

Tajikistan

Country Profile

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1. Overview of Electricity Supply

The Republic of Tajikistan is heavily dependent on hydroelectric power, with about 98 percent of the electricity generated in Tajikistan coming from hydroelectric sources. The balance of electricity generation is from fossil fuels.

It is estimated that the country has a hydroelectric energy potential of over 300 billion kWh per year, though the current utilization is 16.6 billion kWh, about 6 percent of the total potential (EIA, 2005).

The electric transmission and distribution system is in serious need of improvement and modernization. The electricity grid is currently divided into a northern and southern network, with both networks connected to Uzbekistan. As a result, Tajikistan both imports and exports a significant amount of power. This divided system has also led to inconsistent power supply to remote areas. The two systems are planned to eventually connect. Currently, a study is being financed with Kuwaiti aid to look at improvements for the grid (GlobalSecurity, 2005).

Additionally, about 40 percent of the total energy produced in Tajikistan is used by the Tursunzod aluminum plant. More energy producing capacity is needed to resolve domestic energy problems and provide Tajikistan the ability to export electricity to neighboring countries.

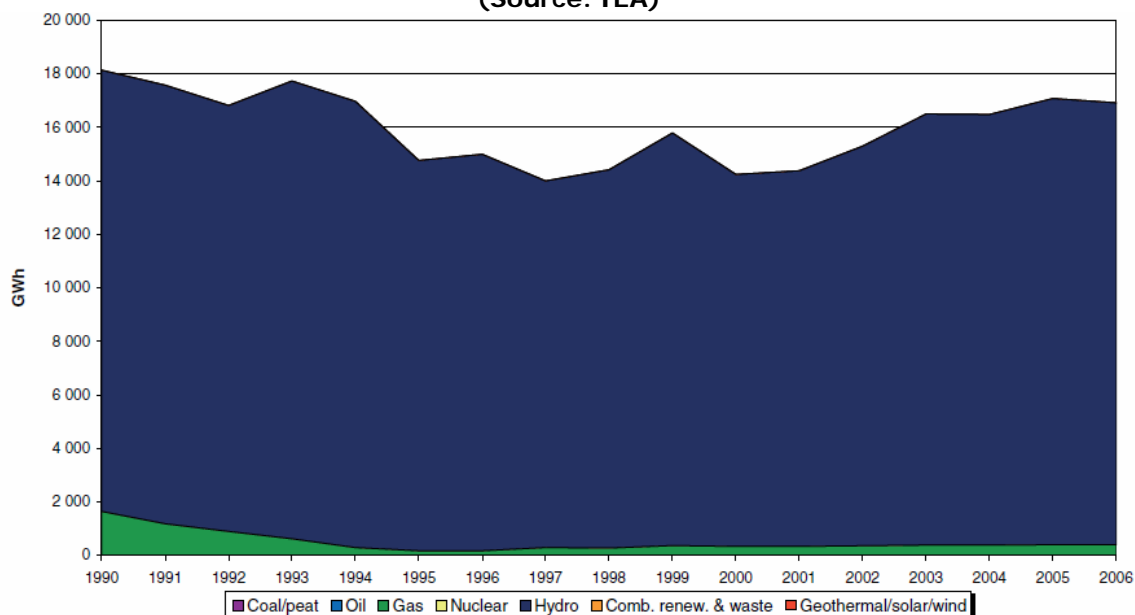
The lack of abundant natural resources will prevent Tajikistan's economy from expanding as fast as the other countries in the region. Without a substantial improvement in both the production and distribution of electrical power, the country will never be able to reap the full benefits of improved aluminum production.

Demographical Information	
Population, millions (2009)	7.35
Land area, thousand sq km (2009)	143.1
Macroeconomic Information (2008)	
GDP, billion US\$	15.4
Real GDP growth rate, percent	7.90
Foreign direct investment (net), million US\$ (2007)	401
Electricity disposition, billion kWh (2006)	
Generation	17.01
Consumption	14.96
Exports	4.23
Imports	4.84
Generation capacity, GW (2005)	
Nuclear	0.00
Thermal	0.39
Hydro	4.04
Other renewables	0.00
Total	4.43

Sources: CIA World Factbook, U.S. Energy Information Administration, United Nations Conference on Trade and Development.

