

1. Details of Module and its Structure

Module Details	
Subject Name	Economics
Course Name	Economics 01 (Class XI, Semester - 1)
Module Name/Title	Infrastructure: Part – 1
Module Id	keec_10801
Pre-requisites	Knowledge about Infrastructure and its importance in economic and social development.
Objectives	After going through this lesson, the learners will be able to understand the following: 1. Meaning and types of Infrastructure. 2. Importance of Infrastructure. 3. The state of Infrastructure in India. 4. Government Initiatives in Infrastructural development. 5. Economic Infrastructure : Energy and Power
Keywords	Infrastructure, Economic Infrastructure, Social Infrastructure, Conventional and Non-conventional sources of Energy, Power

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Table of Contents :

1. What is Infrastructure
2. Types of Infrastructure
3. Importance of Infrastructure
4. The State of Infrastructure and Government Initiatives
5. Economic Infrastructure : Sources of Energy (Conventional & Non Conventional)
6. Economic Infrastructure : Power (Electricity)

Introduction

Infrastructure plays an important role in the economic growth of a country. Agriculture, industry and the services sector, depends heavily on the infrastructural facilities for their growth. It is also crucial for the social development of a country. Since the economic reforms of 1991 in India, infrastructure development has been accorded high priority by the Government.

Some states in India are performing much better than others in certain areas. For instance:

- Punjab, Haryana and Himachal Pradesh in agriculture and horticulture.
- Maharashtra and Gujarat have a significant number of industrial plants located in their cities.
- Kerala has excellence in literacy, health care and sanitation and also attracts tourist in large numbers.
- Karnataka is an information technology hub to multinational companies as it provides the world – class communication facilities.

What do these indicate? These indicate that all the above states have better infrastructure in the areas where they have been excelling in comparison to the other States of India. Some have better irrigation facilities; others have better transportation facilities or are located near ports, which make the raw materials easily accessible to the various manufacturing industries. All these support structures, which facilitate the development of different sectors of the economy, comprise of the infrastructure.

What is Infrastructure?

Infrastructure refers to the basic physical and organizational structures which assist in the efficient working of the economy and society. In other words, it refers to all the services and facilities, which are helpful in providing better economic, social and environmental conditions to the citizens of a country.

Well-constructed and connected roads and railways reflect the Infrastructure



Source: NCERT Class XI- Indian Economic Development, Chapter 8: 'Infrastructure'

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Infrastructure provides supporting services in the main areas of industrial and agricultural production, domestic and foreign trade and commerce. These services include roads, railways, ports, airports, dams, power stations, oil and gas pipelines, telecommunication facilities, etc. It also includes education, health and sanitation, including clean drinking water. Monetary system including banks, insurance and other financial institutions also come under infrastructure. Some of these services have a direct impact on the production process, while others give indirect support, by strengthening the sectors of the economy.

Types of Infrastructure

The overall infrastructural facilities provided in a country include every aspect which is needed for the well-being of a nation. However, these services may be broadly divided under two kinds. All the services that are related with the production activities in a country, like – power, transportation, communication, banking, constitute the **Economic Infrastructure**. The facilities like – education, housing facility, sanitation, security, provide a better standard of living to the people of a country and they constitute the **Social Infrastructure**. Thus, we have two types of Infrastructure. Both, the economic and social infrastructure together help in the overall development of the economy. Table 1 shows the differentiation among the two types of Infrastructure – Economic and Social.

Table 1: Differentiating the Economic and Social Infrastructure

Economic Infrastructure	Social Infrastructure
1. It directly supports the economic system by	1. It indirectly supports the economic system by

helping in the process of production. Examples, energy, transport and communication.	strengthening factors of production, i.e., human beings (labour). Examples, health, Education and housing facilities.
2. It improves the quality of economic resources and thus raises their efficiency.	2. It improves the quality and efficiency of labor and helps in converting them into human resources.
3. Expenditure on this infrastructure raises the stock of physical capital. Examples, machinery, building, industrial plant, dams, etc.	3. Expenditure on this infrastructure raises the stock of human capital.
4. It promotes the process of economic growth of a country.	4. It promotes the process of human resource development in a country.

