CHAPTER-1
INTRODUCTION
CHAPTER-I
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Part-I

1.1 Some Aspects of Economics of Infrastructure

1.1.1 Concept of Infrastructure

Infrastructure is an umbrella term for a number of activities or services such as power, road, dams, transport, health, education etc. A number of interchangeable terms such as 'Social Overhead Capital', 'Economic Overhead Capital', 'Overhead Capital', 'Basic Economic Facilities', etc. have been used to denote services which identifies with infrastructure. Even though these terms are taken to connote certain common services, each of them has its own special orientation and emphasis. As Youngson observes, the title 'Overhead Capital' is vague and misleading and conceals difficulties rather than solves problems.¹ Singer has included education system, health services, housing, transport, power and irrigation among overhead capital.² Nurkse identifies these activities as public utilities, transport facilities, training schemes, water works, power plants, hospitals, schools and various basic services.³ North has identified banking, insurance, postal facilities, warehousing, the development of a distribution system for imports and the early growth of roads and turnpikes connecting the hinterland with major ports as social overhead investments which facilitated the development of manufacturing in U.S.A.⁴ Rostow has

identified it with transport built up, literate and technically trained personnel, power resources and adequate flow of working capital.5

According to Hirschman, transportation and power constitute the hard core of infrastructure. But in the broader sense, the term covers law and order, education, public health and transport, communication, power, water supply as well as such agricultural overhead capital as irrigation and drainage system.6 Kindleberger made a distinction between economic and social overhead capital and thereby identified transport including ports, roads, rail roads, electricity and gas production capacity, pipe-lines, transmission lines, communication network and buildings needed for government, fire and police protection facilities to maintain roads etc. as economic overhead capital and plant and equipment required for shelter, education and public health as social overheads capital.7 Shah has made a long list of items of infrastructure under eight heads, viz., power, irrigation, transport, communication, education, research and development, health and other facilities.8 V.K.R.V. Rao also made a long list of items of infrastructure under nine heads, viz., transport, communication, energy, intermediate goods output, increasing productivity of natural resources, science and technology, information system, finance and banking and human resource development.9

In recent years the term infrastructure is often qualified by a prefix such as ‘economic’ or ‘social’ to distinguish different types of infrastructure. Economic infrastructure, according to World Development Report (1994), includes services for (I) Public utilities such as power, telecommunication, piped water supply, sanitation and sewerage etc. (II)

Public works like roads and major dams, canal works for irrigation etc. and (III) Other transport sector like urban and interurban railway, urban transport, ports, airports etc. Social infrastructure includes educational institutions, health service facilities etc.\textsuperscript{10} The term "overhead capital" was probably used for the first time by H.W. Singer. He identified it with certain kinds of investments which are necessary for development but by themselves are not directly productive. To quote singer: "Any economic system requires a certain number of installations or capital formation which is not itself directly productive, which is in the nature of an overhead cost. There are certain overhead installations which must be present to enable production to take place, but which do not themselves directly result in the production of useable goods."\textsuperscript{11} As examples of such installations, singer mentioned a good educational system, health services, housing, transport, power and irrigation. Thus, basic characteristics of infrastructural facilities, according to Singer, are: First, they are not directly productive. Second, they are in the nature of overhead installations or costs which are necessary for continuation of directly productive activities.

Nurkse used the term 'social overhead capital' which, according to him, "form an essential basis for small scale private investments in miscellaneous industries". The chief characteristics of such overhead capital, in his view, was lumpiness.\textsuperscript{12} He accepts that overhead capital provides an essential basis to other productive activities. Notable among other economists who have contributed in this area are Rostow and Hirschman. In Rostow's scheme of stages of economic growth, the economy has to fulfill certain conditions before it becomes ready for take off. One of the preconditions for take off is the building up of social overhead capital. To quote him: "Technically this pre-conditioning embraces a build up of transport sufficient to begin to make the markets of the economy interact quickly and efficiently and to make domestic raw material available at tolerable economic cost, an

\textsuperscript{11} Singer, H.W., 1951, op. cit., p. 7.
\textsuperscript{12} Nurkes, R., 1955, op. cit., p. 10.
Hirschman has used the concept of social overhead capital in a more general sense. He defined it as: “Comprising those basic services without which primary, secondary and tertiary activities can not function.” In this wider sense, the term includes all public services from health to transport, communication, power and water supply as well as such agricultural overhead capital as irrigation and drainage system. He has, however, also given narrow and more restricted concept of infrastructure or what he calls the hard core of overhead capital which includes transportation and power. Though the term social overhead capital was used earlier, Hirschman gave it a purely social character for the first time by including law and order, water supply and public health services. However, he has elaborated the conditions for including any activity under social overhead capital. According to him, the conditions are: (i) the services provided by the activity facilitate, or are in some sense basic to the carrying on of a great variety of economic activities; (ii) the services are provided in practically all countries by public agencies or by private agencies subject to some public control; and (iii) these services cannot be imported.

