

## Energy Crisis in Pakistan (2008–2018): Impact on Industrial Sector



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**Abstract:** Energy is considered the backbone of the economy of any state. Similarly, the economy of Pakistan is heavily dependent on energy. Pakistan is an agricultural country, and it earns foreign exchange by exporting agricultural commodities. However, Pakistan is facing an energy crisis due to multiple factors. This research will provide a historical analysis of the energy crisis in Pakistan. This energy crisis has affected the industrial sector and economic growth of Pakistan. This paper will highlight the different factors that have contributed to the rise of energy demand in the country. The dynamics that have caused the failure of successive governments in Pakistan to anticipate the constantly increasing demand for energy are also discussed in this research. The long hour's load shedding across the country has affected the lives of the common man in general and the industrial production in particular. This paper will also highlight the impact of the energy crisis on the economy and industrial sector of Pakistan.

**Key Words:** Pakistan; Energy Crisis, Industrial Sector, Economy

### Introduction

The simplistic definition of energy is "power derived from the utilization of physical or chemical resources to get light. Mankind progressed after it learned to convert energy from various natural sources for performing various functions. A layman uses energy to do daily activities such as walk and ride a bicycle etc. Different scientific inventions helped the world population to use energy for driving cars on the roads, cooking food in the oven and stoves, making fridges and freezers for keeping the storing and keeping the food fresh, bringing light, fans, air conditioners in our home spaces etc.

There are various forms of energy that include light, chemical, electrical, heat, tidal, motion and gravitational. On a broader scale, all these forms of energy are categorized into two major types, e.g. kinetic energy, which is also called the working energy and potential energy, which is also known as the stored energy. The most interesting fact about energy is that it can be converted from one form into another. An example can be given of the water stored in a dam is a source of gravitational potential energy

that is converted into kinetic energy when the water flows down and then it produces electrical energy.

Natural resources such as coal or natural gas have stored amounts of chemical energy in them, which can be converted into electrical energy to be utilized by mankind for lighting their homes and heating their offices. The water flowing from a dam contains kinetic energy that is used by states for the generation of electricity. The energy sources can be divided into two main types, i.e. renewable energy sources, which can be restocked and nonrenewable energy sources that can not be replaced. Both these sources of energy can be used as the basic sources of energy for producing heat, or they can also be used to generate secondary sources of energy such as electricity (EIA 2020).

The understanding of the whole phenomenon of energy leads to the question of what is the energy crisis. The energy crisis in a state refers to the shortage of electricity, which is of prime importance for the efficient functioning of the industries and factories of any state in order to progress economically. If we

analyze energy in terms of the state, it is considered to be the lifeline of a state's economy. Energy supply is significant for the social and economic progress of any state. The sources of production of goods in state are dependent on the continuous energy supply as it is crucial in the smooth running of the machinery that is installed in various factories and industries. It is also vital in maintaining the quality of life for the citizens of a state as it supplies light to home and offices. The uninterrupted and continuous supply of energy is linked with the functioning of factories, industries and domestic life etc. The energy shortage means that all the fields of life have been affected.

Energy crisis means that the supply of electricity to the industries, factories, workplaces is facing acute shortage due to the deficiency in the supply of electricity. The demand for electricity is higher than the supply, which leads to power blackouts in a state.

### History of Energy Crisis in Pakistan

The current energy crisis in Pakistan surfaced in late 2007. However, the actual roots of the energy crisis that the state of Pakistan has been facing recently can be traced back to the policies adopted by the government during the early 1990s. The policies related to power during these years allowed the investors from the private sector to install thermal power plants for producing electricity. The fuel for running these thermal power plants was dependent on the imports of oil and natural gas. The money that was being spent on importing fossil fuel from outside ended up increasing Pakistan's oil import bill. The figures recorded during the year 1994 were 530 million US dollars, which crossed 1400 million US dollars in the year 2017 (Rehman et al., 2017). The need of the hour is to reduce Pakistan's reliance on the import of fossil fuels for the generation of energy. The government should adopt an energy policy that may explore the option of renewable energy resources.

The shortfall of energy from the year 2008 onwards meant that Pakistan's big cities were facing the issue of load shedding for almost six hours, while in the rural areas, the power cut was around sixteen to eighteen hours a day. This had a drastic impact on the household consumers and the industrial and commercial sectors, which resulted in the loss of economic activity in the country.

