

Tajikistan

Country Profile

[1. Overview](#)

[2. Policy and Incentives](#)

[3. Wind](#)

[4. Biomass](#)

[5. Solar](#)

[6. Geothermal](#)

[7. Hydroelectric](#)

[8. Links](#)

[9. References](#)

[10. Country Contacts](#)

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1. Overview of Electricity Supply

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 15 billion kWh, about 5 percent of that.

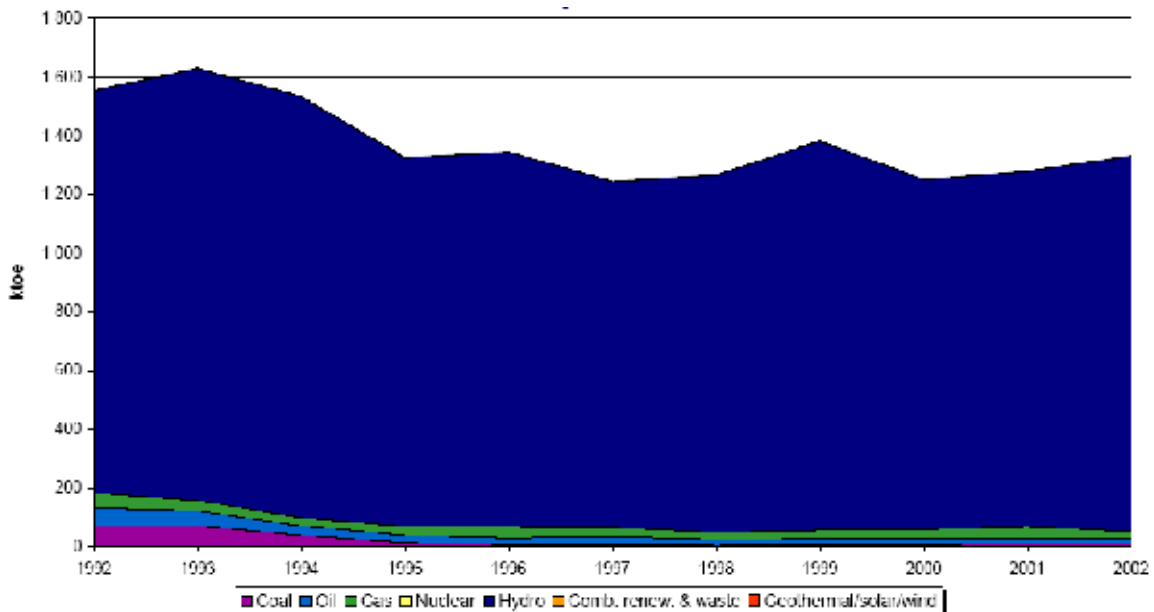
The electric transmission and distribution system is currently in serious need of improvement and modernization. The electricity grid is currently divided into a northern and southern network, with both networks connected to Uzbekistan. As a result, Tajikistan both imports and exports a significant amount of power. This divided system has also led to inconsistent power supply to remote areas.

Additionally, about 40 percent of the total energy produced in Tajikistan is used by the Tursunzodz 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 and despite overall expected economic expansion, the economy will not reach its 1990 level until 2012.

Demographical Information	
Population, millions (2003)	6.5
Land area, thousand Ha (2002)	14,255
Macroeconomic Information (2003)	
GDP, billion US\$	1.6
Real GDP growth rate, percent	10.20
Foreign direct investment (net), million US\$	1,003
Electricity sector	
Electricity tariff, US¢/kWh (2002)	0.5
Collection rate, percent (2002)	65
Load utilization factor, percent (2000)	NA
Electricity disposition, billion kWh (2003)	
Generation	15.41
Consumption	15.05
Exports	3.87
Imports	4.60
Generation capacity, GW (2003)	
Nuclear	0.0
Thermal	0.4
Hydro	4.1
Other renewables	0.0
Total	4.4
<i>Sources: European Bank for Reconstruction and Development, U.S. Energy Information Administration, Food and Agriculture Organization of the United Nations.</i>	

Evolution of Total Production of Energy from 1992 to 2002 in Tajikistan



Source: IEA

[\(return to top\)](#)

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.

