Introduction

The prime objective of this chapter is to search out the operational definitions of the concepts of both infrastructure and industrial development, which could help us in measuring their levels of achievements in the present context. For this purpose, the whole chapter is divided into two sections. Section-1 is devoted to search out the operational definition of infrastructure, whereas Section-2 tries to identify the definition of industrial development for pursuance of empirical analysis in the dissertation.

Section-1: Infrastructure

(i) The Concept

The definition of the concept of infrastructure available in Literature can broadly be placed into two categories, i.e. 'theoretical' and 'pragmatic'. The former are found to be theoretically more biased towards abstraction and not much realistic in practice, whereas the latter are designated as those relatively more elaborative, much closer to the ground realities and better suiting to operational researches. Category-wise these definitions are recapitulated here as under.

(ii) Theoretical

Historically, the word “infrastructure” originated as a military term, for invasion of France during the Second World War and was applied to such items as oil pipelines,
broadening subsequently to include various other capital goods. Moreover, the term 'infrastructure' was adopted more generally as preferable to Social Overhead Capital (SOC) after World War-II, to avoid confusion with hospitals, schools and other welfare type facilities. Besides, it has been used quite freely in recent times with classificatory qualifications like social and economic, rural and urban, although the earlier terms 'social overheads' and 'economic overheads' are also used too often by the social scientists in their studies concerning development economics. A study of concerned literature also reveals that a continuous efforts have been made in the past to define infrastructure alternatively in differing manners. The important among them are described here as follows.

To start with, the whole structure of a society is divided into two, infrastructure and superstructure. The socio-economic structure of a nation comprises all forms of capital, material, human and other types of living beings. Since all of them are involved in the dynamic process of change, they may be viewed as the sources of a regular flow of income, output and employment. No doubt, the role of various forms of capital in the process of change demonstrates a considerable difference. And based on this differing role, a broad distinction can be made between the two, i.e. infrastructure and superstructure. But it is not so easy to carve out a portion of total capital transformed into infrastructure and separate it from superstructure.

In another way, the term infrastructure is defined as all those facilities and activities, which provide sustenance to income generation and production in the rest of the economy rather than income generation and production within the infrastructure enterprises. Based on this concept, it is, however, difficult to bring out a clear-cut demarcation between infrastructure enterprises, capital activity and facilities. The reason
being that the supplies of steel, petroleum products or manufacturing yarn, although never treated as an infrastructure in strict sense, seem to satisfy most of the criteria laid down for its definition.

Further, one of the World Bank experts has defined infrastructure as the basic services or public utilities, which are necessary for functioning of the commodity producing sectors of the economy. Accordingly, bulk of the services fall in the category of infrastructure and commodity production as superstructure. No doubt, most of the infrastructural components are, by and large, services but it is feared whether power and water – the two important products of infrastructure enterprises – can be regarded as ‘services’ and ‘not goods’.

(iii) Pragmatic

While seeking to have greater precision in conceptualization of infrastructure, it would be worthwhile to look into Hirschman’s concept of Social Overhead Capital (SOC), generally equated with the term infrastructure, which is defined as those basic facilities essential for primary, secondary and tertiary economic activities. According to him, an activity to be called infrastructure must fulfill the following four basic conditions:

(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 provisions of these services are generally in the hands of public agencies or of private agencies which are subject to public controls;

(iii) The services are provided by the public agencies free of charge or at rates regulated by public agencies but they cannot be imported; and

(iv) The investments needed to provide services are characterized by ‘lumpiness’ as well as high capital output ratio.
However, some of the above conditions seem to be lacking a theoretical rigour. The first condition, for instance, invites two types of interpretations: it may refer to interdependence in terms of inter-industry relationships or to a time sequence in which the output of a given activity is essential to or a prerequisite for growth of the other activities. The reason being, the input of those activities is simultaneously needed for producing the output vector. The latter interpretation loses its ground when tested empirically. There are numerous examples in economic history where investment in basic facilities has failed to stimulate other activities.

The second condition, however, seems to be more appealing on theoretical plane. In case of almost all the activities falling under social overhead capital, private marginal productivity being less than their counterpart, i.e. social marginal productivity, public ownership has been almost a ubiquitous feature. The total benefit from any component of infrastructure that accrues to the community in terms of income and output is, generally, higher than that of any infrastructure enterprise. This itself helps in explaining the fact why infrastructure enterprises belong more to the public than to the private sector.

Regarding the third condition, there does not seem to arise any kind of major dispute. By and large, services of majority of the items of social overhead capital cannot be imported barring a few exceptions like educated and specialized manpower, which can easily be imported.

