Chapter One

INTRODUCTION

Infrastructure means something which lies below or comes before (infra) the 'structure'. This has to be seen as opposite to the 'superstructure', which is built over and above the structure. The contrast is more striking because while the 'superstructure' is the end result, or, in some sense, the aim of economic development and growth process, the 'infrastructure' is the base or the necessary initial foundation on which the former is built. Thus, broadly speaking, 'infrastructure' can be seen as all those activities and services whose contribution to the economy is not the income generated within the sector itself but the sustenance and support that they provide to the income generation in the rest of the economy. The term originated during World War II as a military term to mean 'underlying' structures in the early days of Marshall Plan, as preferable to 'Social Overhead Capital'; to avoid confusion with hospitals, schools and similar welfare type facilities. Since then, the term has been widely used by economists but does not have a precise definition till now. Different economists have used the term with different connotations, without, however, sacrificing the basic idea that they provide the base over which the structure of the economy is built. Consequently, there have been efforts to encompass a variety of activities within the term infrastructure, to differentiate between different components of infrastructure (social & economic, for example), and to measure the contribution of infrastructure in the economy, or investigate how different economies are affected by the infrastructural facilities.

The foremost reference to the concept of Infrastructure was by A.O. Hirschman. He differentiated between Direct Productive Activities (DPA) and Social Overhead Capital (SOC). SOC can be seen as infrastructure and is usually defined as comprising "those basic services without which primary, secondary and tertiary productive activities cannot function."\(^2\)

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1 Hirschman, A.O. (1958)
2 op cit.
According to him, whether an activity falls under SOC depends on whether it satisfies the following conditions:\(^3\)

(a) The services provided by the activity facilitate, or in some sense, are basic to the carrying on of a great variety of economic activities.

(b) The services are provided in practically all Countries by public agencies, or, by private agencies subject to some public control; they are provided free of charge or at rates regulated by public agencies.

(c) The services cannot be imported.

He commented that the meaning can be narrowed down by including a fourth condition, namely –

(d) The investment needed to provide the services are characterized by “Lumpiness” (technical Indivisibilities) as well as by high capital output ratio (provided the output is at all measurable).

David Aschauer, in 1990, provided a general purpose definition of infrastructure as a region’s “public stock of social and economic overhead capital”.\(^4\)

The World Bank in the world Development report 1994 (WDR94)\(^5\) includes the following in its definition of Infrastructural services.

I. **Public Utilities:** Power, Telecommunications, Piped Water Supply, Sanitation and Sewerage, Solid Waste collection & disposal, Piped Gas;

II. **Public Works:** Roads, Major Dams, Canal Works for Irrigation and Drainage;

III. **Other Transport Sector:** Urban and Inter-urban Roadways, Urban Transport, Ports & Waterways and Airports;

IV. **Social Infrastructure:** Basic Education, Primary Health Care and Banking Service.

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\(^3\) op cit.

\(^4\) Aschauer, D.A. (1990)

\(^5\) World Bank (1994)
The hallmarks of all these are that they loosely follow Hirschman's conditions regarding SOC and are the 'underlying' framework on which the structure of the economy is built up. The definition or the services cited by WDR94 is a comprehensive and almost all inclusive one. Economists over the years have focused on one or more of these services and facilities whenever they have tried to discuss Infrastructure.

In the present study similar notion regarding infrastructure has been adopted. Distinction is made between economic or physical infrastructure and social infrastructure. The specific facilities selected for investigation have been cited later on.

**Infrastructure and Economic Development**

The seminal discussion on the relationship between infrastructure and economic development was put forward by Hirschman himself while he was discussing development strategies. He commented that “enlarged availability of electric power and of transportation facilities are essential preconditions for economic development practically everywhere.” He went on to add that at least in this regard “we have a field where economists have given full recognition to the principle of "efficient sequence" (and economists are known not to agree with each other!). According to him "investment in SOC is advocated not because of its direct effect on final output, but because it permits, and in fact invites, DPA (investment) to come in." The idea was explained with the aid of the following diagram.

Q1, Q2 and Q3 represent different combinations of DPA cost and SOC cost (and availability) that would give the same DPA output Q1, Q2 and Q3 respectively. As SOC availability increases, cost of DPA output decreases. A minimum amount of SOC is a pre-requisite of DPA investment without which DPA can not start, or, the cost of producing any amount of DPA would be infinitely high (S1 and S2 in our figure). After that, any rise in investments in, and hence availability of, SOC will lower the cost of producing the same output of DPA. When SOC becomes plentiful, DPA costs are very low and become minimum possible. Thus he proposed a situation where production of same output of DPA will involve higher costs if SOC are scarce; and will involve lower costs if SOC are plenty. This underlined the importance of SOC in the process of growth and development. (Hirschman himself however went on to provide two alternative strategies of development - one that would operate with excess SOC with induced investment in DPA - movement along C1A1C2A2C3A3; and another with SOC shortage, where the pressure of demand would force investors to build up adequate SOC - i.e. a

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6 op cit.
7 op cit.
movement along $C_1B_1C_2B_2C_3B_3$.) He commented later that the development strategy to be adopted would depend upon the economic & social condition of the region concerned. In a situation of general pessimism, devoid of any entrepreneurial motivation, permissive strategies of excess SOC will not be able to persuade investors to set up DPA. On the contrary, in a region of boom and dynamism, potential investors will take the plunge when they find that SOC is available in plenty and hence their Social Marginal Cost is low.
optimistic decisions. Consequently he made investments in SOC, specially in the fields of transport and power, one of the main preconditions for take-off.

