
UNIT 3 INFRASTRUCTURE

Structure

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- 3.2 Meaning and Need for Infrastructure Development and Management
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3.1 INTRODUCTION

Infrastructure is a key factor in driving a country's growth and development. Infrastructure development can also help in narrowing development gaps between developed and lagging regions. Infrastructure, especially transport and communication, is crucial for regional cooperation and integration. In the absence of efficient physical connectivity, any initiatives taken towards regional trade liberalization will remain ineffective. The role of infrastructure in fostering economic development and integration has been supported by empirical literature. A number of studies have highlighted the importance of physical infrastructure as a determinant of economic growth. There are many categories of infrastructure such as transportation infrastructure which includes road networks, ports, and airports; and communication infrastructure covers telecommunication networks. Information infrastructure and energy availability are two other such categories etc..

After studying this unit, you should be able to

- discuss the meaning and characteristics of infrastructure, and the factors affecting Infrastructural development
- discuss the rural and urban infrastructure strategies
- discuss the infrastructural development in different sub-sectors such as road, housing, sanitation, drinking water, and energy.

3.2 MEANING AND NEED FOR INFRASTRUCTURE DEVELOPMENT AND MANAGEMENT

3.2.1 Infrastructure- Meaning and History

Infrastructure can be defined as the basic physical and organizational structures needed for the operation of a society or enterprise, or the services and facilities necessary for an economy to function. The term typically refers to the technical

structures that support a society, such as roads, water supply, sewers, power grids, telecommunications, and so on. Viewed functionally, infrastructure facilitates the production of goods and services; for example, roads enable the transport of raw materials to a factory, and also for the distribution of finished products to markets. In some contexts, the term may also include basic social services such as schools and hospitals.

Infrastructure – What It Means?

Infrastructure is often confused with the following overlapping or related concepts- Land improvement and land development. The terms land improvement and land development are a general terms that in some contexts may include infrastructure, but in the context of a discussion of infrastructure would refer only to smaller scale systems or works that are not included in infrastructure because they are typically limited to a single parcel of land, and are owned and operated by the land owner. For example, an irrigation canal that serves a region or district would be included with infrastructure, but the private irrigation systems on individual land parcels would be considered land improvements, not infrastructure. Service connections to municipal service and public utility networks would also be considered land improvements, not infrastructure.

The word infrastructure has been used in English since at least 1927 and meant: *The installations that form the basis for any operation or system.* Other sources, such as the Oxford English Dictionary, trace the word's origins to earlier usage, originally applied in a military sense. The word was imported from French, where it means *sub grade*, the native material underneath a constructed pavement or railway. The word is a combination of the Latin prefix *infra* meaning *below*, and *structure*. The military sense of the word was probably first used in France, and imported into English around the time of the First World War. The military use of the term achieved currency in the United States after the formation of the North Atlantic Treaty Organization (NATO) in the 1940s, and was then adopted by urban planners in its modern civilian sense by 1970.

The term came to prominence in the United States in the 1980s following the publication of *America in Ruins* (Choate and Walter, 1981), which initiated a public policy discussion of the nation's 'infrastructure crisis', purported to be caused by decades of inadequate investment and poor maintenance of public works. That public policy discussion was hampered by lack of a precise definition for infrastructure. A U.S. National Research Council panel sought to clarify the situation by adopting the term 'public works infrastructure', referring to: "...both specific functional modes - highways, streets, roads, and bridges; mass transit; airports and airways; water supply and water resources; wastewater management; solid-waste treatment and disposal; electric power generation and transmission; telecommunications; and hazardous waste management - and the combined system these modal elements comprise. A comprehension of infrastructure spans not only these public works facilities, but also covers the operating procedures, management practices, and development policies that interact together with societal demand and the physical world to facilitate the transport of people and goods, provision of water for drinking and a variety of other uses, safe disposal of society's waste products, provision of energy where it is needed, and transmission of information within and between communities." In subsequent

years, the word has grown in popularity and been applied with increasing generality to suggest the internal framework discernible in any technology system or business organization.

