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CADGAT

Hydropower Potential of the Central Asian Countries

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A B S T R A C T

This data article surveys the hydropower potential of the five Central Asian countries: Kazakhstan, Kyrgyzstan, Tajikistan, Turkmenistan, and Uzbekistan. The dataset presents the theoretical hydropower supply capacity of all the river basins of Central Asia. It was prepared using data from national and international sources, and it provides information on installed small and medium hydropower capacities and planned projects in the above-mentioned countries.

Keywords: hydropower, renewable energy, Central Asia, Kazakhstan, Kyrgyzstan, Tajikistan, Turkmenistan, Uzbekistan

1. Background

Even though hydropower resources are unevenly distributed among the Central Asian countries, they are the most exploited renewable energy source in the region. The power sectors of upstream Kyrgyzstan and Tajikistan, endowed with some of the world's greatest hydropower potential, rely heavily on large- and small-scale hydropower plants. Nevertheless, hydropower plays a significant role in the energy balance of the downstream and fossil-rich countries: Kazakhstan, Turkmenistan and Uzbekistan.

There is limited information and data on the hydropower potential of Central Asian countries in the literature and the media. Therefore, the Central Asia Data Gathering and Analysis Team (CADGAT) is producing a series of datasets on renewable energy in Central Asia to help provide a basis for further research in this area. These data are also available in a unified database in Excel format from http://osce-academy.net/en/research/cadgat/

2. Data collection

Data collection for this CADGAT data article was conducted from September 2018 to January 2019, and the figures presented here reflect the situation during that period. Data were obtained and prepared based on information obtained from national and international sources.

3. Key findings

Uzbekistan already exploits 40% of its technically feasible hydropower potential, while Kazakhstan and Kyrgyzstan use only 13% and 15% of their potential to date. With the current 5% exploitation of the technically feasible potential, Tajikistan has tremendous room for expanding hydropower. In Turkmenistan, where the source is least developed with only one hydropower station, the exploitation rate is almost 0%.

4. Hydropower potential in Central Asia (in GW)

	Installed capacity (MW)	Target for expansion (MW)	Production in 2016 (TWh)	Gross theoretical potential (TWh/year)	Technically exploitable capability (TWh/year)	Current utilisation (%)
Kazakhstan	2,372	170 (by 2020)	6.940	198.6	61.9	15%
Kyrgyzstan	3,091	178 (by 2025)	13.320	163.0	99.0	13%
Tajikistan	5,190	No data	18.740	527.0	317.0	5%
Turkmenistan	1	No data	0.003	23.9	4.8	0%
Uzbekistan	1,889	938 (by 2030)	10.950	88.5	27.4	39%

5. Installed hydropower projects in Central Asia

Kazakhstan

Name	Location	Capacity	Year	Funding
Almaty Cascade: 10 stations, plus one under the Institute of Innovation and Energy	Almaty oblast, Bolshaya and Malaya Almatinka rivers	46.9 MW	2016	Samruk Energo
Shulbinskaya HPS	Irtysh river, East Kazakhstan oblast	702.0 MW	1987–1994	Samruk Energo
Bukhtarminskaya HPS	Irtysh river, East Kazakhstan oblast	675. 0MW	1960–1966	Samruk Energo
Kapshagayskaya HPS	Ili river, Almaty oblast	364.0 MW	1970–1980	Samruk Energo
Ust-Kamenogorsk HPS	East Kazakhstan oblast Irtysh river	355.6 MW	1952–1959	Samruk Energo
Moynak HPS	Charyn river Almaty oblast	300.0 MW	2011–2012	Samruk Energo, loan from China Exim bank
Shardarinskaya HPS	Syrdariya river, South Kazakhstan oblast	100.0 MW	1967	Samruk Energo
LLP 'Kaynar-AKB GES-4' Uspenovskaya HPS	Tentek river, Almaty oblast	2.5 MW	1960	National Company KEGOC (Public)
LLP 'Kaynar-AKB GES-4' Antonovskaya HPS	Lepsy river Almaty oblast	1.6 MW	1960	National Company KEGOC (Public)
Zaisanskaya HPS	Yidene river, East Kazakhstan Oblast	2 .0 MW	No data	Samruk Energo
Aksu HPS-1 JSC 'TATEK'	Aksu river, Almaty oblast	1.9 MW	No data	Public JSC 'TATEK' is a national company

