Chapter-5

NATURAL RESOURCES AND ECONOMIC DEVELOPMENT

Mineral, power and forest resources are the foundation of economic development. They help in giving an initial push to the raising of production in all sectors of the economy. If the quality of manpower is high in a country, it will make the best use of the natural resources and attain development in the shortest possible period of time. Human and natural resources are thus both determining factors in economic development.

We, in this chapter, briefly examine the importance, quantity and the quality of the mineral power and forest resources available in Pakistan. The resources are discussed under separate heads.

1. MINERAL RESOURCES

The minerals, are the precious wealth of a country. These are extracted from earth. Some minerals like coal, iron, copper etc., are found in solid forms and some like gas, petrol, oil etc., are discovered in liquid shape.

A country with large deposits of minerals provides a sound base for the development of a large number of industries viz., iron, steel, petro chemicals, cement, pottery etc. The discovery of varied mineral deposits provides employment to a large number of persons living in that area. Their economic condition improves. The availability of mineral resources in the country reduces the import bill of many items like oil, chemicals, machinery etc. The mining sector thus makes a significant contribution to GDP.

Pakistan is quite rich in mineral resources compared to many other developing countries of the world. **The mining sector has largely remained under developed due to financial constraints,** heavy reliance, however, on advanced countries for the discovery of mineral wealth, scarcity of trained personnel at home, etc.

MINERAL DEPOSITS

Natural Gas. Natural Gas is a clean, safe, efficient and environment friendly fuel. Its indigenous supplies contribute about 38% in total primary energy supply mix of the country. It is used in industry to produce consumer goods, cement, electricity, fertilizer and in the transport sector in its compressed form (CNG). Pakistan has an extensive gas network of over 12,971 km Transmission, 139,827 km Distribution and 37,058 Services gas pipelines to cater the requirement of more than 9.6 million consumers across the country. The government is pursuing its policies for enhancing indigenous gas production as well as imported gas to meet the increasing demand of energy in the country. The average natural gas consumption was about 3,865 Million Cubic Feet per Day (MMCFD) including 785 MMCFD volume of RLNG during July 2018 to February 2019.

During July-February FY2018-19, two Gas utility companies (SNGPL & SSGCL) have laid 69 Km Gas Transmission network, 3,232 Km Distribution and 1,366 Km Services lines and connected 165 villages/towns to gas network. During this period, 428,305 additional gas connections including 425,404 domestic, 2,770 commercial and 131 industrial were provided across the country.

Table – 1: Average Sector Wise Natural Gas Consumption in Million Cubic Feet per Day (Mmcfd) (July 2018 – Feb2019)

Sector	Gas Consumption in MMCFD	RLNG	Total
Power	865	546	1,411
Domestic	889	-	889
Commercial	84	5	89
Transport (CNG)	136	47	183
Fertilizer	621	24	645
General Industry	485	163	648
Total	3,080	785	3,865

Source Ministry of Energy, Directorate General Gas

LPG: Liquefied Petroleum Gas: At present LPG contributes only a small percentage of less than **1%** to the total primary energy supply. The lower share of LPG is mainly due to its higher price compared competing fuels such as fuel wood, dung etc. LPG is now popular domestic fuel in areas where natural gas network is not available.

CNG: Compressed Natural Gas: To reduce expensive imported fuel and to improve environment, the govt., has been encouraging the use of CNG in Vehicle. As a result Pakistan has been reported by PES as the largest CNG using country. This exclusive use of gas for a relatively low priority vehicular use led to shortages for the high priority industrial uses. As a result the earlier policy has been reversed. Currently more than 3,416 CNG stations have the CNG marketing licenses in the country. However, keeping in view the mushroom growth of CNG stations in the country vis-à-vis depletion of natural gas reserves, Government has imposed a ban on establishment of new CNG stations in the country w.e.f. 07.02.2008.