Tajikistan Country Summary Table

Evolution of Total Production of Energy from 1990 to 2006 in Tajikistan
(Source: IEA)



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2. Energy Policy, Barriers and Incentives

At the legislative level, the issues of energy production and use are regulated by the Law on Energy, Law on Energy Saving, Law on Nature Protection, Law on Mineral Resources, etc. The Ministry of Energy, Ministry of Industry, Tajik Geological Survey, and Ministry for Nature Protection are the major governmental institutions dealing with energy production and use. These institutions manage mineral resources; determine terms and technological parameters

of mining; issue mining lease documents and supervise deposit conservation; monitor all terms of natural resource management. The Ministry for Nature Protection regulates sustainable management of energy resources and monitor observance of nature use regulations (emissions, pollution, waste formation) etc.

Recently, the Government of Tajikistan has begun a two-track approach to reform its energy sector. The first track focuses on reforming the domestic energy sector, energy pricing, financial discipline, solar protection and institutional reforms. The second is aimed at creating a strategy for the export market. In February 2007 the Government of Tajikistan approved the Program on the Use of Renewable Energy in Tajikistan for 2007-2015 (Kabutov, 2007).

To support the reform the World Bank is supporting an energy loss reduction program that aims to reduce commercial losses in the electricity and gas systems. Electricity tariffs have been increased four fold to reach a weighted average tariff of US 1.59 cents per kilowatt. Also, the installation of smart electricity meters has commenced (World Bank Statement, 2008).

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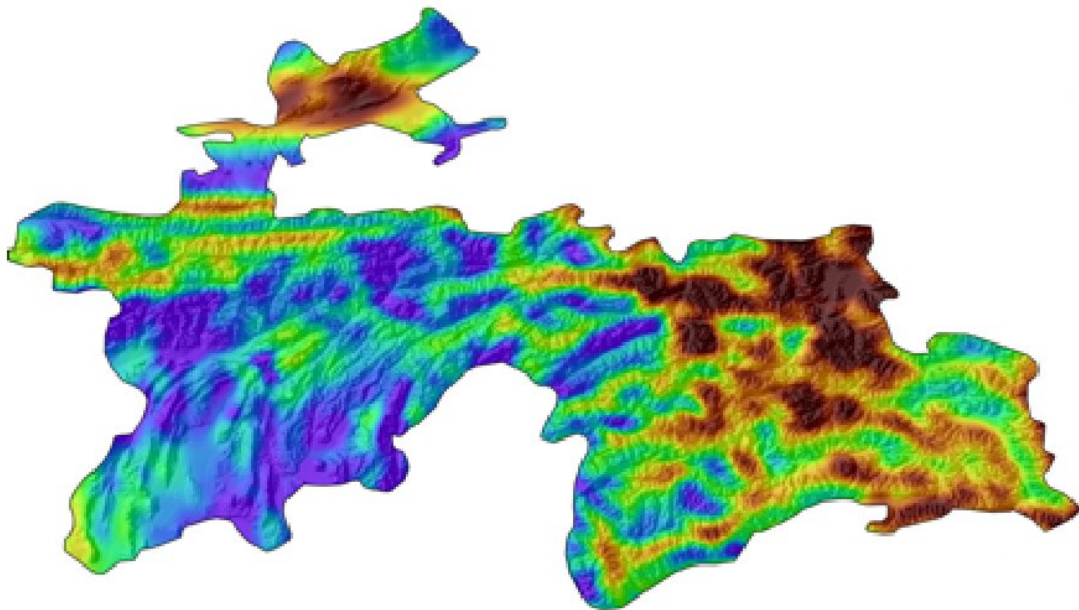
3. Wind

The terrain of Tajikistan is 93 percent mountainous and it includes the foothills of the Himalayas. Pamir and Alay mountains dominate landscape; western Fergana Valley in north, Kofarnihon and Vakhsh Valleys in southwest. Complicated alpine relief of the country dictates the diversity of wind regimes.

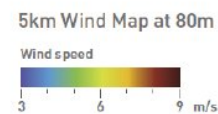
There is no operational wind energy capacity in Tajikistan; however supplementing the dominant hydropower with wind energy is justifiable in certain regions. The strongest winds blow in highland regions, such as Fedchenko and Anzob, and where the landscape of the country favors convergence of air flows, such as in Khujand or Fayzabad. The annual average wind speed in these regions is around 5-6 m/s. Lower average wind speeds of 3-4 m/s are found in the open lowlands and wide valleys. In other lowlands the mean annual wind speed may not exceed 1-2 m/s, which would not be useful for wind energy generation.

The most promising areas are the Pamirs northward the Sarez Lake in the Gorno-Badakshan, Turkmenistan ridge in the Zeravshan river headwater and the region from the Vakhsh ridge to the boundary with Afghanistan. A map displaying the wind velocities throughout the country can be seen in the following figure.