Kyrgyzstan

Name	Location	Capacity	Year	Funding
Alamedin small hydropower station	Chui oblast	0.4 MW	1928	Self-financing (JSC 'Chakan Hydroelectric power station')
Alamedin small hydropower station-1	Chui oblast	2.2 MW	1945	Self-financing (JSC 'Chakan Hydroelectric Power Station')
Alamedin small hydropower station-2	Chui oblast	2.5 MW	1948	Self-financing (JSC 'Chakan Hydroelectric Power Station')
Alamedin small hydropower station-3	Chui oblast	2.1 MW	1951	Self-financing (JSC 'Chakan Hydroelectric Power Station')
Alamedin small hydropower station-4	Chui oblast	2.1 MW	1952	Self-financing (JSC 'Chakan Hydroelectric Power Station')
Alamedin small hydropower station-5	Chui oblast	6.4 MW	1957	Self-financing (JSC 'Chakan Hydroelectric Power Station')
Alamedin small hydropower station -6	Chui oblast	6.4 MW	1958	Self-financing (JSC 'Chakan Hydroelectric Power Station')

Bystrov small hydropower station	Chui oblast	8.7 MW	1954	Self-financing (JSC 'Chakan Hydroelectric Power Station')
Lebedinov small hydropower station	Chui oblast	7.6 MW	1943	Self-financing (JSC 'Chakan Hydroelectric Power Station')
Kalinin small hydropower station	Chui oblast	1.4 MW	1953	Self-financing
Ysyk-Ata small hydropower station	Chui oblast	1.4 MW	1960	Self-financing
Naiman small hydropower station	Osh oblast	0.6 MW	2005	Self-financing
Maryam small hydropower station	Chui oblast	0.5 MW	2011	Self-financing
KSK small hydropower station	Osh oblast	1.0 MW	2012	Self-financing
Kyrgyz-Ata small hydropower station	Osh oblast	0.2 MW	2016	Self-financing
Tegirmentinskyi small hydropower station	Chui oblast	3.0 MW	2017	Russian-Kyrgyz Development Fund – 144 mln. Kyrgyz Som (KGS); 'Tegirmentinskii hydropower station', LLC – 71,6 mln. KGS

Tajikistan

Regions	Total capacity (MW)	Functioning capacity (MW)	Electricity generation (kWh)	Not functioning capacity (kW)
Total in Tajikistan (155 units)	**12.2 MW**	**4.7 MW**	**2,328,340**	**7.5 MW**
Breakdown by regions				
GBAO (35 units)	3.4 MW	0.7 MW	497,785	2.7 MW
Khatlon (8 units)	2.2 MW	-		2.2 MW
Sog'd (38 units)	1.9 MW	1.0 MW	460,336	1.7 MW
Regions (74 units)	**4.7 MW**	**3.0 MW**	**1,370,219**	**1.7 MW**
Breakdown within the region				
Nurobod (9 units)	0.2 MW	0.2 MW	23,269	0.1 MW
Vahdat (24 units)	1.7 MW	1.1 MW	468,720	0.6 MW
Tavildara (8 units)	0.1 MW	0.1 MW	59,024	-
Varzob (8 units)	1.0 MW	1.0 MW	599,974	-
Djirgital (7 units)	0.3 MW	0.2 MW	99,820	0.1 MW
Gissar (3 units)	0.2 MW	0.2 MW	82,026	-
Shahrinav (1 unit)	0.5 MW	-	-	0.5 MW
Tursunzoda (1 unit)	0.5 MW	-	-	0.5 MW
Tajikobad (6 units)	0.1 MW	0.1 MW	21,700	0.1 MW
Rasht (11 units)	0.1 MW	0.1MW	15,686	0.1 MW

Turkmenistan

Name	Capacity	Year	Funding
Hindikush HPS on Mugrab river	1.2 MW	1913	TurkmenEnergo

Uzbekistan

Name	Capacity	Year	Funding
Hishrau HPS (GES-2B)	21.9 MW	After 2000	UzbekEnergo
Taligulyan HPS (GES-5B)	8.8 MW	After 2000	UzbekEnergo
Lower Bozsu No. 1 (GES-14)	10.7 MW	After 2000	UzbekEnergo
Lower Bozsu No. 2 (GES-18)	7.0 MW	After 2000	UzbekEnergo
Lower Bozsu No. 3 (GES-19)	11.2 MW	After 2000	UzbekEnergo
Lower Bozsu No. 4 (GES-23)	17.6 MW	After 2000	UzbekEnergo
Lower Bozsu No. 6 (GES-22)	4.4 MW	After 2000	UzbekEnergo
Andijan HPS No. 2 (GES-36)	50.0 MW	After 2000	UzbekEnergo