Hansen, by contrast, was more interested in the differential effect that such investments would have on different socio-economic regions. In what is now famous as Hansen Thesis, he commented that regions can be classified into three types- (a) Congested (b) Lagging and (c) Intermediate. In Congested areas, the marginal social cost of expanding Public Capital (another ‘name’ often given to infrastructure) would outweigh the marginal social benefit. In Lagging regions the dominant economic activity is agriculture and declining industry, and according to Hansen, the economic impact of infrastructure would be negligible in such areas. Benefits accruing from increased availability of infrastructural facilities would be highest in the Intermediate regions that do not suffer from congestion (associated pollution, shortages, etc.) but have access to quality raw materials, efficient labour and wide market. Making these regions easily accessible; supplying them with cheap & assured power, and looking after the maintenance of social & human capital of these regions would attract & retain economic activities in these regions.

Paul Rosenstein-Rodan and R. Nurkse lent their voices to similar arguments in support of investment in Overhead Capital. Their version of ‘Balanced Growth’ calls for simultaneous investments in large number of activities to break the hurdle of indivisibilities, specially the lumpiness of social overhead capital.

More recently Aschauer commented that public stock of social & economic overhead capital exerts a variety of forces upon the spatial economy. It increases local, regional or national accessibility; infrastructure attracts resources - both human & physical; mobile labour force settles down on accessible areas and economic activity is attracted to these areas. Munnell argues that there are few businesses that would not benefit from being well served by roads, railways, water-sewerage or telecommunications. This increased efficiency due to regional infrastructure is an important impact.

The WDR-1994 has put forward the following arguments regarding the benefits accruing from infrastructure and increased public investment in overhead capital.

(i) OC raises productivity of other economic activities.

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8 Rostow, W.W. (1960)
9 Hansen, N. (1965)
10 Nurkse, R. (1953), Rosenstein-Rodan, P.N. (1943)
11 op cit.
12 Munnell, A.H. (1990)
13 op cit.
(ii) Cross-national studies indicate positive significant correlation between infrastructural facilities and economic growth.

(iii) Rural Infrastructure leads to agricultural expansion by increasing yields, farmers’ access to markets, and availability of institutional finance.

(iv) Adequate quantity and quality of Infrastructure are key factors in ability of countries to compete in global trade.

(v) Infrastructure is an important factor in Global Rating of an economy by Multinational Investors.

(vi) Proper infrastructural facilities can help in eradication of poverty.

(vii) Careful implementation of infrastructural projects is compatible with, and necessary for, global environmental sustainability.

Thus it can be rightly inferred that there appears to be a strong theoretical logic supporting the view that Infrastructure or Overhead Capital is a precondition for economic growth and development. It may not be the ‘engine of growth’, but certainly are its ‘wheels’. Without these wheels the engine may go on roaring and fuels may continue to be exhausted, but there will be no advancement of the national economy. A fault even in the balancing of the infrastructural facilities over time, space and components will create bottlenecks in certain sectors and excess capacity and “blocked investment” in certain other sectors - thereby creating dis-equilibria in the economy. Consequently, the path and the pace of economic development will be at jeopardy. Availability of infrastructural facilities in adequate quantity (volume or otherwise), uncompromised quality and reliability are key-factors in shaping not only the present but also the future of a nation’s economy. Failure in providing such facilities largely reduces productivity of economic activities and depresses general living conditions. As a result, the process of Capital formation – both physical & human – suffers a setback, leading to shortages in the future. In fact, such lacuna in providing necessary infrastructure hinders the building of the ‘structure’ itself and holds back the economy - national or regional – within the (in) famous Low level Equilibrium Trap\(^\text{14}\) and prevents its take-off into self-sustained growth.

The role of infrastructure in fostering economic growth and enhancing public welfare is more pronounced in developing economies like India. Here, infrastructure projects and increase in Public Capital Outlay have a two-pronged effect on the

\(^{14}\) Nelson, R.R. (1956)
development process. In Hirschman's words it has both "Backward and Forward Linkages". On one hand, initiation of infrastructural projects creates demand for labour, land (in most cases) and other "heavy" capital goods like Cement, Iron & Steel, etc. On the other, completion of such projects opens up opportunities for a plethora of economic activities and creates a secondary level of employment creation and income generation. Thus, a new road is accompanied by expansion of transport services by local people; a new bridge facilitates trade & commerce, and a new power plant fosters small manufacturing units. Being an 'Intermediate Region' in the world economy (following Hansen's classification), the effect of infrastructure is expected to be substantial in India. In fact, at the time of our independence, the national government was unanimous in accepting that a much wider base of infrastructure was the 'sine qua non' of economic development of this country. The complete consensus obviated the need for any debate on this issue and it was taken for granted that infrastructure sector needed both large scale action and outlay. During the first 18 years of Planning (1950-51—1968-69) as much as 78% of Total Plan Outlay were devoted to infrastructure – Agriculture, Power, Irrigation, Transport & Communication, and Social Services like Education & Health.

Thus, in the Indian planning level also, there seems to be a general agreement regarding the necessity and crucial role played by Infrastructure in the development process of the economy. This role is to be studied in detail.

This paper would make an effort to study how important has been the role of infrastructure in promoting development in India - both at the national and the regional levels.

The study has seven sections. After this section, we make a short review of existing studies on infrastructure and also outline the major objectives of the present study. The third section discusses the methodology used in the study. The next section outlines the broad trends and patterns of infrastructure in India. The fifth and sixth section studies various aspects of interrelationship between infrastructure and development in the Indian context. The last section sums up the findings and provides a few suggestions.

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15 Hirschman, A.O. (1958)
16 Hansen, N. (1965a)