LNG: Liquefied Natural Gas: The first LNG re-gasification Terminal was commissioned on 27th March 2015 in a record time of less than 11 months. Since March 2015, 83 LNG Cargoes have been handled at the LNG Terminal. The Terminal has re-gasification capacity of 600 MMCFD. Moreover, 2nd LNG Terminal has also been awarded to Pakistan Gas Port Company Limited (PGPCL) by the Government Company i.e. Pakistan LNG Terminal Limited (PLTL). The Terminal is expected to be completed by 3rd quarter. 2017. For this purpose Pakistan LNG Limited (PLL) is in a process to arrange 4.5 MTPA for said terminal.

Coal: Pakistan has fairly large indigenous coal resources (over 186 billion tons) which are sufficient to meet the energy requirements of the country on long-term sustainable basis. Domestic production of coal is expected to increase in the coming years on start of mining activity at Thar coalfield. Presently, indigenous coal production is mostly consumed by brick kilns and a small quantity is utilized by Khanote Power Plant and cement factories. Imported coal is used by power plants, cement manufacturing units, Pakistan Steel and other industries etc. Import of coal has substantially increased comparative to preceding year (FY 2016-17) due to commissioning of new coal based power plants at Sahiwal & Port Qasim.

2. MINERAL DEVELOPMENT AGENCIES

Mining and quarrying accounts for only 0.5 percent of GDP and is a minor sector. However, mining plays a crucial role in economic development. The mining sector is overwhelmingly under the control of the public sector. Coal mining being the only exception where the private sector accounts for 85% of the total coal production. All minerals except oils, gas and nuclear minerals are under the control of provincial governments. The main agencies engaged in the survey, exploration and development of mineral resources are as under:

2. Resource Development Corporation (RDC)

The Resource Development Corporation was established in 1974. It is a Government sponsored Corporation. The main objective of setting up this Corporation is to investigate, probe and develop the mineral resources (except oil and Gas). The Government has laid particular emphasis on finding out the copper deposits at Saindak district Baluchistan.

3. Gemstone Corporation of Pakistan Limited (GEMCP).

The GEMCP was established in 1978 with the share capital of Rs. 10 million. The objective was undertaking mining, cutting, polishing, and marketing of the gemstones in the country and helping in the export of a variety of gemstones available in the country.

4. Pakistan Mineral Development Corporation (PMDC).

The Pakistan Mineral Development Corporation was set up in 1974 with a view to increasing coal and salt mines in the country. The Corporation is operating 4 coal mines, 3 in Baluchistan and 1 in Punjab.

5. Geological Survey of Pakistan (GSP).

Geological Survey of Pakistan is an attached department in the Ministry of Fuel, Power and Natural Resources. This Department is primarily responsible for mineral exploration, collection, and dissemination of geological information. This work is done by geological mapping of the country, preparation of geophysical maps and reports.

The full exploitation of minerals has been constrained by the absence of risk capital inadequacies in the institutional framework and lack of industrial capacity to absorb mineral produce. The Government is now adopting new policy measures for removing the constraints.

Attractive policy packages for petroleum, power and mineral exploration have been announced. The policy lays stress on attracting foreign private investment, simplification of procedures and creation of a domestic corporate securities market.

3. POWER RESOURCES

Energy:

Energy has been rightly termed as the lifeline of economic growth and development. Besides the obvious productive sources of demand, energy requirements also grow for consumptive uses. As a result the growth of population and incomes further accentuation the energy demand originating from the purely productive and developmental uses. As a result the overall demand tend to grow rapidly over time necessitating the corresponding growth in

supply in order the avoid the appearance of constraints in the process of development. The sources of supply are also quite varied with substantial differences in the time period required for their development, cost of production per unit, safety and effectiveness. Careful studies are therefore required to select an appropriate and low cost package for energy supply.