Importance of Infrastructure

- 1. Increases Productivity:** The prosperity of a country depends directly upon the development of agricultural and industrial production. Agricultural production requires power, credit, transport facilities, etc. and their deficiency leads to fall in productivity. Industrial production requires machineries and equipments, sources of energy, banking and insurance facilities, marketing facilities, transport services which include railways, roads and shipping and communication facilities, etc. All these services help in increasing the agricultural and industrial productivity.
- 2. Promotes Agricultural Development:** The development of modern agriculture depends on infrastructural facilities (roadways, railways and shipping) for speedy and large – scale transportation of seeds, pesticides, fertilizers, etc. There is also a need for insurance and banking facilities, so that agriculture can operate on a large – scale basis.

Infrastructural development leading to mechanization of farms



[https://commons.wikimedia.org/wiki/File:A tube well in village Chakrian.jpg](https://commons.wikimedia.org/wiki/File:A_tube_well_in_village_Chakrian.jpg)

3. **Provides Employment:** Infrastructure is the main source of employment generation for the large labor force of our economy. Many people get employment in infrastructural projects like construction and maintenance of roads, railways, power stations, hospitals, schools and colleges, etc. Many more people will also be able to find jobs after a strong and sound infrastructure is developed.
4. **Induces FDI:** A well developed infrastructure attracts foreign investors, who otherwise hesitate to invest in a country which lacks basic facilities.
5. **Raises the Standard of Living:** Well-developed infrastructure signifies a healthy and an educated society. Improvement in water supply and sanitation has a large impact, as it reduces morbidity from major waterborne diseases and also reduces the severity of diseases. Construction of schools and colleges in the urban as well as rural areas, with all the basic amenities like, library, proper toilets, computer and science labs, playgrounds, etc. help in educating the youth of the country, who further assists in research and development of the infrastructure and technology. Hence, infrastructure also facilitates in raising their standard of living.
6. **Facilitates Outsourcing:** Only a country having modern infrastructure can become a centre for outsourcing. India is emerging as a global destination for all kinds of outsourcing, owing largely to its sound base of social and economic infrastructure, like education and information technology.

7. Raises the Size of the Market: With the development of transport and communication facilities, the size of the market grows. The sale and purchase of various goods and services become possible even from distant places. With the availability of banking and credit facilities, the number of buyers and sellers in the market rises and the size of the market also grows.

The State of Infrastructure in India

Traditionally, the government had been solely responsible for developing the country's infrastructure. But it was realized that the government's investment in infrastructure was inadequate. Today, the private sector by itself and also in joint partnership with the public sector has started playing a very important role in the infrastructural development.

One of the main reasons of slow growth of infrastructure in India is low investment. India invests 34 percent of its GDP on infrastructure. As compared to this, China invests 46 percent and Indonesia invests 35 percent of its GDP on infrastructure. The investment has remained low due to breaking down of the Public Private Partnership (PPP) especially in power and telecom projects, issues related to land and forest clearances for projects like construction of expressways and national highways, etc. For the improvement in the economic growth and development of our country, there is a need to increase the investment with a worth around US\$ 4.5 trillion, till the year 2040 (Economic Survey, 2017-18).

A majority of people live in rural areas. Rural infrastructure includes six components (a) Rural housing (b) Irrigation potential, (c) Drinking water, (d) Rural roads, (e) Electrification, (f) Telecommunication. The state of rural infrastructure in India is not so encouraging. Rural women are still using bio-fuels such as crop residues, dung and fuel wood to meet their energy requirement. They walk long distances to fetch fuel, water and other basic needs. The census 2011 shows that in India only 67.2 percent households have an electricity connection and nearly 31.4 percent still use kerosene. There are still a significant number of rural households (around 70 percent) that use bio-mass for cooking. Drinking water supply is one of the components of Bharat Nirman. Tap water availability is limited to only 43.5 percent of households.

Economic Infrastructure

The various kinds of Infrastructure, like - transportation, power, irrigation, building and construction, telecommunication, electricity, etc., are identified as a part of Economic Infrastructure, as because, they

directly benefit in the process of production. Among these, we shall discuss Energy and Power in detail.