### Causes of Energy Crisis

Due to population growth and industrialization, there

has been a massive increase in the demand for energy. The production and supply of energy as compared to the growing demand for energy have been low across the world. Overall, the energy supply has been low as compared to its demand that has resulted in an energy crisis that has engulfed the world in general and developing countries in particular such as India, Pakistan, Bangladesh, Congo, Nigeria, Myanmar, Indonesia, Ethiopia, Kenya, Tanzania, Myanmar etc.

Energy crises ultimately resulted into price rise due to shortage of supply and increase in demand. In contemporary era, the causes of the energy crisis include modernization, industrialization, a huge amount of urbanization and the increase in world population. According to an estimate by the UN, the world population is likely to increase by 9.1 billion by the year 2050. Asia and Africa will be the major contributors to this future population increase.

Electricity is the requirement of almost all walks of life, such as social services, health and education. Otherwise, the world societies will fall under hunger, illiteracy and various diseases. The use of ventilators in recent pandemic situation is an example. The water supply, sanitation, refrigeration of life-saving medicines requires electricity. It is also significant in providing opportunities for the generation of income for the workers and owners of various industries by selling their manufactured goods in the market.

The current energy infrastructure is undeveloped, due to which the country has been facing a severe energy crisis since 2007. Pakistan is a developing state that has been struggling to develop its energy infrastructure. Even with the strong economic growth, the ruling political parties overlooked the growing energy demands of the increasing population. There have been no efforts from the government to ensure the capacity building of the energy infrastructure. The other factors that have caused the current energy crisis in the country include an increase in demand, power theft by the population and outdated infrastructure that has led to the loss of transmission of electricity.

There has been a surge in the demand or the consumption of electricity every year, but the government has not taken effective measures to increase the supply or production of electricity. This has resulted in load shedding in almost all parts of the state, which has a crippling effect on especially the industrial sector of Pakistan.

The energy crisis in Pakistan has its roots in multiple factors. First is the deficit between demand and supply, i.e. due to the increase in population, the demand or consumption of electricity has increased. However, the government has not invested in new resources for power generation keeping in view the growing demands of the population. The process of fast-paced urbanization due to the reason that the masses want to have a better or modern lifestyle is also one cause. An example can be given of the fact that since the last two decades, more households are now using air conditioners, computers, laptops, various kitchen appliances, etc.

Another reason of energy crisis is the increase in industrialization and employment of modern means for growing the agricultural output in the country. As a result, it has led to increased transportation needs of the population, hence putting more burden on the already costly supply of fuel in the country.

The greatest cause of all is that the ruling governments have been neglecting proper policy planning for meeting the energy demands of the growing population. Pakistan has a lot of potential and natural resources to tap power which has not yet been utilized by the successive governments. There is a need for a proactive energy policy planning in this regard.

Another factor is that Pakistan has unbalanced multiple energy sources, i.e. the state's reliance on non-renewable energy resources such as oil and natural gas has been huge. Pakistan imports oil for its energy production from other countries, which is another significant problem. There is a need to have a balanced energy source where the focus should be more on renewable power generation resources such as wind, solar and hydropower.

Most of the indigenous resources that can be instrumental in producing energy have not been utilized by Pakistan. Thar Coal is one of the examples of such indigenous sources, which can be safely said to be the largest coal reservoir in Pakistan, which, if extracted and utilized, is almost equal to the oil reservoirs of Saudi Arabia and Iran.

The other causes behind the energy crisis include the increase in oil prices. As of the year 2012, almost 82 per cent of the production of electricity in Pakistan was based on oil; the increased oil prices in the international markets has put a lot of pressure on Pakistan's economy. The oil base or thermal base electricity generation has decreased the fiscal capacity of the state to supply electricity at a low cost to all the

consumers. Moreover, this economic pressure has led to the non-payment of electricity bills by the government and semi-government authorities. The government was unable to pay the money to the independent power producers, which due to nonpayment are forced to minimize the production of electricity. In addition to that, electricity theft in Pakistan has been a major problem that has led to the chronic energy crisis. Fourth, the obsolete technology used for the transmission of electricity results in the wastage and promotion of theft of electricity by the masses ([Hussain, 2012](#)).

### **Pakistan's Energy Resources**

Pakistan generates electricity from non-renewable energy resources, mainly fossil fuels or thermal. These include natural gas, coal, oil, petroleum and liquefied petroleum gas (LPG). The problem with generating energy from non-renewable resources is that they are limited natural resources, and they can not be restocked or regenerated. This makes them an expansive source of generating energy.