The services of overhead capital are indirectly productive and become available only after long period. Social overhead capital such as power, transport or communications etc. which constitute the framework of infrastructure and the overhead costs of the economy as whole. The diversity of approaches adopted by different economists makes it difficult to suggest an easy list of infrastructure. In this context, many authors have distinguished between the narrow and broader concept of infrastructure. A broader concept of infrastructure is highly adoptable in the plans of developing countries. To quote Joshi:

5. Ibid., p. 84.
6. Ibid., pp. 83–84.
in the context of developing economies, it would be advisable to adopt a broader concept of infrastructure by including under it all the basic economic and social services which promote directly productive activities. Thus, infrastructure will include in addition to economic overheads like transport, power, irrigation and communication, and social facilities like education, health and water supply as well as institutions providing credit, marketing and extension facilities."  

1.1.2 Infrastructure as a pre-condition of Economic Development

The relationship between infrastructure and economic development has been accepted widely, because it is regarded as a necessary pre-condition of economic development by most of the economists. It is also advocated that the strategy of economic development is based on prior development of infrastructure and that is why it have to be created before undertaking any directly productive activity. Rostow is one of the exponents of the "Pre-condition" theory. To quote him: "The whole set of changes in economy's infrastructure, working force, its agriculture and foreign exchange earnings (borrowings) capacity can be generalized in the pre-supposition that before take-off can occur, there must be, in the widest sense, a certain minimum prior build up of social overhead capital if the necessary spreading effects from the take-off leading sectors are intact to occur or if the take-off is not to be distorted or actually absorbed by the lack of adequate flows of working and fixed capital in the form of agricultural products and inputs."  

The creation of social overhead capital helps in initiating directly productive activities through creation of external economies. In countries where these facilities were not created adequately, bottlenecks arise in the process of growth. As Rostow remarks, ".....both history of pre-1914 of Russia and contemporary scene of post- 1958 of communist China indicate that nations have

begun to take-off without a balanced stock of pre-conditioning capital and these structural flaws raised serious problems for them during take-off years".\textsuperscript{19}

The availability of infrastructure facilities constitute a necessary, but on its own insufficient pre-condition for growth. According to Hagen, "...the role of infrastructure facilities in development is coordinate with that of many other pieces of capital equipment and changes in management practices and institutions."\textsuperscript{20} He supported his contention by citing examples of Columbia where development of textiles and sugar production took place in the absence of infrastructure facilities while in Burma, in spite of development of all types of infrastructure facilities, development did not take place.\textsuperscript{21} H.B. Chenery gave the example of Southern Italy where large investments were made in overhead capital in the hope of automatic development but unfortunately failed to justify by experience.\textsuperscript{22} Bauer holds that a readymade infrastructure is necessary for development but ignores the fact that infrastructure develops in the course of economic progress.\textsuperscript{23}

Habakkuk questions social overhead capital as a pre-condition for economic development and points out that ".....in England, the principal changes in transport and agriculture took place before the period of accelerated growth. In many cases the increase in agricultural output and the creation of social overhead capital are not conditions whose pre-existence explains the acceleration of growth; they are part of the acceleration which needs to be explained."\textsuperscript{24} In the early stages of development, a large investment in infrastructure facilities is highly necessary. It is difficult to create the entire network of

\begin{itemize}
\item [19.] Ibid., p. XXV.
\item [21.] Ibid., p. 173
\item [23.] Bauer, P.T., Dissent on Development— Studies and Debates in Development Econometrics, Vikas, New Delhi, 1973, p. 111.
\end{itemize}
infrastructure facilities at a time by any developing country. In the light of the prevailing circumstances of a country's economy, a practicable approach have to be selected for investment in infrastructure facilities.

It can be concluded that a minimum level of development of infrastructure facilities is a pre-condition of economic development. The minimum level of infrastructure facilities required for development depends on the size of the country, the growth stage attained, the pace of current economic growth, etc. After achieving the minimum level of infrastructure facilities, greater policy choices exists in an economy to decide the pattern and sequence of infrastructure between different sectors as well as between various components of infrastructure. The priority order of the volume of investment and the type of infrastructure facilities to be developed by an economy, has to be decided only after building up a threshold level of infrastructure facilities.