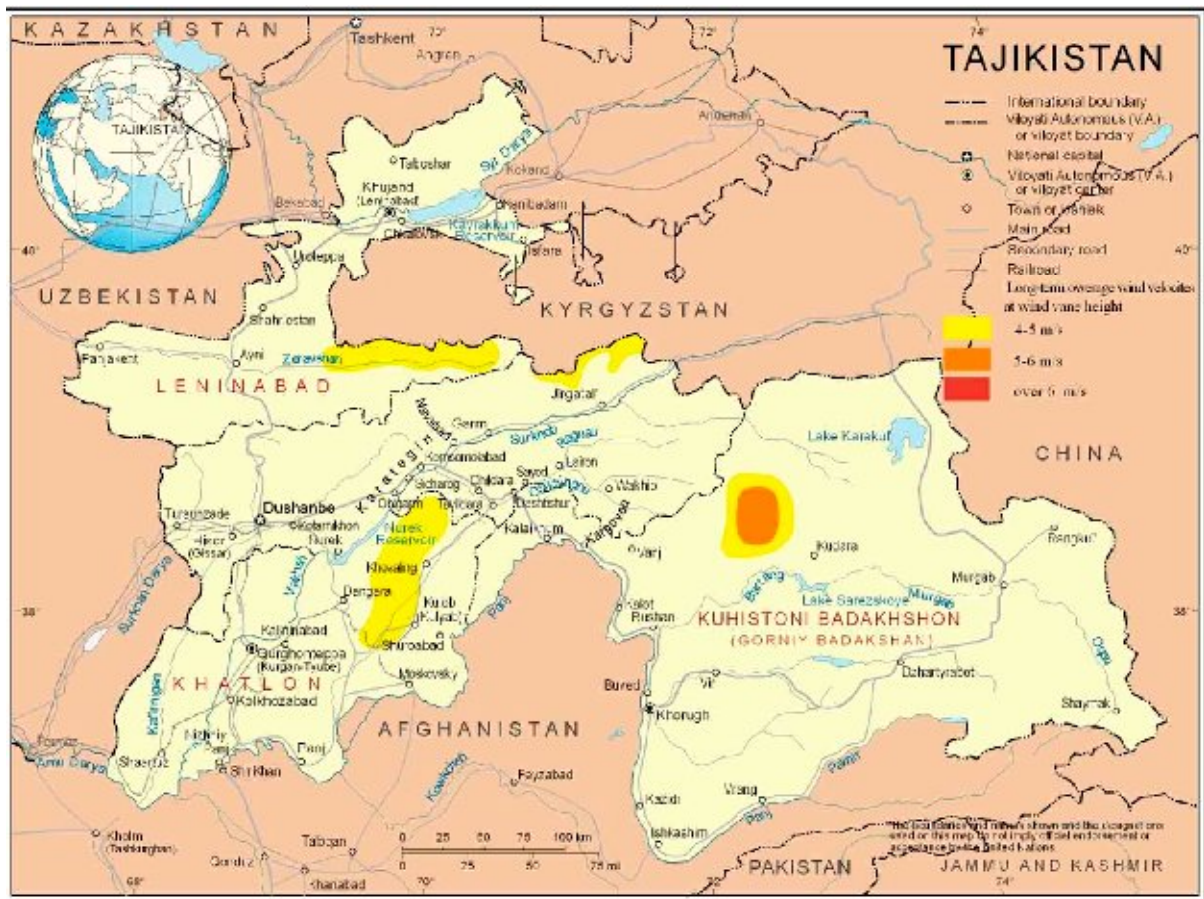
[\(return to top\)](#)

3. Wind

The "Master Plan of Wind Power Development of the USSR till 2010" published in 1989 included a country-level wind map. 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 diversity of wind regimes. The existing meteorological stations are located at the altitude of 2 km and above, therefore the data of observations are difficult to compare. The wind potential suitable for power utilization (peaks and slopes of mountains) seems likely to be about 10-15 percent of the territory.

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-Badakhshan, Turkmenistan ridge in the Zeravshan river headwater and the region from the Vakhsh ridge to the boundary with Afghanistan.