Renewable energy resources include solar, water, wind, tides and geothermal heat. Pakistan needs to employ most of these renewable energy resources for producing electricity. These resources are clean, unlimited and sustainable. Pakistan has been using hydropower for the generation of electricity, but it is still the second-largest source for the generation of energy. There is a need to shift the focus more towards renewable sources of energy generation than non-renewable sources.

The state of Pakistan generates energy/electricity from various sources that include fossils, hydropower, nuclear power and wind. The other natural resources of energy generation such as solar, tide, wave, biomass waste and geothermal have minimal contribution in the overall energy resources of Pakistan. In 2007-17 the oil production in Pakistan was around 64,000 - 95,000 barrels per day (around 17-21% of Pakistan's oil consumption). In 2016-2017, around 4.2 million tonnes of coal was produced in the country whereas around 7 million tonnes was imported to fulfil the requirement of the industry. Moreover, the share of Hydropower was 26% of the electricity generation in Pakistan. The share of Nuclear power generation was around 5.7% of the total electricity generation of Pakistan in 2016 - 2017 (Country Nuclear Power Profiles, 2019). 1237MW electricity is derived from the wind power in 2018 that constitutes around 6%

of the total energy production. This data shows that there is still need to utilize the potential of [wind energy](#) in Pakistan.

There has been a gap in managing Pakistan's demand and supply of electricity. As of the year 2012,

the overall supply of electricity across Pakistan has been 9,500 megawatts, but the demand is estimated to be 15 000 megawatts; this makes the shortfall of electricity around 5300 megawatts.

**Table 1.** Energy Generation share of Different Sources

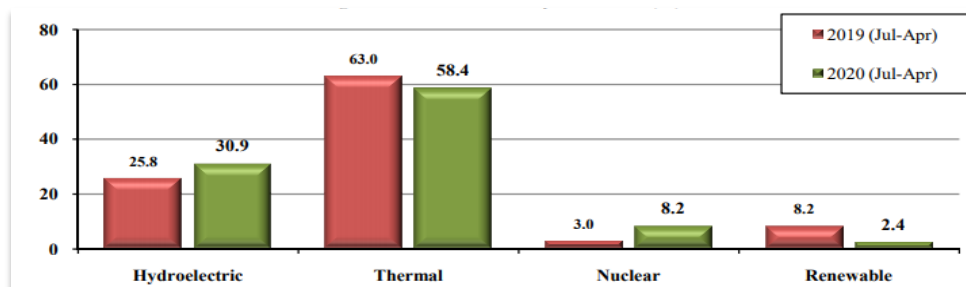
	2019	2020	% Share 2019	% Share 2020
	(Jul-Apr)	(Jul-Apr)	(Jul-Apr)	(Jul-Apr)
Hydroelectric	24931	27270	25.8	30.9
Thermal	61003	51629	63.0	58.4
Nuclear	2903	7049	3.0	8.2
Renewable	7955	2057	8.2	2.4

Source: Ministry of Energy, (Power Division)

According to the latest figures mentioned in Pakistan's Economic Survey (2019-2020), out of the total 96382 GWH, i.e. 100% energy mix, the thermal/ fossil fuels remain the largest source that contributes 51629 GWH, i.e. 58.4%, hydroelectric

sources contribute 27270 GWH, i.e. 30.9%, the share of nuclear has increased up to 7049 GWH, i.e. 8%, while the contribution of renewable energy resources is recorded to be 20.50 GWH, i.e. 2.4% (Pakistan's Economic Survey, 2020, p. 274).

### Share in Electricity Generation of Different Resources



(Source: PES, 2019-20)

Over the years, the installed capacity of electricity generation has increased to almost 7.5 per cent, i.e. for the year 2020, the energy capacity has reached up to 35 972 megawatts. However, the demand or the consumption of energy has been shifted or converted over the years. Pakistan being an agricultural state, the consumption of electricity has been more in the agricultural sector, but according to the recent data, the consumption of electricity in the agricultural sector has decreased, and it has been superseded by household consumption. Although the share of the electricity used by household has increased over the years, however, the overall pattern of energy consumption has remained the same.

The reason behind the increase in the consumption capacity of the households is mainly due

to the current pandemic situation; people were confined at homes for almost the whole year. According to the figures recorded till march 2020, 44.9 per cent, i.e. 22,96, 190 megawatts per hours (MWh), of the total energy generated was consumed by the household consumers. The consumption of electricity by the industrial sector is the second largest as it was recorded to be 29.45 per cent, i.e. 1,505, 957 MWh. Then comes the agricultural sector, which is the third-largest consumer of electricity; it has consumed almost 8.04 per cent of electricity, i.e. 411,257 MWh. In 2020 when the covid-19 pandemic was at its peak, the electricity consumed by the commercial sector was recorded to be 394 916 MWh, i.e. 7.72 per cent. The miscellaneous consuming sectors use around 9.8 per cent, i.e. 505,245 MWh of

electricity (Pakistan's Economic Survey, 2020, p. 275).