With average GDP growth rates of 4.7% during 2014-2018, the demand for energy for productive and consumptive uses increased rapidly. The "National Power Policy 2013" was approved by the CCI to address the key challenges of the power sector and to achieve the long term vision of the power sector. In short run, two critical issues were addressed on fast track. One issue was inefficient recovery system while the other was effective control of transmission and distribution losses. Various initiatives have also been started to ensure the sustainability of the reforms envisaged under the Power Policy of 2013 ranging from regulatory reforms to market development have been introduced.

Another important and critical initiative was projects under China-Pakistan Economic Corridor (CPEC). The CPEC envisaged projects in energy and infrastructure, with a total financial outlay of around US$ 46 billion. Financial outlay of Energy sector projects is estimated to be US $ 34.74 billion while Infrastructure projects are estimated to be US $ 13.217 billion. Energy sector projects included power generation and transmission projects to be implemented in IPP mode while Infrastructure projects includes projects for construction of roads, highways, railways, ports and telecommunications infrastructure, to be implemented as government to government loans/ grants. Till March 2017, twelve (12) projects have been signed in Energy Sectors with eight (8) projects in PPIB and four (4) projects in AEDB.

It is mentionable that till June 2018, installed capacity of electricity reached 33,553 MW which was 22,812 MW in FY 2012-13, thus, posting a growth of 47 percent. Although electricity generation varies due to availability of inputs and other constraints, however, the generation increased from 96,496 GWh in 2012-13 to 120,715 GWh in FY 2017-18 posting a growth of 25 percent, while, during July-March FY 2019, electricity generation remained 87,324 GWh.

With power shortages as a prime economic challenge five years earlier, previous government accorded top priority to electricity generation. Firstly, payables of power sector entities against the Independent Power Producers (IPPs) and public sector power entities amounting Rs 480 billion were fully cleared in 2013, which added 1,700 MWs electricity to the national grid and eased load shedding considerably in the country. Secondly, the government moved in the direction of providing targeted subsidy to power consumers (domestic up to 300 units) by moving towards better cost recovery leading to a financially stable power sector.

Energy sources in Pakistan:

At present the main sources of energy in Pakistan and their relative shares are as follows:

Thermal: 62.1%

Hydro: 25.8%

Nuclear: 8.2%

Renewable: 3.9%

The share of hydro in electricity generation has decreased over the last few decades. Availability of water is one of the main reason for reduced generation from hydel power plants. Currently, thermal has the largest share in electricity generation. Share of RLNG has shown a tremendous growth in energy mix as it served the demand of various power plants (Bhikki, Haveli Bahadur Shah, Balloki, Halmore, Orient, Rousch, KAPCO, Saif and Sapphire) as well as that of fertilizer plants and industrial and transport sector.

Performance of Pakistan Power Sector Players

Pakistan Atomic Energy Commission (PAEC)

Pakistan Atomic Energy Commission (PAEC) has been actively engaged in harnessing nuclear power technology. At present five nuclear plants i.e. Karachi Nuclear Power Plant (KANUPP) at Karachi, Chashma Nuclear Power Plant Unit-1, Unit-2, Unit-3 and Unit-4 (C-1, C-2, C-3 and C-4) at Chashma (Mianwali) are operating with gross capacity of 1,430 MW. These five nuclear power plants supplied 7,267 million units of electricity to national grid during July 2018 to March 2019. KANUPP has now completed forty seven years of safe and successful operation. Four nuclear power plants at Chashma are amongst the best performing power stations in the country.

National Electric Power Regulatory Authority

The National Electric Power Regulatory Authority (NEPRA) is responsible for regulating electric power services and safeguarding the interests of investor and consumers.

Private Power and Infrastructure Board

The Private Power and Infrastructure Board (PPIB) is a 'One Window' facilitator to the private investors in the field of power generation on behalf of the Government of Pakistan (GOP). PPIB has successfully managed to induct 31 independent private power projects totaling about 9,071 MW attracting investment of US$ 9.4 billion.