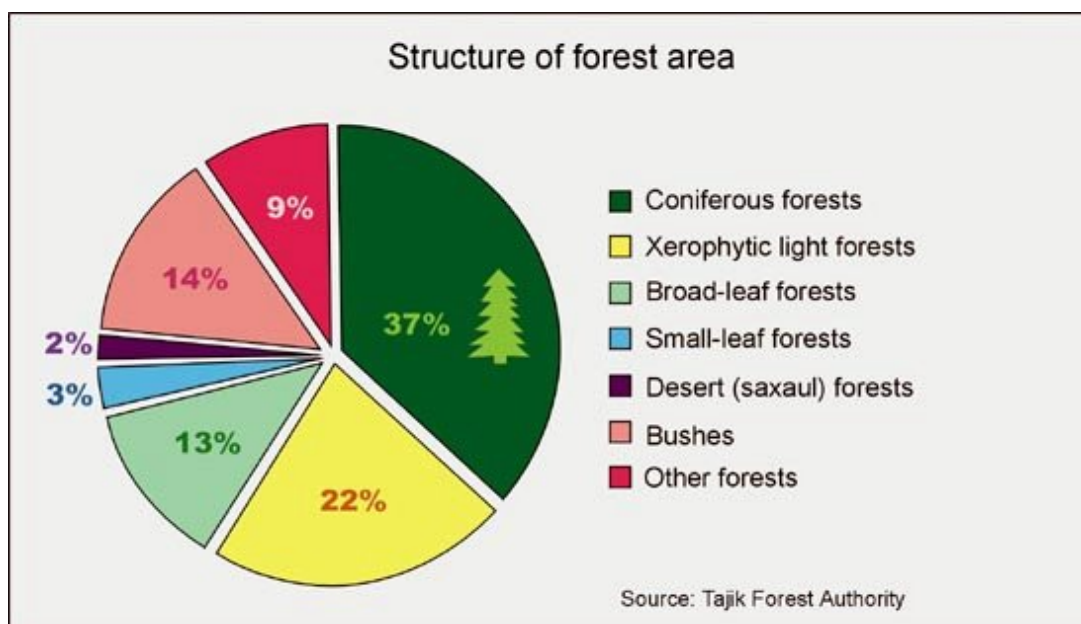
Wind atlas of Tajikistan

[\(return to top\)](#)

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.



Tajikistan Biomass Resource Data (FAO 2002a, FAO 2002b).

Biomass resource type	Total production	Production density
Percent of total land area covered by		
Forests		1%
Shrublands, savanna, and grasslands		48%
Cropland and crop/natural vegetation mosaic		24%
Urban and built-up areas		0%
Sparse or barren vegetation; snow and ice		25%
Wetlands and water bodies		2%
Primary crop production, tonne	(avg. 1999-2001, tonne)	(tonne /1000 Ha)
Total primary crops (rank among COO)	5,346,275 (22)	380 (24)
Top 10 primary crops		
Mixed Grasses, Legumes	3,100,000	220
Maize for Forage & Silage	393,333	28
Seed Cotton	368,103	26
Wheat	294,667	21
Potatoes	281,933	20
Tomatoes	176,100	13
Vegetables and Roots, Fodder	156,667	11
Onions, Dry	127,667	9
Watermelons	89,022	6
Apples	52,000	4

Animal units, number	(number)	(number / 1000 Ha)
Cattle	1,039,500	74
Poultry	750,000	53
Pigs	960	0
Equivalent animal units	1,047,384	74
Annual roundwood production	(1996-98, 000 m ³)	(m ³ / Ha)
Total	NA	NA
Fuel	NA	NA
Industrial	NA	NA
Wood-based panels	NA	NA
	(1996-98, 000 metric tons)	(metric tons / Ha)
Paper and paperboard	NA	NA
Recovered paper	NA	NA

[\(return to top\)](#)

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. Even so, there is very little use of this solar resource, and there are currently no large solar projects under consideration.

The mountain relief and a small number of points where measurements of solar radiation take place make it difficult to compile a map of solar radiation distribution in Tajikistan. 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.

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

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

[\(return to top\)](#)

6. Geothermal

The geothermal resources are small and poorly studied in Tajikistan. Data about using thermal water are generally absent, though it is planned to use the thermal water in vicinity of Khodja-Obi-Garm.

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.

[\(return to top\)](#)

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. For the time being, only 5 percent of this potential is being exploited.

Hydropower engineering is the base for the electric energy sector of the country. The total capacity of operating power plants comprises 4,412 megawatts, 93 percent of which is being produced by hydropower plants. Tajikistan's peak energy production was recorded in the early

[\(return to top\)](#)

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[\(return to top\)](#)

10. Country Contacts

Contacts made in the preparation of this assessment are gratefully thanked for their contribution to this report. Contacts include: