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Central Asia Data Gathering and Analysis Team

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

## 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/>

## 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.

## 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%.

## 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% |

## 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 |

## 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

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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/>

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