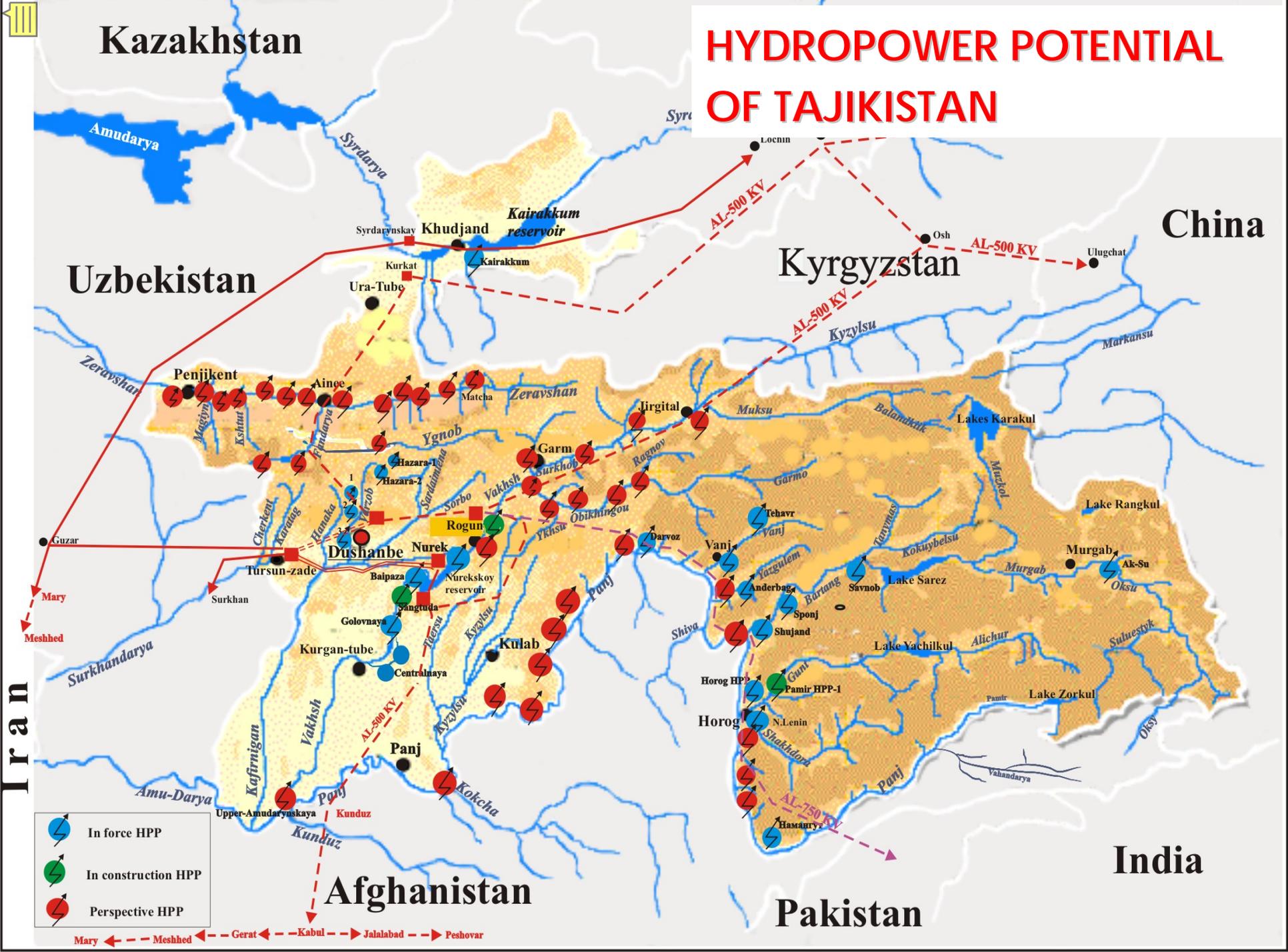
Cascade of HPPs in the Vakhsh river

HYDRO POWER POTENTIAL OF THE CENTRAL ASIA COUNTRIES

Countries	HPP Capacity, MW	Power generation by HPP (2005), bln. kW.h	Economic Hydropower capacity, bln. kW.h	Use of Hydro-power capacity, %	Share in Hydropower capacity of Central Asia %
Kazakhstan	2248	7,9	27	29	6
Kyrgyzstan	2910	14,0	142,5	14	22
Tajikistan	4037	17,1	317	5	69
Turkmenistan	1	0	2	0	0
Uzbekistan	1420	6,0	15	49	3
TOTAL	10616	45,0	503,50	10	100

Source: Report of SPECA «To strengthening of cooperation on rational use of water and power resources of Central Asia», UN, 2004, publications of Statistic Committee of CIS, materials of seminar «Dams and hydropower in Russia and other CIS countries», 2007

HYDROPOWER POTENTIAL OF TAJIKISTAN



BENEFITS FROM HYDROPOWER DEVELOPMENT

HYDROPOWER DEVELOPMENT

HYDRO POWER PLANTS

- Using of the renewable sources of energy;
- Generation of the cheap and environment friendly electricity;
- Saving the fuel resources, which are using now intensively for power generation;
- Reducing the carbon emissions.

WATER RESERVOIRS (STORAGE)

- Sustainable water management;
- Ensuring the water security;
- Protection from floods and mudflows and mitigation the droughts.



BENEFITS FROM EFFECTIVE WATER & ENERGY COOPERATION IN CENTRAL ASIA

EFFICIENT & USEFUL WATER RESOURCES MANAGEMENT;

INCREASING OPPORTUNITY OF THE ELECTRICITY EXPORT;

HUGE ECONOMICAL EFFECT AT THE RATE OF 5% REGIONAL GDP;

SUSTAINABLE USE OF THE NATURE RESOURCES FOR LONG TERM PERSPECTIVE;

ENSURING THE REGION WITH CHEAP & ENVIRONMENT FRIENDLY ELECTRICITY;

ADAPTATION TO THE CLIMATE CHANGE AND EFFECTIVE FIGHT AGAINST NEW CHALLENGE;

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***THANKS FOR
ATTENTION!***