1.1.3 Infrastructure in the process of economic development

Economists have come to a general agreement that availability of infrastructure is a necessary pre-condition of development. Infrastructure represents the wheels of economic activities. To quote Rao: "The functions of infrastructure is to release latent productivity in the factors of production singly and in coordination and bring about not only an increase in the output of individual factors and units of production but also a mutually additive effect through coordination in inputs, outputs and space and time and thus maximise the overall rate of economic growth". 25

The relationship between economic development and infrastructure facilities can be analysed by identifying some critical variables, particularly through its links with capital formation and technological change in the process of economic development. The supply of capital for infrastructure facilities depends primarily on financial institutions which mobilize savings and also provide capital for agricultural and industrial development. The

role of financial institutions in an underdeveloped country are evident from the observations made by Edward. To quote him: "However, poor an economy may be, there will be a need for institutions which allow such savings as are currently forthcoming to be invested conveniently and safely, and which ensure that they are channelled into the most useful purposes. The poorer a country is, in fact, the greater is the need for agencies to collect and invest the savings of the broad mass of persons and institutions within its borders. Such agencies will not permit small amounts of savings to be handled and invested conveniently but will allow the owners of savings to retain liquidity individually but finance long term investment collectively." 26

The impact of infrastructure on the size of the market makes significant contributions to economic development. It is in this context, development economists have emphasized the role of transport and communication facilities. Transport and communication facilities have a multi-dimensional role to play and they affect the economy many ways. As Youngson observed: "The more closely one examines the impact of transport improvement, the more clearly one realises how pervasive this impact is, in what a multiple of ways the transport system helps to determine the scope and direction of economic development and how important are transport improvements in creating new opportunities and new incentives." 27

It is obvious that transport and communication facilities widen the size of the market and thereby increase the geographical area of the producers for serving their products. Apart from widening of the market, a network of communication also familiarises the producer with the market conditions. Therefore, a developed network of communication is of immense importance for any country.

The development of transport and communication network, on the other hand, increases the accessibility to distant natural resources and thereby helps to utilize the resources for

productive purposes. A developed transport and communication network improves economic efficiency by increasing the mobility of other factors of production. As Hagen points out: "...in so far as, there is imperfect mobility, a recommendation for partial remedy is the improvement of transportation, communication and information."  

The early history of the development of the transport facilities in Assam was associated with the development of the tea, petroleum and coal industries. The network of modern transport system was not spread in a planned manner and thereby it was limited in the production centres only. Although Assam has got railways, roadways and waterways, the pace of development is very slow in the state compared to other parts of the country. The people of the state will continue to suffer from the scarcity and higher prices of essential goods and from the loss of markets in other parts of the country until the transport system in the state is developed. To quote Lewis: ".....the cheap and extensive communication is the greatest blessings which any country can have, from economic point of view."  

Power sector plays a crucial role in the process of economic development. The use of modern technology is fully dependent on power and that is why the demand for different sources of energy, especially electricity increases with the adoption of modern technology. Thus, an increased supply of electricity at a low price can help in raising the productivity of industry and agriculture of backward regions. In Assam, there are immense potential for the development of power sector but power generation has been grossly inadequate. As a result, a wide gap between availability and demand for power exists in the state.

Banks constitute vital financial institutions in any economy. Their role in the process of economic development is very crucial as banks represent repositories of community's savings and purveyors of credit. All the vital sectors of any economy have relations with power generation.

banking network. To quote Rao: "Banks on the one hand mobilises savings of the
community, on the other hand finances as the vital economic activities like industries,
trade, commerce, agriculture and other essential sectors like health, education and so on.
Thus, deposit mobilisation and credit control are the two important functions of the bank
which directly influence the economic activities and the level of development of any
community, region or society." The availability of banking facilities in Assam has been
grossly inadequate. On the eve of the bank nationalisation in India in July, 1969, Assam had
only 74 offices of scheduled commercial bank offices which meant only one bank for every
two lakh of population as against the national average of 63 thousand persons. Although
some improvement in banking facilities has taken place in recent years, it is still continues
to be inadequate.

