

Analyses of the Status of Economic & Social Infrastructure in India

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Abstract—The present study explained the term ‘infrastructure’ in detail, including the types of infrastructure such as physical/economic infrastructure and social infrastructure. Study also described the key characteristics of infrastructure and various risks associated with its projects. The key objective of this paper is to study the current status of infrastructure in India, covering both sectors economic as well as social infrastructure. Data presented in the study for the period 2001 to 2013, which has been accumulated from Economic Survey of India, ministry of statistics, annual reports and various websites. Further, study described the imperative role of infrastructure in various sectors. After reviewed the previous literature, study concluded that infrastructure services positively impacts on economic development and both infrastructure and economic development are interlinked with each other and having a strong relationship. For the development of infrastructure, every country needs huge investments; activities such as constructions, operations, and maintenance of infrastructure projects require massive investments for its continuous progress. The present study also described the various sources of infrastructure financing such as FDI, PPP, World Bank, private financing firms etc. Findings of the study indicate that Indian infrastructure is far behind than other economies; it needs more funds, better operators, and specialized maintenance team for its development. Study concluded that PPP is the best option for infrastructure development mainly in developing countries; it has better risk allocation strategies, it shares risk among the parties according to their specialization area, it completes the projects within the time, it brings huge funds also, and having a specialized team for particular field such as construction, operation and maintenance.

Keywords: Physical Infrastructure, Social Infrastructure, Infrastructure Financing, Infrastructure Development, Economic Growth.

1. INTRODUCTION

The term ‘infrastructure’ can be easily understood by a common person without a definition, because it is recognized and identified with the help of its services such as transportation, electricity, communication, education, healthcare, water and sanitation etc. provided to community people and different sectors [15]. Well-built infrastructure is the essential determinant of a country for its economic development. Infrastructure plays an important role in economic development as well as in other sectors also such as

industrial, tourism sector, agriculture sector, poverty reduction, social development and regional development. Infrastructure projects require huge funds for its constructions, operations and maintenance; alone government is unable to invest the whole fund; hence, private financing is the best option for this. Private sectors not only invest huge funds but allocate the various risks and work among the associated parties of infrastructure projects, which facilitate to complete the project within the standard time. Contribution of private financing is at vast level mainly in developing countries like India. The status of Indian infrastructure is still in dire condition, it needs more funds and better operating techniques for its development. The present paper provided detailed explanation of all the concepts related to infrastructure and analyses the present situation of infrastructure in India. The structure of the paper is as follows: Section 2 outlined the objectives of the paper, section 3 enclosed with the brief introduction of infrastructure, section 4 described the role of infrastructure in various sectors, sector 5 covered the brief explanation of financing sources infrastructure, section 6 depicted the scenario of infrastructure in India, and the section 7 concluded the paper and presented the findings of the study.

2. OBJECTIVES OF THE STUDY

The key objective of the present paper is to analyse the status of infrastructure in India. Apart from these there are some other objectives of the study:

To explain the term infrastructure including its classification, characteristics and risks associated with its projects.

To describe the infrastructure financing sources.

To enlighten the role of infrastructure in different sectors.

To analyse the status of physical and social infrastructure in India.

3. CONCEPT OF INFRASTRUCTURE

Broadly, the term infrastructure covered all the services provided by physical and social infrastructure, such as

electricity, transportation, communication, education, healthcare, sanitation and water supply.

3.1 Definition of Infrastructure

There are many authors, academicians, and researchers have been tried to define the term infrastructure in their words, but still there is no particular standard definition of infrastructure has been declared. Here, in the Table 1, we are presenting some definitions provided by the various authors and annual reports.

Table 1: Definitions of Infrastructure

Sources	Definition of infrastructure
The Rutledge Dictionary of Economics (1995)	“The basic services or social capital of a country, which make economic and social activities possible by providing transportation, public health, education services and other facilities in which community activities can take place”.
Bhatia (1999)	“Infrastructure includes all those activities and amenities which help to increase the growth in production and income generation”.
Economic Survey of India (2005)	“An infrastructure sector covers the services of transportation, telecommunication, electricity, and other services such as water supply, and sanitation, solid waste management and urban transport”.
World Bank (1994)	It covers power, roads & bridges, ports, airports, railways, water supply, sewerages, communication, housing, urban services, oil/gas production and mining sectors as infrastructure.

3.2 Types of Infrastructure

Various economists, authors and academicians segregated the term infrastructure in two parts, such as physical infrastructure and social infrastructure. Physical infrastructure covers the sub-sectors of infrastructure which helps in increasing the production level at low cost which facilitates to economic development [8, 14]. On the other hand social infrastructure directly contributes its services to the community which improves the quality of life and increases the living standards of people [15, 19].