3.2.2 Need for Infrastructure Development and Management

The importance of infrastructure for sustained economic development is well recognized. High transactions costs arising from inadequate and inefficient infrastructure can prevent the economy from realizing its full growth potential, regardless of the progress on other fronts. Physical infrastructure covering transportation, power, and communication, through its backward and forward linkages, facilitates growth; social infrastructure including water supply, sanitation, sewage disposal, education and health, which are in the nature of primary services, has a direct impact on the quality of life. The visible signs of shortfalls in capacity and inefficiencies include increasingly congested roads, power failures, long waiting lists for installation of telephones, and shortages of drinking water illustrate the widening gap between demand and supply of infrastructure, and raise questions concerning the sustainability of economic growth in future.

The efficacy of private sector participation in infrastructure development would be contingent upon the capability to commercialize these projects whereby recovery of investments would be through a system of user charges. There is a potential for public private partnerships (PPPs) to contribute more and to help bridge the infrastructure gap in India. There has been considerable progress in the last ten years in attracting private investment into the infrastructure sectors; first in telecommunications, then in ports and roads, and in individual projects in other sectors. With the current GDP growth of 8 per cent, in which there is contribution of nearly 51 per cent from services, and 16 per cent from manufacturing sector, there is a need for proper alignment of resources. To sustain this growth, India needs to develop sound infrastructure so that the right input of a) skilled, qualified, and socially contented labour; b) visible and reliable supply chains; c) prompt and accurate information for decision making; and d) efficient process and updated technology can be given to the operations of manufacturing and services.

The need to provide world class infrastructure that keeps pace with 8 per cent economic growth is clear. City roads are choked with traffic, power cuts are a fact of life and passengers are routinely delayed as booming air travel tests airport capacity. The demand for infrastructural services has increased rapidly after industrial liberalization of the Indian economy. Unfortunately, infrastructural bottlenecks remain the biggest stumbling block of industrial progress in the country. By their very nature, infrastructure projects involve huge initial investments, long gestation periods and high risk. The resulting bottlenecks are beginning to pose serious impediments to enhancing productivity. Urban infrastructure includes water supply and sanitation which are important basic needs for improvement in the quality of life and enhancement of the productive efficiency of citizens. There has been a steady increase in the urban population on account of rapid industrialization, natural growth, and migration from rural areas. This has prompted the working out of alternative ways of meeting the increasing demand for transport given the constraints of land and capital, and the need to control energy consumption, pollution, and accidents. An input – output model of infrastructure is given below.