The fourth condition, i.e., the lumpiness of investment needed or technical indivisibility is a characteristic of a number of hardware components of SOC like roads, large irrigation projects including dams and power generation plants. However, this
condition does not apply in case of software components like health, education and law and order, which are also included in SOC investments.

Thus, as transpires from the critical appraisal, Hirschman’s conditions in defining SOC seem to be partly justifiable and partly not. In spite, his definition of infrastructure or SOC can be considered to be better rewarding and more meaningful for carrying out an empirical analysis.

As a matter of fact, a comprehensive definition of infrastructure would be one, which stresses on creation of external economies as the most important characteristic of investment in SOC. The externalities referred to here comprehend social benefits in a true Pigovian sense. Conceiving this way, we may include under the term ‘infrastructure’ or SOC not only the lumpy or hardware assets like railways, roads, power, major irrigation projects including dams but also the divisible or software assets such as educational institutions, medical and health services, public housing, besides other items like law and order and efficient Government. Inclusion of all these items, no doubt, broadens the concept beyond the normally accepted economic aspect.

Further, while in search of an operational definition of infrastructure, it would be relevant to quote Michael Lipton, who has laid emphasis on coverage of the four major aspects in its definition. First, the services that are usually: (i) hardware based, (ii) supplied publicly, (iii) in part tax financed rather than user financed, (iv) used in consumption as well as production, (v) more valuable to users to the extent that they ‘hook into’ national grids communicating to central facilities (e.g. capital cities, central stores, docks, etc.). Typically, these include roads, railways and airports, telephone systems, usually electric power, often drinking water, and some public buildings and works, notably stores; second, law and order (mainly police and defence); third, human
and social (mainly health and education); fourth, producer-sector specific (mainly in agriculture, research and irrigation). Most of the latter three are also part and partial of the centralized grids. But they are software grids far less costly than the hardware grids for roads or electric power.7

Finally, while focussing on infrastructure, World Development Report defined it as those basic services flowing from: (i) public utilities—power, telecommunications, piped water supply, sanitation and sewerage, solid waste collection and disposal, and piped gas; (ii) public works—roads and major dams and canal works for irrigation and drainage; and (iii) other transport sectors—urban and inter-urban railways, urban transport, ports and waterways and airports.

Thus, infrastructure is an umbrella term for many activities referred to as “social overhead capital” by such development economists as Paul Rosenstein Rodan, Ragner Nurkse and Albert Hirschman. Neither term is precisely defined; both encompass activities that share technical features (such as economies of scale) and economic features (such as spill-over from users to non-users).8

The most common point among the above mentioned definitions is that they lay emphasis on its role as a catalytic agent in carrying out a great variety of economic activities. As a sequel of this, although most precisely but undoubtedly in an utmost abstract sense, the term, infrastructure may be coined as a ‘family resemblance word’; 'like blood' among the members of a family; ‘constructiveness’ is also common among all types of infrastructural components whether hardware or software, economic or social.

As transpires from the above discussion, the economic components like road, transport, power, irrigation and banking institutions constitute economic infrastructure, whereas those encompassing social components like education, public health, sanitation
and drinking water are designated as social infrastructure. The list of such components can be made as **comprehensive** as possible, but it can never be **exhaustive**.

As transpires from the above, infrastructural definitions can be designated as multidimensional in nature, quite rich in contents and finally converging to constructiveness. But they tend to be more relevant only in the context in which they have been used. Hence, none of them, as such, qualify for an operational definition of infrastructure. Yet, the plus point is that indicators based on the contents of these definitions have already been developed and data pertaining to them are easily accessible in literature.

Therefore, after judging suitability of existing infrastructural indicators from the point of view of their relevance and usefulness in the context of industrial development, we have selected, in all, twelve indicators. Out of these, the six concerning the category of 'economic infrastructure' consist of per lakh of population: (i) length of pucca roads under P.W.D., (ii) percentage of villages electrified to total number of inhabited villages, (iii) number of scheduled commercial banks, (iv) number of rural markets, (v) number of industrial estates/areas, and (vi) number of telephone lines/connections. Whereas the remaining six comprising per lakh of population: (i) number of Junior Basic Schools (JBS), (ii) number of Senior Basic Schools (SBS), (iii) number of Higher Secondary Schools, (iv) number of allopathic hospitals/ dispensaries including PHCs, (v) number of polytechnics, and (vi) number of Industrial Training Institutes (ITIs) constitute the category of 'social infrastructure'.