Table 2: Classifications of Infrastructure

Types of Infrastructure	
Physical infrastructure	Social Infrastructure
1. Transportation (Roads, Railways, Ports, Airports, Waterways, Bridges & Tunnels)	1. Education (Schools, Libraries, Universities, Laboratories, Educational institutions)
2. Communication (Telecommunication, Post-offices, Telephones, Towers)	2. Healthcare (Hospitals, Dispensaries, Healthcare Clinics)
3. Power (Electricity, wind mills, transmission & distribution, petroleum and natural gas)	3. Water and Sanitation (Potable water supply, Sanitation & Sewerages facilities, solid waste management)

3.3 Characteristics of Infrastructure

Six characteristics of infrastructure has been identified by The Rangarajan Commission in India, such as natural monopoly, high sunk cost or asset specificity, non-tradability, non-rivalness in competition, possibility of price exclusion and presence of externalities. Apart from the characteristics mentioned above, there are some other characteristics also revealed by several authors such as long gestation period, required huge investments, procedural delay, longer maturity, higher risk portfolio, fixed and low real returns, and capital intensive [1, 15, and 23].

3.4 Risks Associated with Infrastructure Projects

Infrastructure projects are too large in nature and it takes long time to complete; through all the stages it faces various risks such as construction risks, operational risks, financial risks, technical risks, and institutional risks [15, 18]. Various authors has been classified the infrastructure risks according to their nature. These are the following classifications:

1. Commercial risks: these risks are related to the construction and operation of the projects, such as construction risks, technical risks, environmental risks, operational risks, and revenue risks [16, 17, 21, and 31].
2. Financial risks: these risks are associated with the finance of projects, for example economic risks, liquidity risks, currency risks, equity risks, tax risks, interest rate risks, and refinancing risks [21, 31].
3. Country & Community risks: these kinds of risks created due to the legal and political situations of the country, and sometimes due to the thoughts of the civic, these are classified as riots, expropriation, and regulatory risks [12, 16, 17, and 31].
4. Force Majeure risks: risks under this category cannot be controlled by the parties of infrastructure projects, such as natural disasters, war and terrorism [12].

4. ROLE OF INFRASTRUCTURE IN VARIOUS SECTORS

Various studies revealed the role of infrastructure in different sectors such as agriculture, industrial, tourism, regional development, balancing income distribution, improving livelihood, poverty reduction and mainly economic development. Large number of studies has been empirically proved the positive impact of infrastructure on economic development. Here in this section we presented some studies which have been shown the impact of infrastructure on various sectors.

4.1 Infrastructure and Economic Development

Infrastructure is an effective factor of production, it supports to manufacturing activities which facilitates in reducing the cost of production. Infrastructure contributes in economic

growth both by increasing output and by providing services which develops the quality of life. Physical/economic infrastructure such as transportation, power, communication, and irrigation directly contribute in economic development; on the other hand social infrastructure such as education, health, water and sanitation, increases the capability of human capital which helps to increasing the productivity; ultimately, social infrastructure also plays a vital role in economic development. It has been empirically and conceptually verified the positive and strong connection between infrastructure and economic development. The above statement has been proved by the followings studies [8, 14, 20, 29, and 30].

Table 3: Impact of infrastructure on economic development

Authors	Sample countries	Study Period	Variables	Effect
Aschauer 1989	USA	1949-85	Public Capital	+ve
Munnell 1992	USA	1991	Transport infrastructure	+ve
Devaranjan 1996	LDCs	1970-90	Transportation, communication	-ve
Uchimura and Gao 1993	Taiwan	-	Transport, water and communication	+ve
Gracia Mila, McGuire 1996	Spain	1964-94	Public Capital	No effect
Roller and Waverman 2001	21 OECD countries	1971-90	Tele-communication	+ve
Sahoo and Dash 2009	India	1970-2006	Physical Infrastructure	+ve
Shah 1992	Mexico	1970-87	Transport, power, communication	+ve
Hulten & Schwab 1991a	U.S	1951-86	Public infrastructure	+ve
Cronin et al. 1991	US	1958-88	Tele-communication	+ve
Sahoo et al. 2010	China	1975-2007	Physical & social infrastructure	+ve
Canning & Fay 1993	96 countries	1960-85	Transportation	+ve
Roller & Waverman 2001	21 OECD countries	1970-90	Tele-communication	+ve

4.2 Infrastructure and Agriculture Development

In most of the developing countries, the main source of income is agriculture; and the production of agriculture depends upon the availability of infrastructure services. Infrastructure such as irrigation, rural electricity, water supply, tube wells, canals, rural roads, primary health facilities, education, and storage facilities plays an imperative role in agriculture development. Many studies have been conducted

to evaluate the impact of infrastructure services on agriculture and most of the studies found a significant and positive effect on agriculture development [5-7, 22, 26]. According to Pinstup-Andersen and Shimokawa (2006) insufficient infrastructure may be one of the main bottlenecks for the agriculture development. Hence, it is broadly proved that infrastructure such as irrigation facilities, road connectivity, adequate water supply, proper sanitation and sewerages facilities, storages, and fertilizer's sales depots etc. plays a vital role in agriculture development. Modern technologies help in improving the farming methods and increasing the production at low cost [5-7, 22, and 26].