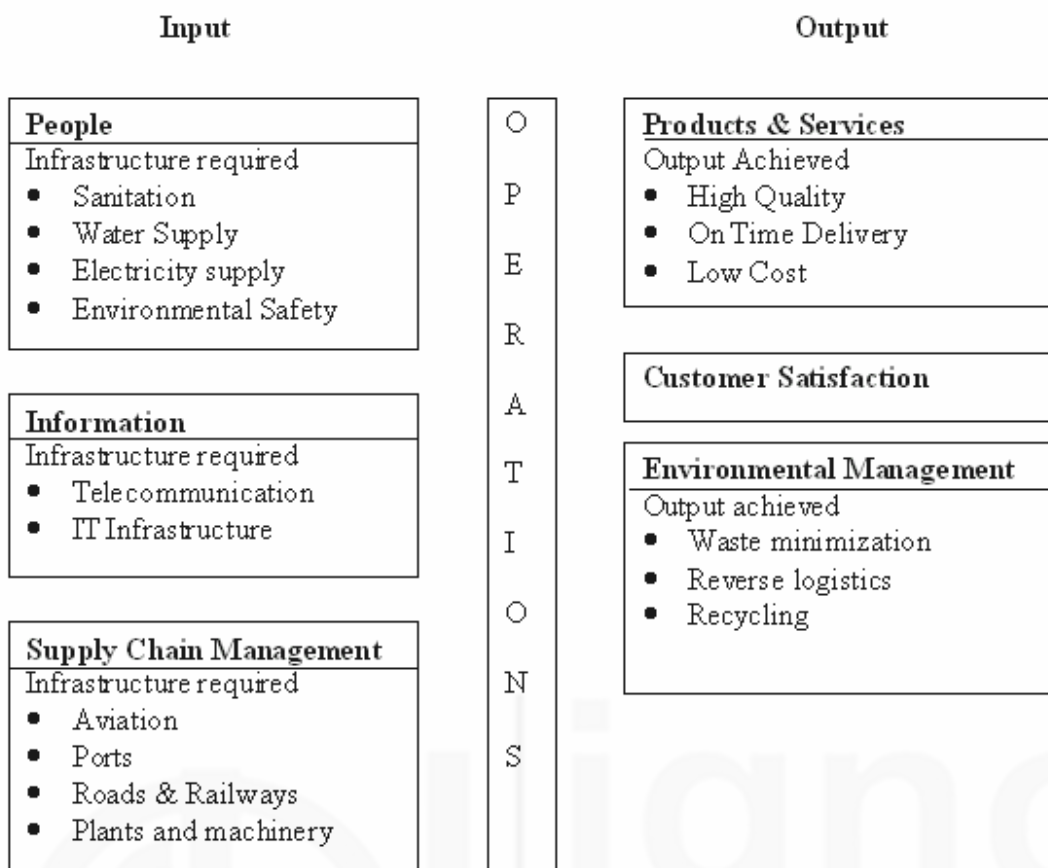


Fig. 3.1: Influence of various infrastructural factors on the operations of an organization, or a project.

Infrastructural development in a country helps to run the operations of any company efficiently and effectively. Since cost is a reality and price is a possibility, and, due to high competition, price is decided by the market forces, the cost control is imperative and within the scope of a company. Lowering costs can be achieved through better managed operations, backed by sophisticated infrastructure. Nowadays, the nature of operations management in India is changing. Customer demands for better services, growing dominance of technology, the view of the individual enterprise as just one component of the total value system, the increase in interconnectedness and globalization of business and economics, and the widening range of stakeholders to be satisfied are all factors contributing to the substantial operational challenges.

There are many issues that the infrastructure or construction industry must take care of. One is correlating the project cost estimates with actual costs incurred. From our experience we have seen that the average cost of a project goes up by 30 per cent compared to the budgeted cost. If the project size is huge, an increase of 30 per cent means an additional burden of several crores of rupees to complete it. Monitoring and controlling costs of projects is a key concern due to their geographical spread as well as temporary or mobile offices. Centralized purchasing becomes difficult in such situation, resulting in the loss of volume discounts and a higher landing cost of materials. Subsequently, it becomes difficult to check the inventory and account for materials used.

Ideally, inventory levels need to be checked so that the budgeted project cost is constantly and automatically updated. In this way, at any phase of the project, an estimate of the cost, per cost site, can be drawn up and compared to the current cost. The time for project execution is shrinking. Infrastructural projects have high upfront costs and long payback periods; there are real cost savings to be gained by executing projects rapidly - even a small overrun can mean the loss of crores of rupees. These gigantic projects require micro-monitoring of small individual projects across multiple locations, and this is done with the help of operations management. The availability of adequate, efficient, and affordable infrastructural facilities both economic and social constitutes the core of development strategy and efforts. In the absence of infrastructure services, enterprises are forced to seek higher cost alternatives which impact profits and production levels adversely. In India, the demand for infrastructural services has increased rapidly since the industrial liberalization of the economy. Unfortunately, infrastructural bottlenecks remain the biggest stumbling block of industrial progress in the country. By their very nature, infrastructure projects involve huge initial investments, long gestation periods, and high risk.

Check Your Progress 1

Note: a) Write your answer in about 50 words.

b) Check your answer with possible answers given at the end of the unit.

- 1) Talk with several of your colleagues and ask them to define what they mean by infrastructure and the genesis of infrastructure. Compare those definitions with the ones given in this unit.

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- 2) What are the main problems and issues in infrastructure development in India? Discuss this topic with several of your colleagues and note your findings, here.

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**3.3 EXIGENCIES OF INFRASTRUCTURE
DEVELOPMENT AND MANAGEMENT**

The style of urban infrastructure provision that encourages more efficient patterns of resource consumption is the basis for the development of sustainable cities.

