

## Afghanistan's energy potential and economic development

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**Abstract:** Energy shortcoming is one of the major challenges for economic development in Afghanistan and majority of Afghans cut off from energy supply. On the other hand, Afghanistan is considered as one of the richest countries in terms of energy potential in the region. This paper sheds light on Afghanistan's major energy sources, energy needs and possible outcomes of energy development. The finding of this study shows that despite the big potential of energy production, more than half of total electricity demand in Afghanistan is met by imported electricity. Furthermore, in the overall domestic energy provision, solid biomass is accounted for almost 85% of the energy consumption in the country. The government planned to develop domestic energy from hydropower and thermal resources like oil, coal and gas. Until self-sufficient energy production is attained, the government would continue importing energy from neighbouring countries

**Keywords:** Energy, growth, Afghanistan.

### Introduction

The last decades of conflicts left Afghanistan as one of the poorest country in the world, experiencing low per capita income, high unemployment rate, low infrastructure, educational and healthcare developments, high inflation rate and so many other undesirable outcomes that directly and indirectly damaged economic and social welfare of its people. After 2001, the huge influx of international financial assistance however stirred the economy, producing sizable changes in economic, social and political arenas of the country, but the development process is still being

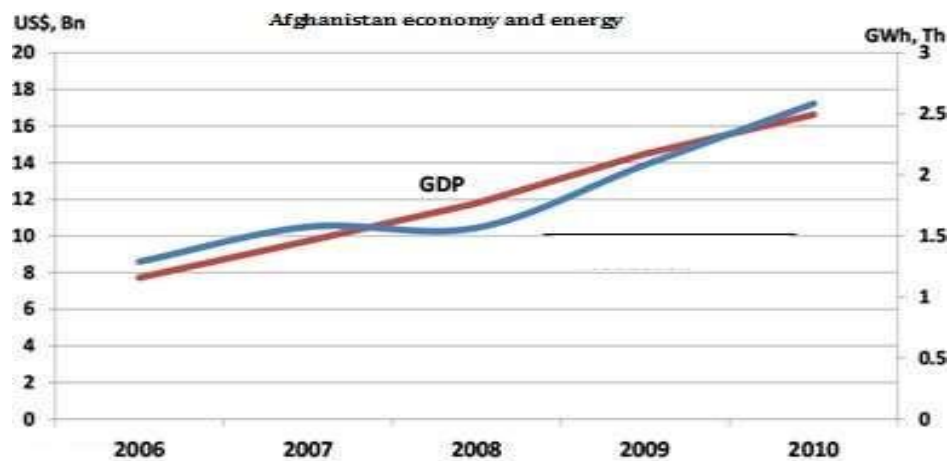
interrupted by factors like: insecurity, low human capital accumulation, unavailability of required infrastructure and lack of sustainable energy development as a critical factor.

Energy development plays a significant role in economic and social development of every country and Afghanistan is not an exception. In this regard, previous theoretical and empirical evidences depict positive correlation between energy use and economic growth and social development. Figure 1 shows the correlation between electricity consumption and GDP improvement in Afghanistan. The figure shows that GDP in Afghanistan rises in line with electricity consumption from 2006 to 2010.

The demand for energy, especially electricity, is improving daily and there is still a huge gap between energy supply and energy demand in the country, leading Afghanistan to experience severe energy deficiency.

Energy shortage is considered as one of the major challenges for economic and social developments in Afghanistan. Currently, majority of Afghans suffer from lack of sustainable energy, especially electricity. The electricity supply and consumption is very low as compared to those in the region countries and the world average, being limited to the big cities of Afghanistan. Even in cities like Kabul and Herat, the electricity supply is not secured; rather the people are witness of irregular electricity blackout. In most part of the rural area of the country, traditional energy provision is prevailing where the availability of electricity is hardly looking.

The aforementioned facts pose questions on how much is the energy potential and need in Afghanistan? How energy expansions boost economic development in the country? These questions motivated this paper to overview the energy sector in Afghanistan, the possibility of its development and the contribution of energy expansion to economic and social welfare of Afghans.



**Figure 1:** Correlation between electricity consumption and GDP improvement in Afghanistan.

### Theory and empirical finding

Expansion of energy supply is considered as a main driver of economic growth since, in the modern world all production processes somehow depend on it. The mainstream economic growth models do not, however, directly point to the role of energy in the growth process. The new classical growth model and the Solow model relates the rate of saving and investment as main source of growth at diminishing rate, taking the technological improvement as exogenous but effective to growth. In addition, the endogenous growth models rely on accumulation of capital (physical capital, human capital and knowledge), leading to endogenous changes in technology, allowing economies to expand further. In general, mainstream macro economists pay less or no direct attention to the role of energy in growth process, while micro economists on the other hand, pay significant role for availability of energy in output improvement as they consider energy expansion as cost-cutting for production. Even if technological changes and accumulation of capital in the mainstream theory are accounted for positive growth, it is clear that extraction of knowledge and utilization of technology are impossible in the absence of energy.