In the process of economic development and social upliftment health is a crucial factor.
It is possible to make a nation healthy, when there is adequate supply of food and when
people of the nation are not under-nourished or malnourished. The First Five Year Plan
document observed: "Health is fundamental to national progress in any sphere. In terms of
resources for economic development, nothing can be considered of higher importance than
health of people which is a measure of their energy and capacity as well as of the potentials
of man-hours for productive work in relation to the total number of persons maintained by
the nation. For the efficiency of industry and agriculture, the health of the workers is an
essential consideration."

The weak health destroy the energy of the people and thereby reduces their working
efficiency. The improvement of health of the people of a nation improves productivity. The
productive life span of the workers can also be raised by reducing the death rate. According

Delhi, pp. 260–261.
32. Government of India, First Five Year Plan, p. 488.
to Lewis, there are three ways in which expenditure on health is productive: “first, it increases the number of man hours of work that can be performed; secondly, it improves the quality of work; and thirdly, by clearing uninhabitable areas, it makes possible the use of natural resources which would not otherwise be utilised.”

It is often believed that the requirement of overhead capital is more in the field of industrial production than agricultural production. But overhead capital in the form of proper roads, irrigation, transport services, market etc. has to play a vital role in modern agriculture as well. As Rao observed: “...ensuring the supply of water through irrigation brings about an increase in the productivity of land and an increase in agricultural production. But the operation of irrigated agriculture requires a number of other inputs. Energy is required for operating pump sets, high yielding variety of seed, a certain degree of mechanization, fertilizer and pesticides, provision of storage, extension services, credit, marketing, price support and transport facilities are all required for increasing agricultural production and making it available for both rural and urban consumption and for industrial production.”

The process of development of infrastructure facilities directly contributes to the development of an economy. Infrastructure facilities generates both income as well as employment in an economy. According to an estimate, in India, the construction of one km. of railway track generates employment for 153.33 man years while its maintenance requires 6.18 man years. Similarly, in case of roads, 77.12 man years are required for construction of one km. and 0.92 man years for its maintenance while operation of road transport requires 7.65 persons per truck and 9.67 persons per bus.

1.2 About the study

1.2.1 Perspective of the study

The expansion of infrastructure plays a crucial role in initiating and speeding up the process of economic development, while its inadequacy hampers the development process. In India, considerable regional imbalance in the availability of infrastructural facilities exists. Though some states of India have gathered considerable development in respect of infrastructure facilities, the progress has been slow and unsatisfactory in Assam. We considered it worthwhile to undertake a systematic study in respect of the level of infrastructure facilities in the state so as to identify the constraints impeding the progress of the facilities. To the best of our knowledge, no indepth study in infrastructure facilities in Assam has been attempted so far and this prompted us to take up the present study. It is hoped that the findings of this explorative study will help the policy makers in devising appropriate remedial measures.

1.2.2 Objectives of the study

The objectives of the study are to:

(a) assess the inter-state and inter-district variations in the level of socio-economic infrastructural facilities;

(b) measure the existing inequalities in the infrastructural facilities;

(c) identify backward areas in each individual fields like transport, power, banking and health in Assam;

(d) review the achievement in the field of infrastructural development under Five Year Plans; and

(e) analyse the impact of governments programme on the availability of infrastructure facilities in Assam.
1.2.3 Scope of the study

Infrastructure in itself is a vast topic with multidimensional aspects. The subject overage of the present study is confined primarily to the role and development of transport, health, power and banking sectors.

The study combines both the exploratory and analytical approaches, but more tilted towards the former. Being basically exploratory in nature, it involves no statistical testing of hypothesis in the real sense. The reference period of the study is the period covered by the past seven five year plans of India. However, historical references have been made of the period prior to independence.

1.2.4 Data and Methodology

(a) Source of Data

Relevant secondary published data required for the study are collected from directorate of Economics and Statistics, Government of Assam, Guwahati and various statistical records.

(b) Selection of indicators

International guideline have emerged from united nations and other organisation in regard to the concept, scope and nature of indicators to be developed to meet the need of planning, policy formulation and evaluation of progress. A variety of Socio-economic indicators have been used in India, for planning, assessment of progress, identification of backward areas and measurement of regional disparities. In the study, eight indicators have been selected to analyse the inter-state disparities in the level of infrastructural development. These indicators are:

1. No. of commercial bank offices.

2. No. of banks per lakh of population.

3. Percentage of villages electrified.
4. No. of irrigation pumpsets energised.
5. No. of registered vehicles on roads.
6. Road length per lakh of population in km.
7. Per capita domestic consumption of electricity (KWH).
8. Per capita industrial consumption of electricity (KWH).