Tajikistan Wind Map at 80m



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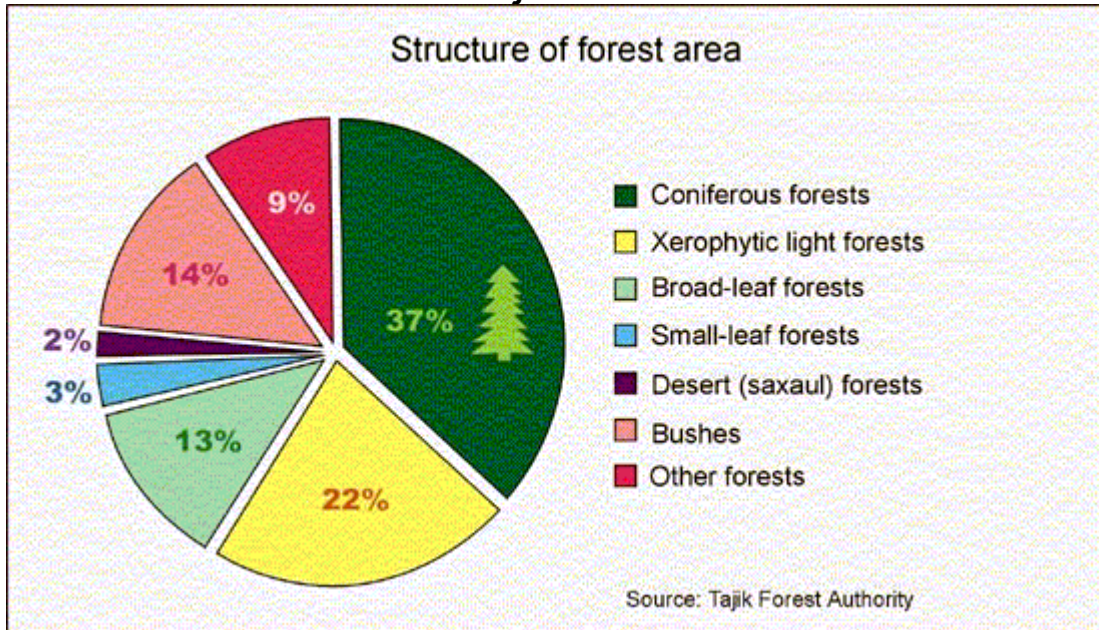
4. Biomass

Tajikistan possesses the potential to use agricultural wastes as an energy source. The most promising option of biomass utilization is biogas generation by means of anaerobic fermentation of manure. A few experimental biogas generators currently operate in Tajikistan. In addition, there is the potential opportunity to produce energy by a thermochemical method of biomass conversion using cotton residues.

Application of bio-fuels is appropriate within cattle breeding areas and farms. The biomass decay lead to the formation of by-products such as methane, liquid methanol, and wood charcoal.

It is estimated that Tajikistan has the potential to produce around 2 billion kWh/year of electricity from biomass sources (Kabutov, 2007).

Structure of Tajikistan's Forest Area



The following table displays the biomass resource production and production density in Tajikistan.

Biomass resource type	Total production	Production density
Total land area covered by	(avg. 2006–2007, km ²)	(avg. 2006–2007, %)
Arable Land	7,300	5
Permanent Crops	1,000	1
Permanent Meadows and Pastures	37,690	26
Forest Area	4,100	3
Other Land	89,870	63
Inland Water	2,590	2
Primary crop production	(avg. 2006–2007, tonne)	(tonne / 100 km ²)
Total primary crops (rank among COO)	3,294,553 (10)	2,302 (7)
Top 10 primary crops		
Wheat	618,500	432
Potatoes	616,800	431
Seed cotton	429,973	300
Watermelons	236,100	165
Tomatoes	231,000	161
Onions, dry	208,000	145
Vegetables fresh nes	150,500	105
Maize	148,250	104
Carrots and turnips	129,100	90
Grapes	111,850	78
Animal units, number	(avg. 2006–2007, number)	(number / 100 km ²)
Cattle	1394941	975
Poultry	2475500	1730
Pigs	600	0.42
Equivalent animal units	1419936	992
Annual roundwood production	(2006–2007, m ³)	(m ³ / 100 km ²)
Total	9000	63
Fuel	9000	63
Industrial	0	0
Wood-based panels	0	0
	(2006–2007, tonne)	(tonne / 100 km ²)
Paper and paperboard	0	0
Recovered paper	NA	NA

Source: Food and Agriculture Organization of the United Nations

Tajikistan Biomass Resource Table

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5. Solar

The climatic conditions of Tajikistan are very favorable for using solar energy. There are 280-330 sunny days a year, and the intensity of total solar radiation varies within a year from 280 to 925 MJ/m² in piedmont regions, and from 360 to 1120 MJ/m² in highlands. Utilization of available solar energy in Tajikistan could satisfy as much as 10-20 percent of national energy demands. The estimated solar potential is about 25 billion kWh/year in Tajikistan. A majority

of the potential is not exploited; however, Tajikistan does utilize some of their solar resource for water heating purposes (Kabutov, 2007).