**Section-2: Industrial Development**

(i) **The Concept**

Ever since inception of industrialization, social scientists have given much attention to this dynamic phenomenon. With the result, a bulk of literature on this subject
is available. Unfortunately, instead of making issues clearer, this stock of information has intensified the mist of ambiguity surrounding the concept of 'industrialisation' or industrial development. Different scholars have interpreted it differently to suit their purposes and meet their requirements. For instance, in its broadest connotation, industrialisation has become synonymous with the term economic development. Actually, the modern economic development is so dependent on industrial development that the difference between the two is hardly bothered. Truly speaking, all such definitions intend to capture the social, economic and political impact of industrialisation, which, in any case, is not less significant. For example, it is defined as "a process which accelerates economic growth; affects structural changes in the economy, particularly in respect of resource utilization, production functions, income generations, occupational pattern, population distribution and foreign trade and induced social change." The difference between economic development and industrialisation vanishes only when latter becomes so mature that the entire economy takes to industrial methods of production. Then, even agriculture becomes an industry, a phase signifying completion of industrial revolution as envisaged by the Marxists.

Therefore, though there does not seem much difference between the two, yet both the terms are not to be conceived identical particularly in the context of LDCs. While economic development is a generic term, which embraces all forms of economic activity that serve to furtherance of development of a given political and spatial unit, industrial development is more specific in its connotation and use. The researchers have, therefore, developed specific definitions of industrialisation so that its contribution to overall economic development can be measured conveniently. These definitions being specific in nature are normally narrow in scope but because of their operational
characteristics, they are deemed to be carrying greater usefulness. However, within this category of definitions, we find multiplicity in proxy of the term industrialisation for its comprehension.

In the Marxist literature when industrialisation is used in narrow sense, it is applied to establishment and development of the industries producing the means of instruments of production.\textsuperscript{13}

Generally, industrial development refers to the growth of industry, i.e., mining, manufacturing, construction and infrastructure industries (transportation, communication and public utilities) and the increase in its share in total economy.\textsuperscript{14}

Sometimes, industrial development is represented by the rising share of 'manufacturing' in Gross Domestic Product (GDP). Manufacturing being the leading sub-sector of industrial sector is less ambiguous term including all goods (no services) that require transformation from the primary material or semi-finished products.\textsuperscript{15} Besides, in many studies, on the basis of 'Clark-fisher Theory'\textsuperscript{16} any movement away from primary activity is termed as industrialisation.\textsuperscript{17}

However, all these definitions suffer from certain inherent inadequacies. For example, as the process of development progresses, the rising share of industrial sector in GDP becomes constant at its maturity and then starts declining as tertiary/service sector starts gaining importance.\textsuperscript{18} Viewing this phenomenon in the light of the aforesaid definitions, such a phase would represent deindustrialisation and the basic purpose of defining the concept would be jeopardised to a large extent. Moreover, since these definitions tend to be biased to the economic aspect of industrialisation, the importance of socio-political and ecological aspects is undermined. Obviously, we do not find these concepts much relevant and meaningful in the present context.
Probably because of the inherent inadequacies in its conceptualisation, Sutcliffe while in search of suitable alternative laid down three criteria for a country to be considered industrialised. First being that, at least 25 per cent of the total income arises in the industrial sector; secondly, at least 60 per cent of this 25 per cent arises in the manufacturing sector, and thirdly, at least 10 per cent of the total population is employed in industrial sector. This workable definition as developed by Sutcliffe seems to be the most operative in nature but its application will largely depend upon the availability of the required data. Moreover, M. Owen Lynch defines industry as 'that trait which makes up the characteristic mode of production based upon machine and fuel power. Industrialism would then become a process involved in creating and maintaining industry or the adoption of this mode of production. These definitions are, no doubt, theoretically sound but their operational merit is rated to be limited.

However, to upgrade the objectivity of the concept, so that it can stand the test of empirical analysis, industrial development has also been conceived in terms of contribution of industrial sector to total net domestic product, value of industrial produce per capita or per industrial worker. But this way of defining the term takes into account only performance aspect of industrial sector and other aspects like environment and technology, which are equally important, are totally disregarded. Therefore, industrial development in the present context has been conceived in terms of certain selected indicators concerning mainly, performance, concentration, input use and technology.

Based on logical connotation, the factors, which are generally required for carrying out industrial activities over a space are designated as determinants of industrial development. They have to be arranged for in advance simply because they are necessary pre-requisites and industrial development is unlikely to occur in otherwise situations.
However, the choice of determinants in the present context has been made keeping in view their relevance and availability of data. In other words, only those factors are made part of our analysis, which are deemed necessary for undertaking an industrial enterprise.