Alternative Energy Development Board

To diversify energy mix and ensure energy security, the Government of Pakistan has mandated Alternative Energy Development Board (AEDB) to act as a central agency for development and promotion of Alternative & Renewable Energy (ARE) technologies in the country and to facilitate the private sector investment in this sector.

Hydel Power Resources:

The hydel power is renewable. It is produced from waterfall in Pakistan. There is a great potential of developing hydro power capacity. Since Independence, huge amounts have been allocated in all the five year development plans and there is a spectacular growth of electric power from **68** MW in **1947** to **28,239** GWH by **2017-18** from hydel generation. The Hydel schemes, though they are being less expensive, are very useful for the development of the country. The hydro projects not only provide energy but also improve the irrigation system of the country. The vast new areas of land are brought under cultivation and the supply of water for existing cultivated area is improved. In addition to these, the hydro projects help in controlling floods, are used for navigation purposes, breeding fisheries, recreation etc., etc.

Non-Conventional Sources of Energy.

Due to price hike of oil since 1973-74, the less developed countries are now developing other renewable sources of energy. These sources are comparatively cheaper and also have a simplified technology. The non-conventional sources of energy are (1) Biogas (2) Solar, and (3) Wind.

1. **Biogas projects.** Biogas, which is produced from animal and plant wastes, is a very cheap source of energy. Biogas can be used for cooking, domestic lighting, powering engines of irrigation and drinking purposes. As nearly **62%** of our people live in villages they can make the best use of this source of energy. Thousands biogas plants have already been installed efforts are being made to convert agro-based industries to biogas generated sector.

   Besides rural areas, the pilot phase of a Biogas Project at Landi Cattle Colony, Karachi has been completed where waste from 400,000 Cattle would be utilized to generate electricity and organic fertilizers.

   In order to tap the potential of electricity generation from the sugar mills in Pakistan, the Government of Pakistan on recommendation of AEDB announced the Framework for Power Co-Generation 2013 (Baggase/Biomass) in 2013. Twenty Four (24) companies sugar mills of 817.5 MW cumulative capacity have been issued Letter of Intent (LOI) from AEDB and are at different stages of project development and will be completed during 2018-19.

2. **Solar energy projects.** Four solar projects (100 MW each) named Quaid-e-Azam Solar Park, Bahawalpur with different IPPs with cumulative capacity of 400 MW are operational. Out of four, three were completed in Aug 2016. Seven IPPs with a cumulative capacity of 72.52 MW have obtained Letter of Support (LOS) from AEDB and are in the process of achieving Financial Closing of their projects while seventeen solar power projects of 484 MW cumulative capacity have obtained Letter of Intent (LOI) from AEDB and are at different stages of project development and will be completed during 2018-19.

3. **Wind energy projects.** Another cheap source of generating power is the wind. In windy areas, the windmills can be used for supplying electricity on a small scale. The windmill can be used for pumping water for crops, grinding corn, crushing sugar cane, thrashing, cutting of wood etc., etc. Twenty Four (28) wind power projects having a cumulative capacity of 1397.6 MW are at different stages of development / operation. Till now, twelve wind power projects of 590.5 MW cumulative capacity have achieved commercial operation and are supplying electricity to National Grid. Eight (08) projects with a cumulative capacity of 445 MW have achieved financial close and are under construction and expected to be completed within 2018.

4. **Small Hydro.** The government has initiated eight hydro projects with the support of Asian Development Bank to the implemented Khyber Pakhtunkhwa and Punjab.

   Another two hydro power projects have been initiated for ADB financing the government of Punjab has issued letters of intent to private investor for the establishment of 10 small hydro projects, with a capacity of 142MW in different parts of the province.

AEDB is building private sector investment in:

(a) Khyber Pakhtunkhwa – 22 projects of 92MW capacity and

(b) Punjab – 30 projects with a capacity of 240MW.

AEDB is assisting the provinces to solicit private investment in small hydro sector under this program pre-feasibility studies with a cumulative capacity of 284.14MW have been completed.