The tables below show the monthly and annual incidence of total solar radiation on a horizontal surface and of direct solar radiation on a surface normal to beams for two areas: Dushanbe (the capital) and meteorological station named after Academician Gorbunov. The first point characterizes a country's part of the plains, while the second one, located at the Pamirs, is in a mountainous area.

	Dushanbe	Gorbunov
Jan	222	287
Feb	270	343
Mar	400	532
Apr	522	691
May	700	866
Jun	820	904
Jul	840	906
Aug	762	833
Sep	616	628
Oct	419	462
Nov	265	329
Dec	197	251
Yearly	6033	7032

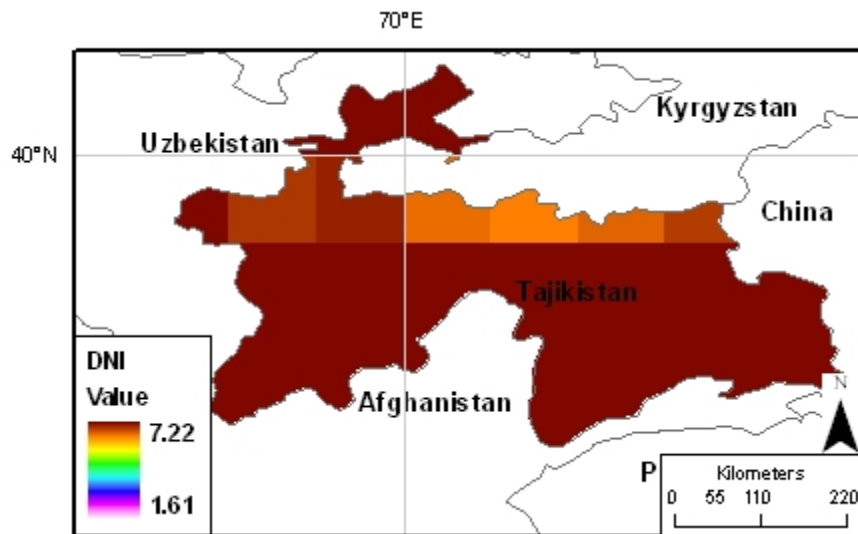
Monthly and annual total solar radiation incident on horizontal surface, MJ/m²

	Dushanbe	Gorbunov
Jan	265	289
Feb	266	248
Mar	344	317
Apr	402	399
May	631	600
Jun	775	837
Jul	792	941
Aug	737	966
Sep	650	822
Oct	463	600
Nov	346	430
Dec	247	251
Yearly	5928	6694

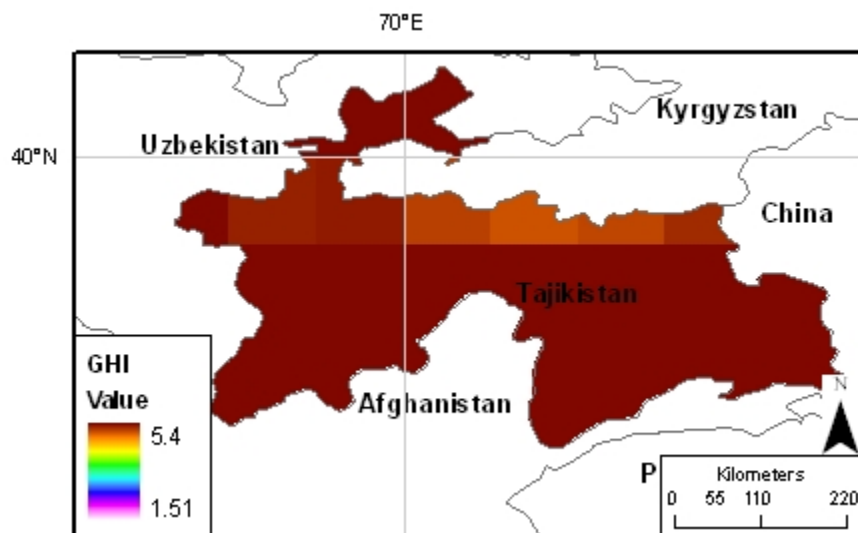
Monthly and annual direct solar radiation incident on surface normal to sunlight beams, MJ/m²

The following maps display Tajikistan's insolation values throughout the country. A majority of the country has significant solar resource.