The conventional approach to urban infrastructure management was based on the premise of facilitating infrastructure supply. The increased awareness of environmental issues and sustainability, coupled with a need to make our cities worth living, demand interventions in the provisions and management of urban infrastructure that are being advocated. Demand side interventions broadly has two aspects –managing the existing demand, and channelling or monitoring the ever increasing demand. The increase in existing demand is correlated with the consumption pattern. The notion of modern consumerism has been deeply embedded in the present socio-cultural set up. In today's society, consumption can be seen as a set of social and cultural practices that serve as a way of establishing differences. This changing attitudinal behaviour mounts pressure on the existing infrastructural system and subsequently calls for sustainable management.

Hence, the management of existing demand requires network operators to understand the consumers and to develop more intimate relationships with them in order to modify the demand on the stressed parts of their network. On the other hand, channelling or monitoring of ever increasing demand covers the issues of regional planning, i.e., micro, as well as macro, planning, covering the intricacies of rural-urban interactions. The present section, however, encapsulates the demand side intervention in the planning process (both, micro and macro), with a critical analysis of the existing Indian planning approach to the urban infrastructure system, and, finally, suggests an alternate planning philosophy to the ongoing chaos.

3.4 THE CHARACTERISTICS OF INFRASTRUCTURE DEVELOPMENT AND MANAGEMENT

Broadly, following are the characteristics of infrastructure development and management.

3.4.1 Natural Monopoly Character of Infrastructure

The most general economic characteristic of modern infrastructure is the supply of services through a networked delivery system designed to serve a multitude of users. This is especially true for piped water, electric power, telecommunications, sewerage, and rail services. Many infrastructure facilities are characterised by declining costs, leading to what is known as a natural monopoly situation. It is important to remember that natural monopoly arises out of technological factors and not due to policy.

It may also be pointed out that the services of infrastructure will be non-tradable. To give an example: should there be insufficient demand for electricity in place A, its supply may be diverted to place B; however, one will not be able to do that for the transmission system that brings electricity to place A. Hence the transmission system is non-tradable even though electric power itself may be tradable.

3.4.2 Public Goods Character of Infrastructure

The demand for infrastructure services arises from both industry and individuals. However, since it is not possible to create infrastructure facilities in an incremental fashion – investments are lumpy – such facilities have to be built complete for a particular size. Hence, in the initial stage supply will be greater than the demand for such facilities while the reverse may occur over a period of time. This characteristic of infrastructure services, generally, that supply is greater than demand, indicates that consumption of its services is non-rival. Such non-rivalness is a characteristic of public goods. The characteristic of non-rivalness implies zero marginal cost of providing benefits of a public good (infrastructure in this case) to an additional consumer. In this sense infrastructure creates external benefits or positive externalities. However, infrastructure services have one characteristic that is absent in the case of pure public goods namely, price exclusion, whereby the enjoyment of benefits is contingent on payment of charges.

3.4.3 Representation of Infrastructure in National Accounts

From the national accounts point of view, infrastructure would form part of the capital stock of the nation. However, in the year it is created the infrastructure facility would be part of production for that accounting period. Where the production spills over numerous periods, it may be necessary to recognise that output is being produced continuously and record it as a work-in-progress. This would be in keeping with the recommendations of SNA 1993 (United Nations: *System of National Accounts 1993*, p. 127).

Once the infrastructure is completed, its contribution is in terms of the services it provides by its usage. Thus, the output of transportation would be measured by the value of the amount receivable for transporting goods and persons. The volume of transport services would be measured by indicators such as tonne-kilometres or passenger-kilometres (United Nations: *System of National Accounts 1993*, p.136).

However, in the case of roads, the situation is different. For a long time the facility was provided by the Government, though now, there is private provision as well. However, services on roads are provided by different entities, both public and private.

3.4.4 Distinction between Physical and Social Infrastructure

Even though social infrastructure is not considered here, it will be appropriate to extend the notion of infrastructure proposed here to the social sector as well. Thus, a hospital or a school would constitute the infrastructure facility, which will provide services in the form of health care and education over a period of time. However, one will have to be careful not to attribute all the characteristics of infrastructure listed above to the social sector. For instance, it cannot be argued that a hospital facility is a natural monopoly even though a substantial amount of sunk costs may be involved. Further, as far as bestowing externalities is concerned, this is more likely to be true for basic health care, possibly preventive health care, while externalities may diminish in the case of higher end health care, and possibly curative health care.