4.3 Infrastructure and Poverty Reduction

Infrastructure and poverty has an inverse relationship. The pace of infrastructure development reduces the speed of poverty. Poverty is the main barrier in the path of economic development of every country. It can be reduced by equally distribution of infrastructure facilities to all community groups. The role of infrastructure in economic development was recognized in 1970s and 1980s, but its contribution in poverty reduction was identified in 1990s. Plethora of studies has been revealed the significant contribution of infrastructure in poverty reduction [2, 4, 13, and 24]. According to Brahmachary (2010), [8], poor community is surviving as an isolated segment and it cannot be a part of economic development until it gets job opportunities as well as sufficient infrastructure facilities. Providing employment to poor community helps to increase their living standards and makes their life economic and social stable [24]. Easily access of primary education and basic health facilities helps in improving their livelihood [25]. Basic infrastructure services such as education, health, transportation, electricity, potable water supply and sanitation facilities to poor people must be provided at low cost to reduce the poverty from any nation.

4.4 Infrastructure and Regional Development

Equal distribution of infrastructure services helps to reduce the regional misbalancing. Infrastructure plays a vital role in regional development. For the development of any region, some basic infrastructure facilities are required such as electricity, transportation, communication, healthcare facilities, education, sanitation and sewerages, gas distributions, whereas the uneven distribution of these services may be the cause of regional misbalancing [14]. Infrastructure development gives a positive impact on regional development, which is closely related to the economic growth and nation's development [33, 35].

4.5 Infrastructure and Income Distribution

According to Ghosh and De (1998) regional unbalancing is the responsible for unequal distribution of income. While, Calderon and Serven (2004) has proved that high quality of rural infrastructure helps in reducing the income inequalities. Various studies have been confirmed that developed

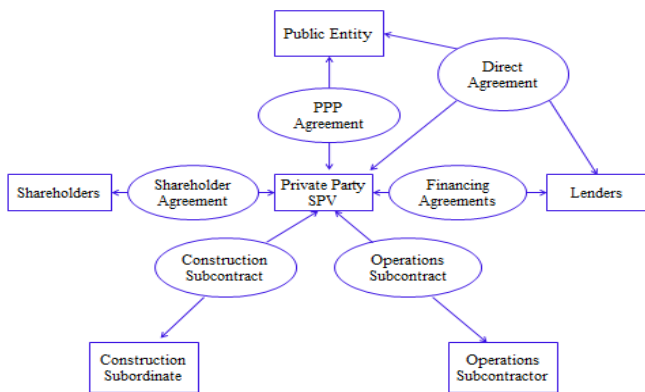
infrastructure reduces the income disparities [9, 10]. Ghosh and De (1998) specified the low investment in infrastructure sector is the beginning of all problems, such as unequal distribution of income, regional disparities and poverty. Therefore, to eliminate all these complications, there is one solution, which is to provide an adequate fund to infrastructure sector for its development.

5. INFRASTRUCTURE FINANCING

Finance is the life blood of any infrastructure projects. Without a sufficient finance, infrastructure planning is just like a paper pencil work. Infrastructure projects are too large in nature and it takes long time to complete, hence, it needs huge funds at every stage of its process (construction, operation, maintenance, and repairing. Before 1990, government was the alone investor in infrastructure sector and had all the responsibilities of its development; but due to lack of investments, infrastructure was in dire situation. Hence, after 1991 governments all over the world agree to allow private sector to invest in infrastructure sector. Private sector came not only with abundant funds but it has also better operating facilities and better risk allocation strategies. Here, in this segment we describe the financing sources available for infrastructure development.

5.1 Public Private Partnership (PPP)

PPP is a contract between two parties, one is government party and another one is private, according to which the private partner supplies the infrastructure services with the main objective is to earn profit, whereas government partner’s tried to provide an infrastructure services at low cost to the society with the primary objective is to make their better and improved livelihood. According to The Council for Public Private Partnership Canada (2004) PPP is a “cooperative venture between the public and private sector, built on the expertise of each partner, which best meets clearly defined public needs through the appropriate allocation of resources, risks and rewards” [3].