## **Government's Policies**

Energy security is directly linked with the economic security of a state. The government of Pakistan needs to rely less on imported thermal resources such as oil for the production of energy. As we have been largely dependent on the fuel imported from other states, it has resulted in the high cost of production, expensive energy production and huge foreign exchange expenditure. There is a need to roll back the dependence on imported fuels and deliberate on other energy sources for meeting the growing demands of electricity. This will be helpful in promoting economic development and enhancing energy security in the longer run.

Renewable energy resources are Pakistan's best source for doing policy planning for long term energy security. Renewable energy resources will help in bringing sustainability and development to the economic, societal and environmental sectors of Pakistan. Relying on multiple sources for energy production and maximum utilization of local or domestic sources can reduce load shedding and provide an uninterrupted supply of electricity to all the consumers in Pakistan.

The developing states like Pakistan that have just entered the phase of the industrialization process and are struggling to grow economically need to put more efforts into using renewable energy resources. This challenge can be met via adopting effective government policies. The uninterrupted electricity supply is directly linked with the effective function of the industrial sector, which is the second-largest consumer and the major source of overall economic growth of Pakistan.

The government of Pakistan has been working on the integrated energy plan (IEP) aimed at completing in the next 25 years. According to a statement issued by the Special Representative of Prime Minister on petroleum, Nadeem Babur, the government has been working on the IEP that will ensure the consumers of electricity, oil and gas have an uninterrupted and affordable supply of these facilities (Kiani, 2020). This is aimed at ensuring that the consumers have reliable, affordable access to the major energy components of the state. The state of Pakistan will be focusing more on the increase of electricity production from the next two decades. The Special Representative of Prime

Minister, in his statement, has further highlighted the renewable energy will play a significant role in future for meeting the electricity demands of the country.

The famous policy of the government of Pakistan known as the Vision 2025 clearly highlight the goals that have been set for the state's energy sector. Pakistan's Vision 2025 is to guarantee that the masses have access to uninterrupted, clean and affordable energy. In order to achieve this long term goal, the government had planned to end the gap between the demand and supply of electricity by the year 2018 (Planning Commission, 2014). This goal has been almost achieved as there has been a 7.5 per cent increase in the energy generation capacity of Pakistan in the year 2020 (Pakistan's Economic Survey, 2020, p. 274). Another goal was to produce enough energy to fulfil the estimated growth in demand by adding 45 000 Megawatts (Planning Commission, 2014, p. 102) to the total energy mix. The most significant goal that has been listed is the improvement of the energy mix and relying on gas, oil, hydro, coal, solar, wind, nuclear and biomass. All of this will be done keeping in view the economic feasibility, impact on the environment, and relevance to the indigenous resources.

It was reported by the media in 2019 that the government was planning to increase the role of renewable energy sources for the generation of power to almost 30 per cent by the year 2030 (WWEA, 2019). This means that the government will put more focus on wind, power, biomass and solar sources of energy generation. The recent contribution of these resources is minimal. The data recorded in 2019 shows that renewable energy resources only contribute a minimal total of 4 per cent in the total energy mix of Pakistan (WWEA, 2019). With the depleting hydropower resources and the expensive thermal nonrenewable energy resources, Pakistan needs to tap the resources such as wind and solar power for the generation of electricity.

## **Impact on the Industrial Sector and Economy**

Pakistan's economy depends upon the three main sectors; agriculture, industry and services sector. This research study is focusing on the impacts of the energy crisis on the industrial sector of Pakistan. Hence the other two sectors do not fall under the scope of this paper. Post-2007, Pakistan's economy in general and its industrial sector, in particular, was affected by the energy crisis. The Gross Domestic Product (GDP) of

the state kept on falling down with a ratio of 2-3 per cent due to the energy shortages.