Energy

Energy is an important input for most of the production process and consumption activities. It plays a crucial role in the development of an economy. There exists a positive correlation between economic growth and demand for energy. It happens because growth is an index of increasing productive activity, which essentially requires a large amount of energy. In India, energy is used on a large-scale basis in agriculture and related areas, like production and transportation of fertilizers, pesticides and farm equipment from one place to another. Energy is also required in houses for cooking, household lighting and heating.

Classification of Energy Sources

The sources of energy may be broadly classified as - Conventional and Non-conventional sources of energy. Figure 1 explains the classification of the sources of energy.

Figure 1: Classification of Energy Sources



Conventional Sources of Energy -

The **Conventional sources of energy** are the traditional sources, which are generally non-renewable. The conventional sources are exhaustible resources. They produce greenhouse gases like carbon-

dioxide emissions and other harmful pollutants. The conventional sources can further be classified as, commercial and non-commercial sources of energy.

Commercial Energy refers to those sources of energy which command a price and they are bought and sold. For example, coal, petroleum, natural gas and electricity.

1. **Coal** provides a substantial part of the nation's energy needs. It is used for power generation, to supply energy to industry as well as domestic needs. India is highly dependent on coal for meeting its commercial energy requirements.
2. **Petroleum** is next major energy source in India after coal. It provides fuel for heat and lighting, lubricant for machinery and raw materials for a number of manufacturing industries.
3. **Natural Gas** is an important clean energy resource found in association with or without petroleum. It is used as a source of energy as well as industrial raw material in the petrochemical industry. Natural gas is considered as an environment-friendly fuel because of low carbon-dioxide emissions and is therefore, the fuel for the present century.
4. **Electricity** has a wide application in present times. The per capita consumption of electricity is considered to be an index of development.

Commercial sources of energy are generally exhaustible / non-renewable (except hydro-power). These are mostly used for commercial and industrial purposes, except electricity.

Non-commercial Energy consists of those sources of energy which are found free in nature and generally do not command a price, for example, firewood, agricultural waste and dried dung. These are mostly used in rural areas. They meet sizeable energy requirement in rural India. However, their use is being discouraged as use of firewood leads to depletion of forests, and cow-dung is most precious manure for agriculture. Non-commercial sources are generally renewable.

Non-conventional Sources of Energy -

The other classification of the source of energy is the **non - conventional source of energy**. These are the environment-friendly and renewable sources of energy. They include, tidal energy, solar energy and wind energy. They are inexhaustible in nature. These energy sources are more sustainable, equitably distributed and nature-friendly.

1. **Solar Energy:** A very important and natural source of energy is the Sun. The rays from sun could be tapped in the photovoltaic cells and then converted into energy. Another effective

way of extracting solar energy is through the solar thermal technology, which is relatively advantageous over the other non-renewable energy resources (thermal and nuclear energy).

Solar Power Plant



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2. **Wind Energy:** The trade winds, seasonal winds, local winds, land and sea breezes are used as a source of energy. The blowing of these winds produces kinetic energy which is further converted into the electrical energy with the use of turbines. The Ministry of Non-conventional Sources of Energy is motivating the production and consumption of wind energy in India, with an intention to lessen the burden of oil import bill.

Wind Energy is a Non-conventional source of energy



https://commons.wikimedia.org/wiki/File:A_Wind_Energy_farm_and_the_Cenotaphs,_the_ancient_and_the_modern,_Jaisalmer_Rajasthan_India.jpg

3. **Tidal Energy:** The tides from the ocean prove to be a store-house of energy. The main cause of this energy generation is the rotation of the earth. It is a form of hydropower. The kinetic energy from the moving water of rivers, tides and open ocean currents lead to energy generation. The potential energy from the difference in the heights of the high and low tides also generate power. As a part of technique for this process, the floodgate dams are built across the inlets and also power turbines for electricity production.

Tidal Power Plant



https://commons.wikimedia.org/wiki/File:Sihwa_Lake_Tidal_Power_Station_01.png

Consumption Pattern of Energy in India

Consumption pattern of energy shows the percentage use of different sources of energy (commercial and non-commercial).