3.5 HOW TO MEASURE INFRASTRUCTURE DEVELOPMENT

What counts as a development result? Simply counting project outputs is no longer adequate. The focus, for example, is less on counting the kilometres of road built than on measuring the impact of crucial infrastructure on the lives of people down the road. Did access to health care improve? Did the cost of growing vegetables go down? Did more goods get to market, and did the villagers' incomes increase?

Some of the ways to measure the infrastructure development are discussed below as done on World Bank guidelines.

i) Implementation Completion Reports (ICR)

When a project is completed and closed at the end of the loan disbursement period (a process that can take anywhere from 1-10 years) the World Bank or funding agencies, and the borrower government or developer, document the results achieved; the problems encountered; the lessons learned; and the knowledge gained from carrying out the project. The report, prepared by World Bank operational staff, is submitted to the Bank's Board of Executive Directors for information purposes. The knowledge gained from this results measurement process is intended to benefit similar projects in the future.

ii) Independent Evaluation Group (IEG)

An independent unit within the World Bank or Funding agencies strives to provide an objective basis for assessing the results of the Bank's work. The IEG assesses the performance of roughly one project out of four (about 70 projects a year). These project performance reports measure outcomes against the original objectives, sustainability of results and institutional development impact. From time to time, the IEG also produces impact evaluation reports to assess the economic worth of projects and the long term effects on people and the environment.

iii) Quality Assurance Group (QAG)

The Quality Assurance Group evaluates the operations work of the World Bank staff or funding agencies in developing countries, providing timely feedback that can help rectify project design and improve project supervision. The QAG publishes an Annual Report on portfolio performance which gives the Bank's Board of Directors and Senior Management a strategic overview of the size, composition and quality of the Bank's lending portfolio and analytical research program.

iv) Results Measurement System (RMS)

The International Development Association (the World Bank's fund for the world's poorest countries) tracks aggregated results. Its Results Measurement System (RMS) is designed to strengthen the focus of the IDA's activities on development outcomes and keep donors aware of the IDA's effectiveness. The system measures results on two levels.

- a) Aggregate country outcomes including
 - Growth and poverty reduction
 - Governance and investment climate
 - Infrastructure for development
 - Human development.
- b) The IDA's contribution to country outcomes, or agency effectiveness.

v.) GIS Mapping

Due to the demanding need for infrastructure development, as well as to keep the existing infrastructure maintained in a proper condition, the multi sensor mobile mapping has become a critical need of many developing, as well as developed countries. It is well established that switching from static to dynamic mapping has increased the pace of infrastructure development manifold. Presently, there are a number of systems being deployed worldwide without any common standard for accuracy and performance. Automation, high accuracy, and budgets are the salient elements which will satisfy the demands of various segments of the infrastructure markets.

3.6 SOME IMPORTANT SUB - SECTORS OF INFRASTRUCTURE DEVELOPMENT - AN INDIAN PERSPECTIVE

Some of the important sub-sectors of infrastructure are discussed briefly for your understanding

3.6.1 Roads

The road sector can broadly be divided into the following

- i) national highways
- ii) state highways
- iii) major district roads
- iv) other district roads
- v) rural roads
- vi) general staff roads.

Currently, at 3.3 million km, India's road network is the second largest in the world. Road density in terms of population is only 2.75 km per 1,000 people compared to the world average of 6.7. The road density in terms of land at 770 km per 1,000 square km is also short of the world average of 841. Indian roads carry around 85 per cent of passenger traffic and 65 per cent of freight traffic.

The network comprises 68,354 km of national highways and 599,622 km of state roads, and rural and other roads. National highways constitute only two per cent of the total road length, but carry nearly 40 per cent of the traffic. State highways constitute about 13 per cent of the road length and carry 40 per cent of the traffic. The road network is grossly inadequate in capacity. Only 14 per cent of national highways and one per cent of state highways are four-lane. Further,

only about 59 per cent of national highways and 22 per cent of state highways are double-lane. Due to poor surfacing, average vehicular speeds are around 50 km per hour.