## Important Industries in Pakistan

Table 2

S. No	Industries
1	Cables and electrical goods, Cement
2	Chemicals and pharmaceutical, Paints
3	Cosmetics o Engineering Auto and Allied
4	Fertilizer
5	Fuel and energy
6	Food and Allied, beverages, cooking oil
7	Glass and Ceramics
8	Iron and steel
9	Paper and board
10	Plastic and rubber
11	Sports
12	Sugar and Allied
13	Surgical
14	Textiles
15	Wood and furniture

Source: (Zaidi, 2015)

The role of electricity is vital in almost all economic activities. The energy crisis had negative repercussions on the overall economy, but the textile industry and power looms were severely disturbed.

The people who used to earn their bread and butter through the industrial sector protested across Pakistan during the energy crisis. These riots were at their peak in the year 2012. Most people who took part in these strikes and sit-in were from Punjab, and either they were owners of small scale industries or employees.

According to a report of the Asian Development Bank (2012), it was quoted that Pakistan's economic growth was limited because of the energy crisis. It was suggested by the bank that Pakistan should work towards developing a policy in which the emphasis should be put on better load management in order to decrease the losses of the commercial and industrial sectors. The recorded downfall in GDP due to power shortage was said to be 3-4 per cent (Asian Development Bank, 2012, p 19). It was reported that the energy crisis had a crippling impact on Pakistan's

economy and its industrial sector. An estimated loss of 13 per cent was recorded to the industrial sector. The energy crisis has hit the industrial sector on multiple fronts; the small business that was unable to generate power for themselves were shut down, unannounced load shedding led to fluctuations in electric voltage that damaged the expensive industrial machinery resulting in the loss of millions of dollars and lastly the absence of electricity during the working hours had negative impacts over the productivity of labour force (Burki et al., 2010).

The energy crisis proved to be a humanitarian issue. The standard of life dropped down as the advanced technology and machines that are attributed to the better standard of life require electricity for functioning. Unannounced load shedding created a sense of marginalization among the Pakistani population. Many of the social evils were born during the peak of the energy crisis in Pakistan that includes increased street crimes, riots, psychological issues, increased number of disputes between various parties etc. The reason behind the unrest in Pakistani society

can be directly linked to the increased rate of unemployment as the small businesses and industrial sector was affected severely due to the energy crisis. The working class, especially that has been working in factories, and the industrial sector, were hit hard by the energy crisis (Faheem, 2016).

The industrial sector had the direst impacts at the height of the energy crisis in Pakistan. The investors that included the domestic, regional and international stakeholders started rolling back their projects due to the termination of electricity for longer hours. The foreign stakeholders started shifting their industries to other neighbouring countries such as India and Bangladesh. This was a great setback for Pakistan's industrial sector. The shifting of businesses and industries to the neighbouring countries meant that Pakistan's economy would lag behind in the region. Foreign investors were not ready to invest money to start their businesses neither in the Pakistani market and nor in Industrial production. This had serious repercussions on the growth rate of Pakistan's industrial sector.

The economic impact of the energy crisis was felt by almost all sectors of Pakistan's economy. The economic loss was faced by the country due to the unannounced load shedding leading to low or zero productivity. This took a toll on the overall GDP of Pakistan, which kept on falling for almost a decade. Moreover, the inflation rate during this decade was high, which was also linked to the energy shortfall. The textile sector was the most affected part of Pakistan's economy; huge textile companies had to shift their factories to various other states for running their businesses.

The electricity shortfall also decreased production in Pakistan, which has led to decreased economic growth. The activities of the industries such as cement, textile, engineering etc., were most affected by the energy crisis. It was reported that their performance was declined, especially during the years from 2007 to 2009 (Naseem & Khan, 2015). This was an open example that the industrial sector was badly hit by the energy situation in Pakistan.

The ramifications of the energy crisis were felt by the agricultural sector of Pakistan as well. In modern times the agricultural methods and techniques require a smooth supply of electricity to function properly; this includes the production of fertilizers, pesticides etc. The energy crisis resulted in low productivity in

the agriculture sector, which had a spillover effect on the economy of Pakistan.

Long hours of unannounced and announced load shedding in Punjab that is the hub of small and large industries in Pakistan and also in Karachi has cost huge economic losses to Pakistan's economy. It was reported that just in Karachi, the production capacity of the five major industrial sectors fell around 50 per cent from 2008 to 2015 (Faheem, 2016). This was mainly due to the reason that the main power generation company, i.e. the Karachi Electric Supply Company (KESC), has been facing a severe shortfall of electricity. There was a sense of bleakness born in the people who had been working with the industrial sector. Unemployment was at its peak as local industries started rolling back, and the overseas stakeholders were not willing to invest more in Pakistan. Rather they were shifting their investments to other countries that they had already invested in Pakistan.