Public sector Hydro Power Projects have been initiated in different provinces as under:

(a) Khyber Pakhtunkhwa of 56.2MW

(b) Punjab – 90.4MW

(c) Gilgit – Baltistan - 30MW.

Conclusion

We have examined the various sources of energy and their availability in Pakistan. We in the long run shall have to bank upon on hydel and solar energy for meeting the energy crisis. The world scientists are of the view that the world is not facing a crisis of energy but a crisis of technology. The oil which is consumed in the engines uses only around only 45% of the energy potential and 55% of it is burnt as waste. Same is the case with nuclear reactor which exploits and harnesses 1% of the energy produced by uranium. The scientists of the world now shall have to develop the technology which uses **100%** of the energy potential of oil.

4. ENERGY CRISIS IN PAKISTAN

With power shortages as a prime economic challenge five years earlier, previous government accorded top priority to electricity generation. With average GDP growth rates of 4.7% during 2014-2018, the demand for energy for productive and consumptive uses increased rapidly. The "National Power Policy 2013" was approved by the CCI to address the key challenges of the power sector and to achieve the long-term vision of the power sector. In short run, two critical issues were addressed on fast track. One issue was inefficient recovery system while the other was effective control of transmission and distribution losses. Various initiatives have also been started to ensure the sustainability of the reforms envisaged under the Power Policy of 2013 ranging from regulatory reforms to market development have been introduced.

Box-1 List of Power Plants Started during Present Government

										Total
2014	Plant Names	GENCO II, Gaddani CC	Wind others	Lucky						
	Fuel Type									
	Installed Capacity (MW)	747	106	84						937
2015	Plant Names	RYK Mill Limited	FWEL-I	Quaid-e-Azam	Nandipur					
	Fuel Type	(Bagasse)	(Wind)	(Solar)	(Thermal)					
	Installed Capacity (MW)	30	50	100	425					605
	Plant Names	Sapphire	Chiniot Power Limited							
	Fuel Type	(Wind)	Bagasse							
	Installed Capacity (MW)	52	62							114
2016	Plant Names	Apollo	Best Green	Crest Energy	Metro	Younus				
	Fuel Type	(Solar)	(Solar)	(Solar)	(Wind)	(Wind)				
	Installed Capacity (MW)	100	100	100	50	50				400
	Plant Names	Tapal	Master	Gul Ahmed	Tenaga	Chashnupp C-4				
	Fuel Type	(Wind)	(Wind)	(Wind)	(Wind)	(Nuclear)				
	Installed Capacity (MW)	30	50	50	50	340				520
2017*	Plant Names	Fatima Energy	Hamza Sugar	Sachal	Dawood Hydro China	Bukki	Hawa Bahadur Solar	Sachwal		
	Fuel Type	(Bagasse)	(Bagasse)	(Wind)	(Wind)	(RLNG)	(RLNG)	(Coal)		
	Installed Capacity (MW)	90	15	50	50	1,356	1,200*	1,243		3,829
	Plant Names	PASHA Power	Gulf Power	Bulleh	Patrind	Chashnupp C-4	Quaid-e-Azam Solar	Port Qasim	Thal Industries	
	Fuel Type	(FSO)	(FSO)	(RLNG)	(Hydel)	(Nuclear)	(Wind)	(Coal)	Solar(PV)	
	Installed Capacity (MW)	9*	84	1,195	14*	340	90	1,320	50	3,002
2018	Plant Names	Artistic	Thatta	Hawa	Tarbela 4th Ext.	Neelum Jehlum				
	Fuel Type	(Wind)	(Wind)	(Wind)	(Hydel)	HSD				
	Installed Capacity (MW)	50	50	50	1,410	969				2,529
Grand Total (MW)										10,936