Tajikistan Solar Direct Normal Insolation (Source: NASA)



Tajikistan Solar Global Horizontal Irradiance (Source: NASA)



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6. Geothermal

The geothermal resources are small and poorly studied in Tajikistan. Data about using thermal waters are generally absent, though it is planned to use the thermal water in vicinity of Khodja-Obi-Garm. It is estimated that Tajikistan could produce 45 billion kWh annually using geothermal energy sources (Kabutov, 2007).

Geothermal resources are concentrated in convective hydrothermal systems of Tien Shan foothills. Evaluation of the resources of one thermal water field was carried out:

- Khodja-Obi-Garm; temperature 90 °C, TDS 0.5 g/l; total flow rate 280 l/s.
- Total thermal water resources in Tajikistan has not been estimated and resources for electricity production have not been identified.

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7. *Hydroelectric*

Hydropower resources are abundant and evenly located over the territory of Tajikistan. In terms of hydropower potential, Tajikistan is one of the world leaders. Tajikistan's hydroelectric potential is estimated at over 500 billion kWh of electricity per year (Kabutov, 2007). Currently, 16.6 billion kW are produced, which is approximately 6 percent of their total potential (EIA, 2005).

Approximately 14 billion kW of electricity is being produced by hydroelectric power plants on the Vakhsh River; the plants have a total capacity of approximately 3,800 MW. The largest facility on the Vakhsh is the Nurek hydroelectric plant, which has a capacity of 3,000 MWe.

A larger hydropower facility at Roghum (335 m tall) is under construction and will have a capacity of 3,600 MWe. However, recent security problems as well as seismic concerns in the area have halted most progress (GlobalSecurity, 2005).

In November 2004, the Russian government endorsed an agreement with Tajikistan for participation in the construction of the Sangtuda 1, a 670 MW hydroelectric power station. The project was halted in 1989, but with the recent investment of \$500 million from Russian companies, the last of the four facilities was unveiled on July 31, 2009. This plant will eventually power around 12 percent of Tajikistan. Sangtuda 2, a 220 MW hydroelectric plant, is currently under construction with its completion date set for 2010 (UN Economic and Social Committee, 2003).

The biggest hydropower plants in Tajikistan are: Nurek hydropower plant (height of dam is 300 m) with production capacity of 3,000 MW, Sangtuda 1 hydropower plant – 670 MW, Baipaza hydropower plant - 600 MW, Golovnaya HPP - 240 MW, Kayrakkum HPP - 126 MW. Small hydropower plants have big prospects, and at present their total capacity is about 115 MW.

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8. *Relevant Links*

Please see webpage for relevant links.

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9. *References*

Applied scientific reference book on climate of the USSR. Hydrometheoizdat, L., Issue 31, 1988.

Department of Energy, "An Energy Overview of the Republic of Tajikistan." Available online: www.fe.doe.gov.

Energy Information Agency, "Energy Balance," 2005. Available online: www.eia.org.

GlobalSecurity.org, "Energy in Tajikistan," April, 2005. Available online: www.globalsecurity.org.

Kabutov, K., "Tajikistan: Priority Directions and Status of Research in the Field of Renewable Energy Sources," Published in *Geliotekhnika*, 2007, No. 4, pp. 91-96.

Karimov, Marupov, Nasirov, "Renewable energy sources and stable development of mountain regions in Tajikistan". Proceedings of the International congress "Business and investments for renewable energy in Russia", Moscow, 1999.

Kulikov, G. and Mavritsky, B. et al. Atlas of Thermal Water Resources of the USSR. Moscow, 1984.

Novikov, V., Petrov, G. and Karimov, U., "Use of Renewable Energy in Tajikistan."

Obozov, A., "Opportunities for renewable energy sources in Central Asia Countries," Project Kun Kyrgyzstan, July 1998.

United Nations Economic and Social Commission for Asia and the Pacific. Regional Round Table on Foreign Direct Investment for Central Asia, 3-4 April 2003, Dushanbe, Tajikistan.

World Bank Statement on the Energy Policy in Tajikistan, January 15, 2008. Available online: www.worldbank.org.

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10. Country Contacts

Contacts made in the preparation of this assessment are gratefully thanked for their contribution to this report. Please see webpage for contacts listing.

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