Inadequacy of funds is a prime reason for the demand-supply gap. Experts estimate that the shortfall in terms of funding for developing and preserving assets has consistently remained at over 40 per cent. For state roads, the estimates state that only half of what is required annually is available. In addition, several roads that were designated national highways during the Ninth and Tenth Plans continue to be substandard. Rapid traffic growth and overloading of vehicles adds to the problem.

Some other factors pose challenges for the sector. These involve land acquisition, encroachment on highways, environmental and forest clearances, shifting of utilities, railway approvals for rail over bridges, local law and order problems, poor performance by some contractors, etc. The 11th Five Year Plan assigns high priority to the expeditious completion of works approved under different phases of the NHDP. For the roads and bridges sector, the 11th Five Year Plan envisages a total investment of Rs 3,14,152 crore (approximately \$ 78.5 billion at an exchange rate of Rs 40/\$) over the five-year period starting 2007-08. Of this, the shares of the centre, the states, and the private sector are expected to be 34.2, 31.8 and 34 per cent, respectively.

3.6.2 Housing

The policies of urban development and housing in India have come a long way since the 1950s. The pressure of urban population and lack of housing and basic services were very much evident in the early 1950s. In some cities this was compounded by migration of people from Pakistan. However, the general perception of the policy makers was that India is predominantly an agricultural and rural economy and that there are potent dangers of over urbanization which will lead to the drain of resources from the countryside to feed the cities. The positive aspects of cities as engines of economic growth in the context of national economic policies were not much appreciated and, therefore, the problems of urban areas were treated more as welfare problems and sectors of residual investment rather than as issues of national economic importance.

The Government through a National Agenda declared *Housing For All* as a priority area and has set a target of construction of 2 million houses every year with emphasis on the poor and deprived, out of which 0.7 million houses are to be constructed in urban areas.

3.6.3 Sanitation

India is witnessing a high rate of population growth, and increasing urbanization. More than 28 per cent of India's population resides in urban areas; more than 80 million urban citizens are below the poverty line, with little or no access to basic infrastructure services such as water supply and sanitation (WSS). The cost of inefficient and unreliable WSS services is borne disproportionately by the urban poor, who spend around US\$15–20 billion annually on the treatment of waterborne diseases. Public private partnerships in delivering WSS services can assist in remedying this situation to a certain extent. However, given the challenges of affordability and lack of baseline information, structuring PPP in the WSS

sector has been relatively more difficult than in other sectors. There are only a handful of PPP projects in the WSS sector in India as compared to power generation, roads and ports.

3.6.4 Drinking Water

Water is a prime natural resource, a basic human need and a precious national asset. Planning, development and management of water resources needs to be governed by national perspectives. As per the latest assessment (1993), out of the total precipitation, including snowfall, of around 4000 billion cubic metre in the country, the availability from surface water and replenishable ground water is put at 1869 billion cubic meters. Because of topographical and other constraints, about 60 per cent of this, i.e., 690 billion cubic meters from surface water, and 432 billion cubic meters from ground water can be put to beneficial use. Availability of water is highly uneven in both space and time. Precipitation is confined to only about three or four months in a year and varies from 100 mm in the western parts of Rajasthan to over 10000 mm at Cherrapunji in Meghalaya. Rivers and underground aquifers often cut across state boundaries. Water, as a resource is one and indivisible: rainfall, river waters, surface ponds and lakes, and ground water are all part of one system.

- Drinking water (from tap to the mouth) supply, including the system of pipes, pumps, valves, filtration and treatment equipment and meters, including buildings and structures to house the equipment, used for the collection, treatment and distribution of drinking water
- Sewage collection and disposal
- Drainage systems (storm sewers, ditches, etc.)
- Major irrigation systems (reservoirs, irrigation canals)
- Major flood control systems (dikes, levees, major pumping stations, and floodgates).

3.6.5 Energy

Electricity- During the Eleventh Plan, the government aims to add power generation capacity of about 70,000 MW and provide electricity to all un-electrified hamlets and all rural households through the Rajiv Gandhi Grameen Vidyutikaran Yojna (RGGVY).

- Electrical power network, including generation plants, electric grid, substations, and local distribution
- Natural gas pipelines, storage and distribution terminals, as well as the local distribution network
- Petroleum pipelines, including associated storage and distribution terminals
- Steam, or, hot water production and distribution networks for district heating systems.