On the other hand, ecological economists pay more roles for the energy, defining it as the oxygen of the economy and the life blood for the economic growth. This group of economist count energy as the direct factor of production and main driver of economic growth. Strem and Cutler (2004) relates the linkage between energy and economic growth to substitutability of energy resources with other inputs like capital. If the substitutability of energy and capital are equal to zero,

then, they are complementary to each other and economic growth requires a proportionate improvement of the two inputs. The inverse is when they are perfectly substitutable.

Empirical evidence on casual relation of energy and output are inconclusive, having reported positive and ambiguous correlation between the two. Many empirical studies applied Granger casualty test, aiming to find whether the casualty goes from energy use to growth or vice versa. For example, Kraft and Kraft (1978) and Akarca and Long (1980) depict positive casualty from output to energy and ambiguous relation. On the other hand, Masih and Masih (1997) report positive long run co-integration from energy to growth for Indonesia, Pakistan and India.

Toman and Jemelkova (2003) argued that energy play different roles in various stages of development. He stated that countries in the earlier stage of development require high proportion energy to GDP, and this share declines when a country move towards industrialization. He also introduced some channels of energy supply to economic development such as: widening possibility of time reallocation from energy provision to education, flexibility in working time, more efficient use of capital, lower production and transportation cost and health benefit of using technology like refrigerator etc.

### ***Energy potential and need***

Afghanistan is labelled as one of the richest countries in the region in terms of energy potential, having large deposits of natural gas and oil, renewable energy resource such as hydro, solar and wind electricity powers. Based on National Renewable Energy Laboratory (NREL) of America, 23000 MW hydroelectricity and 158000 MW wind electricity powers can be generated in Afghanistan (Elliott, 2008). Also based on Ministry of Energy and Water of Afghanistan, in excess to the aforementioned sources, Afghanistan has a huge potential (240000 MW) of solar electricity power, since, on average it has 300 sunshine days per year and there is a possibility of 6.5 kwh/m<sup>2</sup> per day electricity generation. Development of these renewable resources make the country not only to meet domestic demand for energy but also turn Afghanistan as energy exporter in the region and allow the country to export energy surplus to the South-Asian markets.

The development of renewable energy resources are accompanied with some advantages and challenges. The dominant advantage of the wind, hydro and solar powers is the reduction of

pollution since the level of emission drops dramatically by shifting from wood and ladder energy use towards the mentioned renewable energy. The high cost of energy development and utilization could be the major challenge for Afghanistan government. Also, Afghanistan has 15.687 trillion foot cubic natural gas, 1598 billion barrels of oil and 562 million barrels liquid gas deposits (Damla, 2014). Extraction and utilization of these energy deposits could respond to a big part of domestic demand for oil and gas in the country.

Despite the rich energy potential, majority of Afghan population cut off from the electricity access. Based on Ministry of Energy and Water, currently, only 10 to 15% of population access to electricity and electricity consumption per head is lower than those of the neighbouring countries and far more from the world average consumption. According to World Bank Report, the per head energy consumption in Afghanistan was 154 kwh per year which is lower from India (667 kwh/year) and far away from the world average (3100 kwh/year) in 2012 (World Bank Data).

In 2014, the overall electricity demand in the country was 3500 MW and total electricity supply was only 1750 MW which was partly generated by consumers themselves. The share of non-traditional energy generation exceeds 50% of energy use in Afghanistan (Ministry of Water and Energy). The demand for energy increases on average around 9% per year and the peak demand for energy would be between 2600 to 4300 MW and different scenarios (Master Plan of Energy).

Currently, a big share of the overall electricity is consumed by household and government, reaching to around 90% of total power. Since industries have not been well improved in the country yet, the share of energy consumed by firms and business is very low (Aminjonov, 2016). This fact implies that as much as the country move towards industrialization, energy demand would also considerably increase.

### ***Energy development and its possible economic outcomes***

Energy development in Afghanistan is at the focal point of government strategy and substantial improvements have been made for post 2001. After the fall of the Taliban regime, the demand for energy has increased in line with economic growth. The government of Afghanistan with the support of international financial institutions has put its effort to improve the energy supply from domestic resources and abroad to meet the increasing domestic demand for energy. Currently,

since the potential for sustainable domestic energy supply is not technically and financially feasible for the government, Afghanistan continues importing energy from central Asian energy surplus countries. To date, Afghanistan imports electricity from neighbouring countries such as: Tajikistan, Uzbekistan, Turkmenistan and Iran.

Additionally, Afghanistan could play as a transit corridor, linking energy surplus Central-Asia to the growing energy demand South-Asian countries. Several energy projects are underway some of which would be domestically served in Afghanistan (TUTAP), while others would partly be spent to meet domestic need and partly transited to Pakistan (CASA1000) and to Pakistan and India (TAPI).