To begin with, efforts have been made to exhibit determinants of industrialisation through the following chart:

**Chart 2.1**

**Determinants of Industrial Development**

- **Resources**
  - 1. Natural*
  - 2. Labour**
  - 3. Capital

- **Environment/Industrial Climate**
  - 1. Infrastructure***
  - 2. Institutions****
  - 3. Agriculture
  - 4. Urbanisation

- **Markets**
  - 1. Internal
  - 2. External

*Consists of agriculture, livestock, minerals, marine, water energy and forest resources.
**Comprises skilled, semi-skilled and unskilled labour.
***Includes road, transport, water and power.
****Consists of financial, technical, training and marketing institutions.

As shown in the Chart 2.1, resources make up the potential of the economy and are primarily gift of nature. Therefore, any space in question will be either richly or poorly endowed with such resources. Planning for industrial development under these two extreme situations will also require different approaches to be followed. Resources needed for industrial development can be further specified as (i) Natural, (ii) Human, and (iii) Capital.

**Natural Resources** are primarily given by geographical, climatic and even locational factors. They have their bases in agriculture, livestock, mineral, marine, water, energy and forest. They are known as a foundation stone for the establishment and expansion of industries.
Human Resources, on the other hand, are needed to make use of natural resources in the best possible manner. Moreover, processes of manufacturing in different types of industries use different types of labour belonging to skilled, semi-skilled and unskilled categories. Human resources have a significant bearing on growth of industries because manufacturing being the chief industrial activity is nothing but transformation of materials from their natural form into finished or semi-finished form. And the role of labour in the process of transformation is most crucial.

Capital, as the dictionary meaning goes, "...refers to a factor of production produced by the economic system. Capital goods are produced goods, which are used as factor inputs for further production... the word is also used as a term for financial assets."\textsuperscript{20} This is needed by all productive activities covered under industrialisation either for investment in physical resources such as land, building, machinery equipment, etc., or for making purchases of raw materials, fuels, etc. Capital can be further divided into fixed and working capital. While the former refers to the amount of money invested to acquire fixed assets, which are to be used for fairly long period, the latter refers to the funds required to carry out day-to-day activities.\textsuperscript{21}

Environment - Availability of resources alone is not going to effect industrial development unless there is a healthy industrial climate to attract entrepreneurs for undertaking industrial activities. There is likelihood of under-utilisation of the resources including installed capacity in the absence of proper environment. Environment is influenced by both economic and non-economic factors. As shown in the Chart 2.1, main factors constituting environment consist of infrastructure, institutions, agriculture and urbanisation.

Infrastructure and its components are needed for both establishment and growth of industrial enterprises. Whereas, institutions help upgrade the environment by developing a financial system, facilitating flow of funds to industrial sector. It also
represents technical and training institutions, which greatly assist in developing technical and managerial skills of the human resource.

**Agriculture** contributes greatly to the manufacturing sector through not only feeding the factories by providing raw materials but also its employees by providing basic wage goods to them. In return, agricultural sector uses most of the inputs produced by the manufacturing sector such as fertilizers, pesticides and agricultural implements. In short, the relationship between agriculture and industry is that of mutual interdependence type, which once again proves how the former makes the environment more conducive to growth of the latter.

**Urbanisation** defined as the proportion of urban population to total population is an indicator of the transformation of society from agrarian to non-agrarian. This kind of change leads to an improvement in environment which goes in favour of expansion of industrial activities. In urban setting, manufacturing firms are benefited with several external economies such as availability of skilled labour and access to various infrastructural facilities including industrial sites, electricity, water, sewage, roads, railways and in many cases ports as well. Besides, each firm also benefits from the economies of agglomeration, which emerges due to the presence of many firms with a wide range of necessary inputs and services.

Moreover, with the swelling of population in cities, the size of market also expands. This results in creation of more attraction, which is all the more stronger in most of the LDCs, where transport and communication facilities are not very developed. Thus, as transpires from the above, urbanisation seems to be closely associated with industrialisation and there is no denial of the fact that the former positively contributes to the latter.
Market - It is usually said that production cycle remains incomplete unless the product reaches the ultimate consumer. This is how markets have come to play a significant role in industrial development of a country. As often argued by Economists, low level of development in majority of LDCs has been due to smallness of the market. In the absence of a proper marketing system, there is no point of attraction for entrepreneurs to expand their production levels in order to enjoy economies of scale. More so, markets are necessary not only for disposal of finished products but also for acquiring services of various factors of production. Viewing this, a strong base of marketing network is required for accelerating the pace and the process of industrialisation.