Check Your Progress 2

Note: a) Write your answer in about 50 words.

b) Check your answer with possible answers given at the end of the unit.

1) Write the appropriate measurement method of infrastructure development.

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2) Based on your understanding and experience find out the major sectors of infrastructure development.

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3.7 PERSPECTIVE OF RURAL AND URBAN INFRASTRUCTURE DEVELOPMENT IN INDIA

The infrastructure development strategy in Indian context can be broadly categorised into rural and urban infrastructure development.

3.7.1 Rural

India’s economic growth and development is predicated to a large extent upon the development of its 700-million strong rural population. A majority of the population lives in about 600,000 small villages and are engaged primarily in agriculture, directly or indirectly. A substantial portion of India’s current agricultural labour force has to move to non-agriculture sectors for incomes in all sectors to go up. The challenge is to manage the transition of 80 per cent of the rural population from a village-centric agricultural-based economy to an industry based economy. Infrastructure development in rural India needs to be put on a fast track in order to tap the rural retail opportunity currently estimated at \$34 billion, which, according to a Confederation of Indian Industry (CII) and Yes Bank study, is expected to touch the \$58 billion mark by 2015. The study focuses only on FMCG, durables, agricultural inputs (including tractors) and two and four wheelers.

Grey Areas of India’s Rural Infrastructure

- A set of basic facts define the constraints within which the economic growth and development of India’s rural population must be addressed.

Fundamentally, they relate to resource constraints, the nature of infrastructure, and the future trajectory of the geographical distribution of the population.

- These services include, at a minimum: market access, educational, health, financial, entertainment, transportation, and communications. Further, services depend on the availability of infrastructure.
- Infrastructure investment is irregular and inadequate to support 600,000 villages, and the average cost of providing infrastructure is inversely related to the scale of the operation.
- Limitations on the financial and other resources available for providing infrastructure made it impossible to provide infrastructure at every village in India. Even if they were provided at every village, it will not be commercially sustainable.

3.7.2 Urban

Global and Indian experience indicates that the urban sector has increasingly become an important driver of economic growth.. The urban population of India has rapidly increased in recent years. In 1961 about 79 million persons lived in urban areas of the country, by 2001, their number had gone up to over 285 million, an increase of over 350 per cent in the last four decades, which will increase to over 400 million by the year 2011 and 533 million by the year 2021.

In 1991 there were 23 metropolitan cities, which have increased to 35 in 2001. As a result, most urban settlements are characterized by shortfalls in housing and water supply, inadequate sewerage, traffic congestion, pollution, poverty and social unrest making urban governance a difficult task.

Urban infrastructure consists of drinking water, sanitation, sewage systems, electricity and gas distribution, urban transport, primary health services, and environmental regulation. Many of these services are in the nature of 'local' public goods with the benefits from improved urban infrastructure in a given city limited to the citizens living in that city.

Widespread urbanization is a twentieth century phenomenon. Rome was probably the first settlement to reach one million populations in 5 BC while London became the second such city in 1800. In 1900, the total urban population of the world was not more than 250 million, less than 15 per cent of the total population. The Indian urban population today is itself greater than this number. In 2000, the world's urban population had increased to almost 2.9 billion, about 47 per cent of the total population. Today Asian countries have emerged as most populous countries. According to a United Nations Study (1995), by the year 2015, ten of the world's fifteen largest cities will be in Asia, three of these will be in India.

The structural reforms and the associated development strategies launched in 1991 are expected to accelerate rural urban migration and boost the pace of urbanization. The demographic and economic growth in India is likely to be concentrated in and around 50 to 60 large cities with population of about a million or more. There is migration from villages to town and cities which results in the growth of metropolitan cities since they provide multiple avenues, services and amenities, e.g., education, health care, employment, business, and entertainment options. People also migrate for economic opportunities and urban lifestyles. Though urbanization brings about development in the social, economic and