The development of energy from domestic resources is at the focal consideration of Energy Master Plan of Afghanistan. Among different sources of renewable energy, there are more options to develop hydropower and thermal energy. Table 1 shows the time schedule, energy potential and cost of hydro energy options depicted in the Master Plan of Afghanistan.

S/N	Project	River	Province	Capacity (MW)	Commit date	Annual energy (GW)	Estimated cost (\$M)
1	Baghdara	Panshir	Parwan	210	2021	968	600
2	Surbi 2	Kabul	Laghman	180	2021	891	700
3	Kunar A	Kunar	Kunar	789	2022	4772	2000
4	Kajaki additional	Helmand	Helmand	100	2021	493	300
5	Kukcha	Kukcha	Badakhshan	445	2022	2238	1400
6	Gulbahar	Panjshir	Panshir/Baghlan	120	2021	594	500
7	Capar	Panjshir	Panjshir	116	2021	574	450
8	Kama	Kunar	Nengarhar	45	2021	223	180
9	Kunar B	Kunar	Nunar	300	202	1485	600
10	Kajaki extension	Helmand	Helmand	18.5	2015	91	90
11	Olambagh	Helmand	Uruzgan	90	2021	444	400
12	Kilagai		Baghlan	60	2021	297	250
13	Upper Amu	Amu Daria		1000	2023	4955	2500

14	Dashtijum	pyanj		4000	2023	19819	8000
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The feasibility of the aforementioned project is questionable due to yearly security deterioration and unaffordability of construction cost that result from a high budget dependency to the international financial assistance. The second option for development of renewable energy is the use of thermal resources namely oil, gas and coal.

Afghanistan has huge deposits of covered and uncovered gas and oil which can contribute to energy development in the country. Most of these deposits are located in the north of the country and there is an option of 200 MWe power from gas deposits in Sheberghan. The current rate of gas production is not sufficient for generating the aforementioned power, rather the production rate of gas should be increased thrice more than the current rate to make the project feasible, for that reason, some new wells need to be drilled.

The third source for energy development is coal deposits which are expected to reach up to 73 million tons (Master Plan). Coal as an option for power plant is supposed to be used to generate 400 and 800 MW power for Aynak copper mine and Hajigak iron mine, respectively. The feasibility of this project is restricted to the improvement of coal production rate as much as ten times more than its current production rate.

The last option for energy production is the use of oil. This option is however not economical for majority of people due to high price of oil, but it is of more importance for small scale consumptions for some urgent needs like hospital etc.

Several economic impacts could be expected from the domestic energy development and energy import and transit for Afghanistan. The energy development boosts Afghanistan economy by accelerating economic performances. It would also generate direct and indirect long run job opportunities that further contribute to economic growth. Increasing energy supply enhances the economic growth resulting from wide and cheap electricity access for businesses and households.

Afghanistan's functioning as a transit corridor produces many other gains in terms of improvement of trade balance, foreign exchange reserves and appreciation of domestic currency. Presently, Afghanistan is experiencing trade deficit amounting over \$5 billion which is almost five times greater than its total exports. This fact leads to a continuous devaluation of domestic currency,

pushing inflation up which in turn harms consumers and foreign investments. Development of energy could play vital role in improvement of trade balance, while the competitiveness of Afghanistan in the global markets is improved thereby leading the export to easy flow to the regional and global markets. Also imposition of transit fee could not only further improve foreign reserve and cut the deficit of trade balance, but it would inject the economy by huge flow of income to the government budget.

Further, upon completion of energy development, Afghanistan would be considered as one of the most reliable destination for investment. This would further enhance economic activities, boosting economic growth and cut down the unemployment rate.

Finally, regional economic integration, resulting from enhancing energy trade could reduce political disparity which in turn fosters economic growth not only in Afghanistan but also in the region. Political discrepancy among the countries in the region is one of the obvious obstacles for economic integration from which Afghanistan badly suffers. Implementation of the TAPI and CASA1000 projects would pave the way for construction of political trust in the region and will especially be much effective for Afghanistan-Pakistan and Pakistan-India economic relationships.

## **Conclusion**

Afghanistan suffers from severe energy shortage and majority of its people cut off from electricity. On the other hand, there is huge potential for energy development in this country. Therefore, the government of Afghanistan has been putting efforts to establish secure energy supply and pave the way for faster economic performance. After 2001, the overall supply of energy increased but in line energy demand is also rising and there is still a big gap in our energy market. Currently, energy improvement takes place through both development of domestic energy resources and energy import from central Asian neighbouring countries and several projects like TUTAP, CASA and TAPI which are underway. Import of energy would continue until 2032 and beyond until the domestic energy supply is well developed. It is expected that after 2032, if there is political and financial stabilities, Afghanistan would be able not only to meet domestic electricity demand but it would appear as electricity exporter to the neighbouring countries.



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