Source: Economic Survey

Table 1: Power Sector Performance Comparison

			2009-2013	2014-2018
Capacity		MW	22,812 as on June 2013	29,577 as on Feb 2018
Generation		MW	20,850	28,771
Transmission		MVA	33,370	49,128
Distribution		MVA	33,751	44,096
Number of New Project		No	17	39
PPIB	Investment	US $ Million	2,635	7,103
	Capacity Addition	MW	2,530	4,854
AEDB	Investment	US $ Million	227	2,586
	Capacity Addition	MW	106	1,452
Transmission and Distribution Losses	Maximum	%	19.6% in FY 2010	18.7% in FY 2014
	Minimum		18.9% in FY 2013	17.9% in FY 2017
	Average		19.4%	18.3%
Recovery	Maximum	%	89.6% in FY 2013	94.5% in FY 2018
	Minimum		85.2% in FY 2010	89.1% in FY 2014
	Average		85.6%	91.2%

Source: Ministry of Energy (Power Division)

Source: Economic Survey

Sources of Power:

(i) **Hydel Power** has an installed capacity of 8,239 MW and 22,539 GWh has been generated during 2018-19 (July-March). Share of Hydel Power Plants in total generation is 25%.

(ii) **Thermal Power:** Thermal power plants installed capacity is currently 22,740 MW and 54,195 GWh have been generated during 2018-19 (July-March). Share of Thermal Power Plants in the total power generation is 62%.

(iii) **Nuclear:** Installed Capacity of Nuclear Power Plants is 1,295 MW and 7,178 GWh have been generated during 2018-19 (July-March). Share of Nuclear Power in the total power generation is 8.2%.

(iv) **Renewable:** The installed capacity of Renewable Power Plants is 1,760 MW and 3,412 GWh have been generated during 2018-19 (July-March).

Consumption of Electricity:

Following is the consumption of electricity (GWh) during 2018-19 (July-March)

Household:	34,718 (48%)
Commercial:	5,680 (7.9%)
Industrial:	19,460 (27%)
Agriculture:	6,698 (9.3%)
Street Lights:	320 (0.44%)
Other Govt.:	5,346 (7.4%)
Total:	**72,222**

5. KALABAGH DAM

A controversial Project

Kalabagh Dam Project was identified as a potential dam site for water storage as well as power generation in 1953. Since then reports and studies have been carried out. The salient features of the Kalabagh Dam are as under.

(i) **Salient Features:**

Height	=	915 feet above sea level
(ii) **Water Storage Capacity**	=	6.1 MAF (Million Acre Fet).
(iii) **Generation Capacity**	=	2400 MW which can be maximized to 3600 MW
(iv) **Total length**	=	11000 feet
(v) **Catchment area**	=	110,500 Sq. meter.
(vi) **Cost**	=	**$ 5.5 billions**

Controversial Issue

The Kalabagh Dam is being hotly discussed in all circles. It has become the most controversial subject in the history of Pakistan. The three provincial assemblies namely, NWFP, Sindh and Baluchistan have passed resolutions against the construction of Kalabagh Dam.

Adverse impact of Kalabagh Dam. Those who oppose the construction of Kalabagh Dam put forward the following arguments.

(i) **Land submergence.** An area of 134500 acres (99500 unculturable, 32000 culturable 3500 irrigation land), will be submerged,

(ii) **Water logging.** Most of the areas of Mardan, Swabi and Pubbi districts would be water logged.

(iii) **Danger to Nowshera.** Due to construction of dam, the Nowshera city will be submerged

(iv) **Displacement of people.** The residents of affected areas in NWFP numbering about 534500 would be displaced.

(v) **Reduction in water supply to Sindh.** The construction of Kalabagh Dam will reduce water supply to Sindh.

(v) **Sea water intrusion.** The salty sea water intrusion through the Indus River will damage the wide area of Sindh Province.

Merits of the Dam

Those who favour the construction of Dam say that the merits of Kalabagh Dam far outweigh its demerits if any. The main arguments put forward by them in favour of Dam are as follows.