Commercial energy consumption makes up about 74 per cent of the total energy consumed in India. This includes coal with the largest share of 57.3 per cent followed by oil at 0.2 per cent, natural gas at 7.2 per cent and hydro energy at 13.2 per cent. Non-commercial energy sources consisting of firewood, cow dung and agricultural wastes, account for over 26 per cent of the total energy consumption. India depends on imports for crude and petroleum products, which is likely to grow rapidly in the near future. This is negatively affecting the Balance of Payments of India.

Sectoral Pattern of Consumption of Commercial Energy

With the rapid rate of economic growth, there has been a corresponding increase in the use of energy. Table 2 depicts the consumption pattern of the various sectors of the Indian Economy over the past years. Industrial sector has the largest share of 44 per cent of total consumption of commercial energy. Share of transport sector in consumption of commercial energy decreased from 44 per cent in 1953-54 to only 2 per cent in 2014-15. There has been continuous fall in the share of the transport sector, while the share of the industrial sector has been increasing.

Table 2: Pattern of Consumption of Commercial Energy (in %) for different Sectors

Sector	1953 -54	1970 -71	1990-91	2014-15
Household	10	12	12	23
Agriculture	1	3	8	18
Industries	40	50	45	44
Transport	44	28	22	02
Others	5	07	13	13
Total	100	100	100	100

Source: *Planning Commission, Government of India, New Delhi, and Energy Statistics 2016, Central Statistical Office, Ministry of Statistics and Programme Implementation, Government of India.*

Consumption of commercial energy by the agricultural sector is very less (18 per cent). It shows the dependence of agricultural sector on the traditional methods of farming.

Power (Electricity)

Power or electricity is the most visible form of energy, which is often identified with progress in modern civilization. With the gradual development of various sectors of the economy, the demand for power is increasing year after year. The growth rate of demand for power is generally higher than the GDP growth rate. Some studies have indicated that in order to have an 8 per cent GDP growth per annum, power supply needs to grow around 12 per cent annually. A huge amount of investment is required for an effective power generation.

Sources of Power Generation

There are three main sources for electricity generation in India.

- 1. Thermal Power:** When power is generated out of coal, oil and natural gas, it is termed as thermal power. It is the major source of electricity and accounts for 64.8 per cent (as shown in Table 3) of total electricity generation.

Thermal Power Plants



[https://commons.wikimedia.org/wiki/File:Tuticorin Thermal Power Station at Night.jpg](https://commons.wikimedia.org/wiki/File:Tuticorin_Thermal_Power_Station_at_Night.jpg)

2. **Hydro Power:** When power is generated from the water of fast flowing rivers falling from high dams, then it is termed as hydro–electric power.

The working of a Hydro-electric Power Plant

It is the very cheap among all the three sources and it has no polluting agent. It is a renewable source of energy. India's Energy Policy encourages two energy sources: Hydro-power and Wind, as they do not rely on fossil fuel and avoid carbon emissions.

3. **Nuclear or Atomic Power:** When power is generated from the nuclear fission and fusion, it is termed as nuclear or atomic power. The energy that generates electricity is carried by the nucleus of an atom. When the structure of an atom is altered, a lot of energy is released in the form of heat, which is used to generate electricity. Uranium and Thorium are the two important minerals used in the production of Nuclear energy. Nuclear Power accounts for only 2 per cent of the total installed capacity of electricity (against the global average of 13 per cent).



[https://hi.m.wikipedia.org/wiki/%E0%A4%9A%E0%A4%BF%E0%A4%A4%E0%A5%8D%E0%A4%B0:The Kudankulam Nuclear Power Plant \(KKNPP\).jpg](https://hi.m.wikipedia.org/wiki/%E0%A4%9A%E0%A4%BF%E0%A4%A4%E0%A5%8D%E0%A4%B0:The_Kudankulam_Nuclear_Power_Plant_(KKNPP).jpg)

Table 3: Sources of Power Generation in India (2018)

Source of Power	Per cent
Thermal Power	64.8
Hydro Power	13.2
Nuclear Power	2.0
Others	20.1
Total	100

Source: *Power Sector at a Glance ALL INDIA, Policies and Publications, Ministry of Power, Government of India.*