cultural spheres of life, sometimes it disturbs the ecological system. Rapid and unplanned growth of urban agglomeration generates a series of negative environmental and social effects. Today, urban India presents a pathetic scene. Cities have become sites of rotting garbage, degrading drainage systems, and a shocking night soil removal system. Besides, the poor have practically no access to covered toilets, and in many towns and cities, the majority have to defecate in the open. The untreated sewage being dumped into the nearest water body leads to health hazards. India is one of the least urbanized countries in the world because between 1951 and 2001, the level of urbanization increased by just 13 percentage points. However, it has the second largest urban population in the world and more than two third of it lives in the 393 cities that have population of over 0.1 million. The four mega cities, viz., Mumbai, Kolkata, Delhi, and Chennai, with a population of more than 6 million each in 2001, account for almost one fourth of the total urban population living in cities. As per the 2001 census, 285 million people, i.e., 27.8 per cent of the 1027 million total population of India resides in 4368 cities and towns in the country, whereas in 1991, 25.7 per cent of the population lived in urban areas. The decadal growth in urban population during 1991-2001 has been 31.2 per cent, whereas at the beginning of the 20th century, only 10.8 per cent of the total 218 million population of the country resided in cities and towns. The number of million plus cities has increased to 35 in 2001 from 12 in 1981 and 23 in 1991. These 35 million plus cities account for 107.9 million urban population of the country. As per the projections of Government of India, the urban population of the country in 2011 will be 405.26 million and 553.04 million in 2021. Thus, around one third population is expected to live in urban areas.

Check Your Progress 3

Note: a) Write your answer in about 50 words.

b) Check your answer with possible answers given at the end of the unit.

- 1) Discuss the positive and negative aspects of rapid infrastructure development with your colleagues and differentiate the social role of infrastructure development.

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3.8 LET US SUM UP

Dear learner, in this unit we started by looking into the meaning and need for infrastructure development and understood that infrastructure is a key factor in driving a country’s growth and development by narrowing development gaps between developed and lagging regions. Later we discussed exigency and characteristics of infrastructure development. We also discussed different measures of infrastructure development viz implementation completion reports, independent evaluation, quality assurance, results measurement system and GIS

mapping. Later we discussed some important sub- sectors of infrastructure for development viz., roads, housing, sanitation, drinking water and energy. At the end we discussed the infrastructure development strategy with Indian perspective.

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3.10 CHECK YOUR PROGRESS - POSSIBLE ANSWERS

- 1) Infrastructure can be defined as the basic physical and organizational structures needed for the operation of a society or enterprise, or the services and facilities necessary for an economy to function. The term typically refers to the technical structures that support a society, such as roads, water supply, sewers, power grids, telecommunications, and so on.
- 2) The basic objectives of infrastructure development in the context of both the rural and urban sectors are following. As society changes, accordingly the demand for infrastructure arise. The early stages of human civilization were characterized as nomadic, where human beings were completely self sufficient and were not worried about any material possession as nature was the sole supplier. The need of infrastructure was felt when people started to move into the agricultural and urban stages, and today, the contemporary city is a vast and complex network of urban infrastructure.
- 3) There is no disagreement about the importance of infrastructure for sustained economic development is well recognized. Inadequate and inefficient infrastructure can prevent the economy from realizing its full growth potential, regardless of the progress on other fronts. Physical infrastructure covering transportation, power, and communication, through its backward and forward linkages, facilitates growth; social infrastructure including water supply, sanitation, sewage disposal, education and health, which are in the nature of primary services, has a direct impact on the quality of life. The widening gap between demand and supply of infrastructure, and raise questions concerning the sustainability of economic growth in future.

Check Your Progress 2

- 1) There is no one method to measure infrastructure development. Broadly it the process of measurement follows- Implementation Completion Reports (ICR), Independent Evaluation Group (IEG), Quality Assurance Group (QAG), Results Measurement System (RMS). The International Development Association (the World Bank's fund for the world's poorest countries) tracks aggregated results. Its Results Measurement System (RMS) is designed to strengthen the focus of the IDA's activities on development outcomes and keep donors aware of the IDA's effectiveness. The system measures results on two levels.
- 2) The major sectors of infrastructure development are : roads and highways networks; housing; sanitation; drinking water and energy

Check Your Progress 3

- 1) Aspects of infrastructure include: transport systems; communication systems; power/energy systems and; basic public service facilities.