To analyse the relationship between infrastructure and economic development, the following two indicators of development have been selected, viz.

1. Percentage of main workers to total population.
2. Literacy percentage.

As many as sixteen indicators of infrastructure under transport, banking, power and health sectors have been selected to study inter-district disparities in infrastructure development in Assam. Indicators for transport sector:

1. Length of national highway (in km).
2. Length of state highway (in km).
3. Length of surfaced roads (in km).
4. Length of unsurfaced roads (in km).
5. Roads per lakh of population (in km).
6. Roads per 00 sq. km. of area.
7. No. of motor vehicles on road.

Indicators for banking sector:

1. No. of regional rumal bank offices.
2. No. of commercial bank offices.
3. Population (in Nos) served per bank offices.
4. No. of bank offices per 100 sq. km.
5. Deposit per capita (in Rs.) and
6. Credit per capita (in Rs.)

Indicators for power sector:
1. No. of villages electrified.
2. No of irrigation pumpsets energised.

Indicators for health sector:
1. No. of hospitals.
2. No. of PHC.
3. No. of dispensaries.
4. No. of hospital beds.
5. No. of rural family welfare centres.

The indicators selected to study the relationship between infrastructure and economic development in Assam are not same as India due to non-availability of data. The indicators are:

1. Literacy percentage.
2. No. of registered factories of manufacture of food products.

(c) Methodology

In the study, simple ranking method is used to measure the existing imbalances of the levels of socio-economic development in India. In order to measure the disparities in the levels of infrastructure development of states, the values of indicators have been standardised by converting them as percentage of national average of respective indicators. The weighted values of the indicators, thus obtained for each state are summed and arranged and then composite indices of the levels of infrastructure have been prepared. The relationship between economic development and infrastructure is examined with the help of regression analysis.
To present an outline of the level of socio-economic development at district level in Assam, each of the districts of the state are assigned rank orders and added up to obtain total rank order. The development index is computed with the help of the following formula:

\[ DI = \frac{TS}{TN} \]

Where, \( DI \) = Development Index.

\( TS \) = Total score of all districts.

\( TN \) = Total score of individual district.

The extent of inter-district disparities in the level of infrastructure is measured by computing composite scores of the selected indicators of infrastructure. The scores are assigned on the basis of the following formula:

\[ S_{xi} = \frac{V_{xi}}{V_i} \]

Where, \( S_{xi} \) stands for score of i indicator in x district,

\( V_{xi} \) for value of i indicator in x district,

\( V_i \) for average value of i indicator in the study area.

Calculating the score value of each indicator for each district, composite score (\( C_x \)) has been constructed for each district on the basis of the following formula:

\[ C_x = \frac{V_{xi}}{V_i} + \frac{V_{xj}}{V_j} + \ldots \ldots + \frac{V_{xn}}{V_n} \]

In order to analyse the disparity in each individual fields like transport, power, banking and health sectors, the composite index has been prepared. The technique of factor analysis has been applied to analyse the disparities in banking sector. A comparative study of the availability of health facilities in Assam is attempted by computing composite centrality score values of health per 10,000 persons with the help of the following formula:

\[ CCSV = \frac{10,000 \times C}{TP} \]
1.2.5 Utility of the study

A study on the development of infrastructure facilities has its own importance in a situation where infrastructure facilities problem is becoming perplex and stupendous and more so in a backward state like Assam where infrastructure facilities in general has failed to make any significant impact on the development of the economy. As the gap between the availability and requirement of the infrastructure facilities has substantially widened, the state needs assistance from government, private developers and planners. Though infrastructure facilities has achieved considerable development during the past plan period in the country, marked inter-state and inter-district disparities in the level of infrastructure facilities still exists. Hence, an investigative exercise on the topic has its own academic utility. The task before the policy makers is a proper diagnosis of the problems and formulation of a set of appropriate corrective measures for overcoming the constraints. The findings of such type of study can be expected to go a long way in helping the policy makers.

1.2.6 Chapter plan

The study consisting of five chapters begins with a brief reference to some aspects of economics of infrastructure and a brief description about the study itself. In the second chapter, an outline of the infrastructureal development under Five Year Plans is presented. An analysis of the existing inter and intra-state inequalities in infrastructural facilities in India with special reference to Assam is attempted in the third chapter. The fourth chapter deals with the disparities in infrastructural facilities in each individual field like transport, power, banking and health. Identification of lagging areas in each individual field in Assam is attempted in the chapter. The summary of main findings of the study is presented in the concluding chapter.