6. Planned hydropower projects in Central Asia

Kazakhstan

Name	Description
LLP 'Kazhydrotechenergo'	Shelek HPP-29 in the Shelek Enbekshikazakh region, with a total capacity of 34.8 MW, Almaty region
LLP 'Datang-TT-Energy'	HPP-1, 2 on the Koksu river in the Kerbulak District, with a total capacity of 42 MW, Almaty region
LLP 'Tursyn'	Turgusunskaya HPP on the Turgusun river in Zyryanovsky District, with a capacity of 24.9 MW, East Kazakhstan region
LLp 'AltEnergy'	Nizhne – Baskanskaya HPP – 1–3 in Sarkand District, with a total capacity of 15 MW, Almaty region
LLP 'Tarazgreenpowerjenco'	Merkensky HPP Cascade – 5–7 in the Merke District with a total capacity of 18 MW, Zhambyl oblast
LLP 'Teplotenergomash'	HPP 1, 2 on the Big Almaty Channel with a total capacity of 12 MW, Almaty region

Kyrgyzstan

Name	Description
Small hydropower station on the Djangakty river in Batken oblast, Kygyzstan – 0.54 MW	Kyrgyz State Committee for Industry, Energy and Subsoil Use
Konur-Olon small hydropower station in Isyk-Kul oblast – 3.6 MW	Kyrgyz State Committee for Industry, Energy and Subsoil Use
Kok-Sai small hydropower station in Isyk-Kul oblast, Kyrgyzstan – 3.4 MW	Kyrgyz State Committee for Industry, Energy and Subsoil Use
Sokuluk small hydropower station-5 in Chui oblast, Sokuluk district – 1.5 MW	*'Small Hydro Power Plants in the Kyrgyz Republic: Assessment of the Potential and Development Challenges'* by World Bank Energy and Extractives Global Practice in collaboration with the International Finance Corporation and Report of the Ministry of Energy of the Kyrgyz Republic
Oi-Alma small hydropower station-2 in Osh oblast, Kara-Kuldja district – 7.7 MW	*'Small Hydro Power Plants in the Kyrgyz Republic: Assessment of the Potential and Development Challenges'* by World Bank Energy and Extractives Global Practice in collaboration with the International Finance Corporation and Report of the Ministry of Energy of the Kyrgyz Republic
Totgul small hydropower station in Batken oblast, Batken district – 3 MW	*'Small Hydro Power Plants in the Kyrgyz Republic: Assessment of the Potential and Development Challenges'* by World Bank Energy and Extractives Global Practice in collaboration with the International Finance Corporation and Report of the Ministry of Energy of the Kyrgyz Republic
Otro-Tokoi small hydropower station in Issyk-Kul oblast, Ton district – 20 MW	*'Small Hydro Power Plants in the Kyrgyz Republic: Assessment of the Potential and Development Challenges'* by World Bank Energy and Extractives Global Practice in collaboration with the International Finance Corporation and Report of the Ministry of Energy of the Kyrgyz Republic

Tajikistan

SHPP	Installed capacity (MW)	Annual electricity generation (kWh)	Location
Yazgulom-3	1.9 MW	16,000	Vanch
Yazgulom-4	1.9 MW	16,000	Vanch
Yazgulom-5	1.9 MW	16,000	Vanch
Sorvo	0.2 MW	900	Vakhdat
Paldorak-1	0.3 MW	2,160	Kuxisto-Mastchox
Rukshif-1	0.2 MW	3,456	Kuxisto-Mastchox
Samchon	0.5 MW	3,000	Kuxisto-Mastchox
Padask	0.9 MW	5,280	Kuxisto-Mastchox
Iskich	0.5 MW	3,000	Gissar
Fayzobod	0.5 MW	3,459.6	Abdurax
Djavoni	0.2 MW	1,020	Rogun
Guli surx	0.1 MW	600	Rogun
Lugur	0.4 MW	2,100	Rogun
Shingilich	0.1 MW	390	Rasht
Runob	0.3 MW	750	Rasht
Khidiriyon	0.3 MW	1,500	Rasht
Chaft	0.1 MW	600	Rasht
Kalanak	0.1 MW	720	Rasht
Sipoling	0.1 MW	360	Rasht
Voydara	0.1 MW	300	Nurabod
Sangvor	0.1 MW	600	Tavildara
Charsem	10.0 MW	60,000	Shugnan
Namadgut	1.5 MW	13,000	Ishkashim
Roshorv	0.6 MW	5,000	Rushan
Yamchun	0.1 MW	840	Ishkashim
Vichxarv	0.1 MW	840	Vanch
Kishtudaki nav	0.2 MW	423.3	Panjikent
Padrud	1.1 MW	6804	Panjikent
Kurgovad	1.5 MW	10,000	Darvaz
Leninobod	0.1 MW	820.8	Djilikul
Dukak	0.3 MW	1,800	Nurabad
Layrun	0.2 MW	450	Nurabad