There was a growth in the issues related to the psychology of the masses. The general masses, out of their frustration, started taking part in sit-in strikes and violent riots, which harmed the private and public infrastructure. This social situation was highlighted by the international media that resulted in the popular notion at the international level that Pakistan is unsafe for foreign investments and businesses.

## **Conclusion**

Pakistan is facing an acute shortage of electricity that has resultantly put Pakistan in a severe energy crisis. The crises were severe in 2007 and later on. On one side, urbanization, population growth and industrialization are some of the major factors that are contributing to the constant rise in demand for electricity whereas, on the other hand, mismanagement, electricity theft, improper planning and line losses are affecting the adequate and constant supply of electricity in Pakistan. The economic progress of the state has declined due to this energy crisis. The successive governments have failed to overcome the challenge of the energy crisis. Pakistan has not built dams since long, and electric generation is majorly dependent on thermal power plants that produce electricity by using crude oil. Pakistan has to import oil for thermal power plants to produce electricity. Hence a large amount of foreign exchange reserves are spent on the import of oil. This heavy spending on the import of oil is affecting the state

economy. The industry has suffered a lot due to the energy crisis, and many industrial units have been shifted to other parts of the world from Pakistan due to a shortage of electricity. Pakistan has lost huge foreign exchange reserves due to the shifting of industrial units from Pakistan to other parts of the world. The government has started to build dams for

the production of cheaper electricity and other alternate sources such as coal power plants and renewable energy resources. Pakistan should invest more in renewable energy resources such as solar lights and windmills to meet the energy requirement on the one hand and to supply cheap electricity to the population on the other hand.



## References

- Ahmad, T. (2013). Electricity and Energy Problems with Pakistan. Causes, Consequences and Sustainable Solutions, GC University, Munich, GRIN Verlag. [Electricity and Energy Problems with Pakistan - GRIN](#)
- Asian Development Bank. (2012). Annual Report, p 19. <https://www.adb.org/sites/default/files/institutional-document/33806/adb-annual-report-2012.pdf>
- Burki, A. A., Munir, K., Khan, M. A., Khan, U., Faheem, A., Khalid, A., & Hussain, S. T. (2010). Industrial policy, its spatial aspects and cluster development in Pakistan. *Analysis report to the industrial policy 2010, 1*.
- Faheem, B. J., (2016). Energy Crisis in Pakistan, IRA International Journal of Technology and Engineering, Vol.3 Issue 1. <https://research-advances.org/index.php/IRAJTE/article/view/95>
- EIA. (2020). US Energy Information Administration, " What is energy? ", June 18. <https://www.eia.gov/energyexplained/what-is-energy/#:~:text=Energy%20is%20the%20ability%20to,the%20ability%20to%20do%20work.&text=People%20use%20energy%20to%20walk,to%20send%20astronauts%20into%20space>
- Hussain, A. (2012) "The Challenges Ahead", The Express Tribune, Karachi, June 24.
- Kiani, K. (2020) 25-year energy plan in the offing, Dawn, February 1. <https://www.dawn.com/news/1531817/25-year-energy-plan-in-the-offing>
- Naseem, I., & Khan, J. (2015). Impact of Energy Crisis on Economic Growth of Pakistan, *International Journal of African and Asian Studies*, An International Peer-reviewed Journal, Vol.7. <https://core.ac.uk/download/pdf/234689844.pdf>
- Pakistan. (2025). one nation-one vision. Planning commission. Ministry of Planning, Development & Reforms. Government of Pakistan, Islamabad (2014) <https://www.pc.gov.pk/uploads/vision2025/Pakistan-Vision-2025.pdf>
- Pakistan Economic Survey. (2019-20). Chapter 14: Energy. Ministry of Finance. [http://www.finance.gov.pk/survey/chapter\\_20/14\\_Energy.pdf](http://www.finance.gov.pk/survey/chapter_20/14_Energy.pdf)
- Rehman, S. A. U., Cai, Y., Mirjat, N. H., Walasai, G. D., Shah, I. A., & Ali, S. (2017). The Future of Sustainable Energy Production in Pakistan: A System Dynamics-Based Approach for Estimating Hubbert Peaks. *Energies, 10* (11), 1858.
- WWEA. (2019). Pakistan to Set 30% plus 30% Renewable Energy Target by 2030, April 2. <https://wwindea.org/pakistan-to-set-30-plus-30-renewable-energy-target-by-2030/>
- Zaidi, S. A. (2015). Issues in Pakistan's economy: A political economy perspective. *OUP Catalogue*.