(1) **No area will be water logged or submerged.** The height of the Kalabagh Dam is 915 feet above sea level with a storage capacity of 6.1 MAW. The height of Mardan, Swabi and Pubbi is 960, 970 and 962 feet respectively above the sea level. As such there can be no question of water logging or submerging of any city of NWFP.

(2) **Affected area and persons.** The total area of 2900 acres of non irrigated land while 100 acres of irrigated land of NWFP will come under water, while 34500 persons would have to be shifted from the affected areas. The displaced persons will be duly compensated.

(3) **Objection of Sindh about ruination of land.** In case the Kalabagh Dam is constructed, it would only be able to store 6.1 MAW water. The rest 43 MAF would go into the sea. As such there will be no intrusion of salty water of sea through the Indus River.

(4) **No reduction in water supply to Sindh.** With the construction of Kalabagh Dam the inbuilt provision of water would increase from 103 MAF to 114 MAF. It would be distributed to among the provinces with a 37% share each of this allocation to both Punjab and Sindh while 14% and 12% to NWFP and Baluchistan respectively for agricultural sector promotion. There will thus be increased water supply to the four provinces.

(5) **Electricity generation.** The Kalabagh Dam would be able to generate 2400 MW hydel power which can be maximised to 3600 MW. The provision of cheap electricity will greatly help in the economic development of the country.

(6) **Storage capacity of existing dams decreasing.** The water storage capacity of the three storage dams Mangla, Tarbela and Chashma is decreasing fast due to sedimentary deposits. In order to meet the loss of the existing reservoirs, the construction of Kalabagh Dam is considered essential.

Conclusion: The construction of Kalabagh Dam is a technical subject. It falls in the domain of professional engineers. The various political parties which have fears about the ill effects of Dam should nominate their technocrats who should discuss the issue throughly and then give their opinions. If the technocrats agree and there is a consensus among the federating units, then the construction of Kalabagh Dam should not be delayed even by a single day.

6. DIAMER BASHA DAM PROJECT

Agriculture is the backbone of the economy of Pakistan. Since the commissioning of Tarbela Dam in 1776, no new water reservoir has been constructed in the country. As a result, the rivers water which is a precious input for agriculture is going waste into the sea. We are at present facing an existing water shortage by nine million acre feet (9 MHF) and it is likely to go up to 20 MAF by 2020. There is thus an urgent need to build dams for providing irrigation water to our farmers and cheaper electricity for the industries.

The Diamer Basha Dam Project is located on Indus River about 315 Km upstream of Tarbela Dam. It is 165 Km downstream of the Northern Area Capital Gilgit. The area under water reservoir would be 25,000 acreas and 30 villages with a population of 22,000 would be directly affected.

Main Features:

Basha Dam has a water storage capacity of 6.4 million acre feet (6.4 MAF). It has a total installed capacity of power of 4500 MW. The estimated cost of the Dam is 6.5 billion US dollar.

Benefits of the Dam:

(i) **Reduction in cost of electricity:** The construction of Basha Dam will increase the hydropower potential in the country and help **in reducing unit cost of electricity**. At present oil and coal based thermal generation cost Rs. 7 KWH; whereas the hydel generation unit cost is Re one only per KWH.

(ii) **Increasing more land under cultivation:** At present about 30% of land is not being cultivated due to shortage of water. If Basha Dam and other dams are constructed with the mutual agreement of provinces, the water reservoirs will not only provide water to our farmers in the four provinces but also help in generating 10,000 MW of power.

(iii) **Expansion of industrial sector:** Pakistan can partly meet (4500 KW) its energy needs for industrial expansion from the Basha Dam Project. With the availability of cheap

electricity, there will be increase in industrial production, increase in exports of value added goods, generation of employment and reduction in imports.

(iv) **Control over floods:** The water reservoirs built will help in controlling floods. There will be a check on land erosion near river banks.