(ii) Measurement

In spite of so many obstacles encountered in the path of its measurement, a number of measures are made available in literature to assess the level of industrialisation or industrial development. The important among them are described here as under.

A measure, which has gained currency among the social scientists, is known as the contribution of secondary sector to the total income in terms of GDP/SDP as the case may be, to assess the level of industrialisation. While enjoying merit of simplicity, this measure suffers from its inherent weaknesses. In considering the contribution of this sector to the economic growth of the economy, as pointed out by Kuznets, even when we deduct the contribution made by some other sectors, the magnitude of the net product so measured would still depend upon the rest of the economy. "Its product may perhaps be more correctly described as the result of the activities of the economy whose particular focus is the given sector rather than as a contribution of the given sector fully creditable to it as if it were outside the economy and offering something to the latter." Concisely, it is very difficult to isolate the exact contribution of any sector fully creditable to it.
Another very important output oriented measure of industrial development is in terms of a rising share of value added in manufacturing. However, even this measure fails to portray a true picture of industrialisation. As the process of development proceeds, the share of manufacturing first rises then becomes constant and thereafter starts declining. Actually, the rising significance of tertiary sector depresses the performance of the secondary sector. Therefore, sole dependence on this measure is not recommended.

The index of industrial production as an indicator of industrial growth is another widely used measure to assess the level of industrialisation. However, the problem regarding this measure is that industrial output is influenced by a number of factors such as size of unit, input patterns, levels of mechanisation, conditions of plants, supply of raw materials, power and labour participation and various other social and political factors. In addition, as pointed out by Isher Judge Ahluwalia this measure suffers from unreliable data and non-representative coverage which restrict the accuracy of it.

Various other common measures are in practice to measure the level of industrialisation such as number of factories and some input oriented criteria, e.g., employment in the industrial sector and productive capital employed. A study based on number of factories would demonstrate only the degree of concentration of industrial activity, which is but one aspect of industrial development. Besides, it may provide wrong impression as no distinction is made on the basis of the size, which is of great importance in industrial economics.

Industrialisation has also been described by many scholars as diversification of employment. Therefore, in many studies, level of industrialisation is measured by the proportion of workers engaged in industrial sector in relation to area, population or the total workforce. However, disfavouring to this, it is argued that although industrial activity and factory employment are closely related, they may not move together.
matter of fact, it appears that with a view to improving objectivity of the concept so that it can stand with the test of empirical analysis, industrial development has, usually, been conceived in narrow sense of contribution of industrial sector to total net domestic product, value of industrial produce per capita/per industrial worker, or index of industrial production. But this way of defining the term in narrow sense takes into account only performance aspect of industrial sector and the other equally important aspects like concentration, technology and input uses have not been considered for their inclusion in its conceptualisation. Therefore, with a view to analysing the inter-category and inter-district relationship between infrastructure and industrial development, the latter in the present context will be conceived in broad sense of composite index of the following selected indicators concerning its concentration, technology and input uses. Besides, both the terms industrial development and industrialisation will be used interchangeably throughout the dissertation from beginning to the end.

1. Percentage contribution of manufacturing to total net district domestic product (NDDP);
2. Net value added by manufacture per capita;
3. Net value added per worker in registered manufacturing;
4. Percentage of net value added from registered manufacturing to net value added from total manufacturing;
5. Number of SSIs per lakh of population;
6. Number of workers engaged in registered SSIs per lakh of population; and
7. Investment per worker in registered SSIs.
Notes and References


7. Michael Lipton, op.cit.


16. Classifying occupation as primary, secondary and tertiary activities, C. Clark and A.G.B. Fisher in their 'Sector Theory' hold that the ratio of labourforce in occupational categories and economic progress follows a set pattern. As a country
develops economically the ratio of primary industries in the economy declines steadily; the secondary industries first grows, reaches a plateau and then declines, while the ratio of tertiary picks up and grows steadily thereafter. While defining, Clark describes primary activities as those including agriculture, livestock, farming of all kinds, hunting and trapping, fisheries and forestry. Secondary is defined to cover manufacturing, production, building and public work construction. Mining is included on the basis that it bears greater resemblance to manufacturing. Tertiary activities include commerce, transport, public administration, domestic (paid works) personal and professional service. For further details see C. Clark, *Conditions of Economic Progress*, First Edition, Macmillan Co. Ltd., London, 1951, pp.337-338.


24. The Government Institutions such as Central Statistical Organisation (CSO) and Reserve Bank of India (RBI) make use of this measure to study industrial development.