Mini Hydropower Plants

Mini HPP	Installed capacity (kW)	Annual electricity generation (kWh)	Location
Shodmoni	60	360	Nurabad
Saidon	30	180	Nurabad
Kabutiyon	30	180	Nurabad
Ulfatobod	30	180	Nurabad
Khasandara	60	360	Nurabad
Sari Pulak	30	180	Nurabad
Chavchi	60	360	Nurabad
Girdob	40	240	Nurabad
Langar	60	360	Tavildara
Roga	30	180	Tavildara
Margzor	40	240	Rogun
Neknot	80	480	Panjikent
Puli Girdob	45	270	Panjikent
Xuchaxo-2	60	259.2	Ganchi
Obchi-1	40	86	Ganchi
Basmanda-2	80	172.8	Ganchi
Guliston	50	175	Muminabad
Shaxrinav	30	105	Muminabad
Kaskun	50	150	Nurabad
Valgon	40	345.6	Kuxistoni Mastchox
Total	26,801	175,735.3	

Turkmenistan

We are not aware of any hydropower plants in Turkmenistan at the current time.

Uzbekistan

Name	Funding
Lower Chatkal HPS – 100.0 MW	In accordance with the state programme on the development of the hydropower sector between 2017–2025
Pskem HPS – 404.0 MW	In accordance with the state programme on the development of the hydropower sector between 2017–2025
Mullalak HPS – 240.0 MW	In accordance with the state programme on the development of the hydropower sector between 2017–2025
Upper Pskem HPS – 200.0 MW	In accordance with the state programme on the development of the hydropower sector between 2017–2025
Hodjikent HPS with a reservoir – 200.0 MW	In accordance with the state programme on the development of the hydropower sector between 2017–2025
Cascade of Zarchob HPSs on the Tupalang river, 69.0 MW	In accordance with the state programme on the development of the hydropower sector between 2017–2025
Akbulak HPS on the Akbulak river – 60.0 MW	In accordance with the state programme on the development of the hydropower sector between 2017–2025

Abbreviations and terminology

HPS	Hydropower station	MW	Megawatt
kW	kilowatt	SHPP	small hydro power plant
kWh	kilowatt hour		

About CADGAT and the Central Asia Regional Data Review

The Norwegian Institute of International Affairs (NUPI) and the OSCE Academy established the Central Asia Data Gathering and Analysis Team (CADGAT) in 2009. The purpose of CADGAT is to produce new cross-regional data on Central Asia that can be freely used by researchers, journalists, NGOs, government employees and students inside and outside the region. The datasets can be found at: http://osce-academy.net/en/research/cadgat/

The following CADGAT data articles have been published:

1. Hydroelectric dams and conflict in Central Asia
2. Narcotics trade and related issues in Central Asia
3. Language use and language policy in Central Asia
4. The transport sector in Central Asia
5. Road transportation in Central Asia
6. Gender and politics in Central Asia
7. Political relations in Central Asia
8. Trade policies and major export items in Central Asia
9. Intra-regional trade in Central Asia
10. Trade barriers and tariffs in Central Asia
11. Holidays in Central Asia. Part I: Laws and official holidays
12. Holidays in Central Asia. Part II: Professional and working holidays
13. Media in Central Asia: Print media
14. Media in Central Asia: TV
15. Radio in Central Asia
16. Renewable energy policies of the Central Asian countries
17. Wind power potential of the Central Asian countries
18. Solar power potential of the Central Asian countries
19. Hydropower potential of the Central Asian countries

CADGAT has also produced a database on Elites in Central Asia, which can be found at http://osce-academy.net/_dbelite/