Challenges in the Power Sector

Power development has been significant during the last four decades of planning. However, generation of power is still insufficient in comparison to its requirement. As a result, India is facing power crisis in the recent years. Some of the challenges, which India's power sector has been facing are given below:

- 1. Inadequate Electricity Generation:** India's installed capacity to generate electricity is not sufficient to feed an economic growth of 6-8 per cent. However, all-India installed power generation capacity has increased and reached to approx. 344 GW in 2018.
- 2. Under-utilization of Installed Capacity:** The electricity once generated, cannot be stored. Hence, it should be produced only in that quantity, which could be distributed as well. The difference between power production and distribution is the capacity loss. The average capacity utilization of the power projects is reflected by 'Plant Load Factor' (PLF). A higher PLF is always better as it would mean more output sold at a lower cost per unit and this also indicates that power generated is adequately distributed. PLF is affected by non-availability of fuels, maintenance shut-down, and other distribution losses. India had been witnessing a higher PLF (77.5 per cent) during 2009-10, but it had lowered to 60.67 per cent in 2017-18, thereby becoming a matter of concern for the nation.
- 3. Poor performance of State Electricity Boards (SEBs):** State Electricity Boards (SEBs) are the functional bodies that distribute electricity, but they have been inefficient in their operations. There are transmissions and distribution losses, wrong pricing of electricity and a large portion of these losses occur due to theft of power.

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4. **Shortage of inputs:** Thermal power plants, which lay the foundation of India's power sector, are facing shortage of raw material and coal supplies.
 5. **Limited role of Private and Foreign Investors:** Private entrepreneurs and foreign investors are yet to play their role in a major way in the process of power generation and distribution.

Measures taken to improve the Power Sector in India

Government of India has taken up certain policy measures to improvise the Power sector of the country. Some of the initiatives by the Government are -

1. In order to enhance power supply in rural areas, **DeenDayalUpadhyayaGramJyotiYojana** had been launched in December 2014 to extend financial assistance for capital expenditure by distribution companies (discoms) for strengthening the distribution infrastructure, including metering in rural areas.
2. A new scheme, **Saubhagya(Pradhan Mantri Sahaj Bijli Har Ghar Yojana)**, has been launched in September 2017 to ensure electrification of all remaining willing households in the country in the rural and urban areas.
3. **Ujjawal DISCOM Assurance Yojana (UDAY)** had been launched in November 2015 for ensuring reduction in interest burden, cost of power, and aggregated technical and commercial losses.
4. The **NationalLEDProgramme** was launched in January 2015 to promote the use of most efficient lighting technology at affordable rates. This programme includes two components:
 - i) **UnnatJyotibyAffordableLEDfor All (UJALA):** It aims to provide LED bulbs to domestic consumers with a target to replace 77 crore incandescent bulbs with energy efficient LED bulbs.
 - ii) **Street Lighting National Programme (SLNP):** It aims at replacing conventional street lights with smart and energy efficient LED street lights.
5. The Bureau of Energy Conservation has been taking up a number of programmes for energy conservation, including, standardization and labeling of appliances, buildings, passenger cars and heavy duty vehicles, etc.

To conclude, though India has made considerable progress in building infrastructure, yet the facilities are unevenly distributed. Many parts of rural India are yet to get good roads, telecommunication facilities, electricity, schools and hospitals. As India is progressing towards modernization, the increase

in demand for quality infrastructure will have to be addressed. Infrastructural facilities should be equally accessible to all.

Summary

- Infrastructure refers to the basic physical and organizational structures which assist in the efficient working of the economy and society.
- Infrastructure provides supporting services in the main areas of agricultural and industrial production, domestic and foreign trade and commerce.
- Infrastructure may be broadly divided into two types, economic and social.
- Economic infrastructure directly supports the economic system by helping in the process of production.
- Social infrastructure supports the economic system by strengthening the factors of production, i.e., human beings, who contribute to the process of production.
- Besides supporting agriculture and industry, development of infrastructure helps in employment generation in the country.
- In our country, both the public and private sectors play an important role in infrastructure development.
- Energy is one of the most important economic infrastructures, as it is an important input for most of the production process.
- Energy sources can be classified into conventional and non-conventional sources of energy.
- Power or electricity is the most visible form of energy, which is often identified with progress in modern civilization.

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