(v) **Canals will become perennial:** The building of big water reservoirs, our canals will become perennial and will no longer be seasonal. The availability of water will help the farmers to increase the farm yield and make the country self reliant in food.

7. NATURAL RESOURCES AND ECONOMIC DEVELOPMENT

One theory of development is that for a country to develop, it must have a large natural resource base. The natural resources include land, its fertility and situation forests, minerals, climate, water resources, sea resources, power etc. The theory asserts that if a country is rich in natural resources, it will find growth in income more easily than a country which has infertile land and inadequate supplies of minerals, forest, etc.

The other theory is that although abundant supplies of natural resources do assist economic growth, but they are neither sufficient to ensure growth nor always necessary for it. It is difficult to find a correlation between the natural resources of a country and its stages of development.

For instance, former USSR, Argentina before 1990's, India, Pakistan etc., have large supplies of natural resources but their economic growth performance is not satisfactory. In the less developed countries, the natural resources are either unutilized, under utilized or misutilized.

On the other hand, Japan is deficient in natural resources. It imports most of the natural resources that it uses as inputs for industrial production. Brazil has huge amounts of natural resources, yet Brazil has a much lower per capita income than Japan. The fact is that natural resources by **themselves** are not particularly useful for economic development. They can be developed through improved technology and increase in knowledge. Switzerland, Singapore, Hong Kong, Taiwan, Korea, since the end of World War-II, have achieved rapid rates of economic growth based on human capital and entrepreneurial ability.

Human Capital Investment or human capital formation improves the quality of a population as measured by its skills, education, and health. It shifts the production function upward by improving the know how and basic skill of the labour force. Investment in human capital compared to investment in physical resources, thus is vital and more important in influencing a nations economic and social progress.

Technology Change. The recent researches also suggest that the physical resources should not be devoted entirely on the production of goods for immediate consumption. They should be saved and utilized for bringing technological change in the country. The technological change is brought about by discovering and implementation of new ways to produce goods and services. In all the advanced countries of the world, rapid economic progress has been made by inventions of new goods and services.

In short, we can say that the sources of economic growth in developing countries are not different from those that apply in the developed country. It is the investment in human capital and appropriate technology along with proper utilization of available natural resources which increase the ability of the economy to the grow at a rapid rate.

QUESTIONS

1. Discuss the importance of mineral resources in the economic development of the country. Examine the main mineral resources of Pakistan with reference to their importance in development?
2. What are the main mineral deposits of Pakistan? What is their importance in economic development?
3. Briefly describe the main agencies which are engaged in the survey, exploration and development of mineral resources in Pakistan.
4. Discuss the importance of power resources in the development of a country. Examine the main power resources of Pakistan?
5. Describe in brief the main sources of energy in relation to the needs, resources and production of various sectors of economy?
6. Give a brief account of the electric power resources of Pakistan.
7. Discuss in brief the role of WAPDA in the economic development of Pakistan?
8. Write a note on Kalabagh Dam project.
9. Discuss the role of natural resources to economic development of a country.

Short Answer Questions

Q.1. What is the consumption of electricity by sectors in Pakistan?

Ans. Electricity consumption by household sector is around 48%, industrial sector 27%, agriculture sector 9.3%, commercial sector 7.9%, and government sector 7.4% of the total electricity consumption in Pakistan in **2018-2019**.

Q.2. Name the three oil and gas companies operating in Pakistan.

Ans. (i) Oil and Gas Development Company Ltd. (OGDCL) (ii) Sui Northern Gas Pipelines Ltd. (SNGPL) and (iii) Sui Southern Gas Company Ltd. (SSGCL).

Q.3. What is the total installed electricity generation capacity from all the sources in Pakistan in 2018-19 (July-March).

Ans. **34,282** MW as in March 2019.

Q.4. What are the transmission and distribution power losses and theft of WAPDA in 2018.

Ans. **16.80%** during **2017-18**.