Source: Devan (2005)

Fig. 1: Contractual relationship between PPP parties

Other than the government and private parties, PPP has various other parties, such as shareholders, lenders, constructors, operators and financiers. Fig. 1 depicts the contractual relationship between the various parties of PPP. PPP also has some benefits such as it minimize the cost of life cycle of a project, better risk sharing strategies, faster completion of projects, improve service quality of infrastructure, reduced the overburden of government partner, and it has a specialized team in particular field [32].

PPP has various forms such as DBB (Design-Bid-Build), DBO (Design-Build-Operate), DBFO (Design-Build-Finance-Operate) and many more. PPP has been successfully contributed its financing services in these infrastructure sectors in India, such as roads (East Coast road, Mumbai-Pune Expressway, Coimbatore Bypass, Jaipur-Kishangarh); water supply (Tirupur project); Power (Vishnuprayag project, Sasan UMPP, Mundra UMPP); ports (Pipapav, Mundra, Krishnapatnam); airports (Hyderabad, Delhi, Mumbai); railways (Pipapav rail project, Kutch rail project).

Many literatures considered PPP as a best investment alternative for infrastructure development particularly in developing countries such as India.

5.2 Foreign Direct Investment (FDI)

Foreign Direct Investment refers to the funds provided by foreign investors, countries and units in another country; the entire supervision on that investment is continuing with the foreign investors [27]. FDI contributed its vital role in various sub-sectors of infrastructure such as telecommunication, healthcare, energy, roads, education, and water supply.

Table: 4 FDI flow to India: Industry wise

(US \$ million)					
Source Industry ↓	2010-11	2011-12	2012-13	2013-14	2014-15
Total FDI →	14,939	23,473	18,286	16,054	24,748
Sector wise Inflows					
Manufacturing	4,793	9,337	6,528	6,381	9,613
Construction	1,599	2,634	1,319	1,276	1,640
Financial	1,353	2,603	2,760	1,026	3,075
Real Estate	444	340	197	201	202
Electricity	1,338	1,395	1,653	1,284	1,284
Communication	1,228	1,458	92	1,256	1,075
Business	569	1,590	643	521	680
Miscellaneous	509	801	552	941	586
Computer	843	736	247	934	2,154
Rest. & Hotels	218	870	3,129	361	686
Retailers & W.	391	567	551	1,139	2,551
Mining	592	204	69	24	129
Transportation	344	410	213	311	482
Trading	156	6	140	0	228
Education	56	103	150	107	131
Others	506	419	43	293	232

Source: www.rbi.org.in

5.3 World Bank Group

It contributes a significant role in the growth of infrastructure sector of developing economies. It includes five institutions such as The World Bank, IBRD (The International Bank for Reconstruction and Development), IDA (The International Development Association), IFC (The International Finance Corporation), MIGA (The Multilateral Investment Guarantee Agency), ICSID (The International Centre for Settlement of Investment Disputes). All these institutions are working together in more than 100 nations; these institutions are offering finance, guidance and other solutions that facilitate to economies to identify the urgent challenges of development.

Table 5: Investments made by PPI in India (sector-wise)

Sub-sectors	Project count	US \$ million
Airports	7	5111
Electricity	356	141686
Natural gas	5	1015
Rail roads	8	7826
Roads	387	73530
Seaports	38	8636
Telecommunication	37	100231
Water & sewerages	14	605

Source: www.ppi.worldbank.org

6. STATUS OF INFRASTRUCTURE IN INDIA

There has been a rapidly increasing the apprehension about the worse status of infrastructure in India and scarcity of its financing resources.

Table: 6 Status of infrastructure in India (2001-2013)

Sectors →	Educati on	Healt h	Roads	Power
Years ↓	Total number of Schools	Total Allopathic government hospitals (no.)	Total Road length (National & State Highways, rural & urban roads) Km	Gross generation of electricity (in utilities & non-utilities)
2001	971054	-	3373520	560842
2002	1017159	-	3426600	579120
2003	1033863	-	3528654	596543
2004	1120487	-	3621507	633275
2005	1194300	-	3809156	665873
2006	1220728	-	3880651	697459
2007	1260004	-	4016401	752454
2008	1285991	-	4109592	813102

2009	1330778	-	4471510	842531
2010	1407959	12760	4582439	905974
2011	1399408	11993	4676838	959070
2012	1399185	23916	4865394	1051375
2013	1772927	19817	-	1111722

Source: <http://mospi.nic.in/MospiNew/upload/SYB2015/index1.html>

As we can see in Table: 6, infrastructure is increasing at very low rate in India. Due to lack of well operating and maintenance techniques it becomes in nastiest situation. For the improvement of its situation, government and policy makers have to focus on its maintenance and renovation rather than new constructions.

7. CONCLUSION

The present study described the term infrastructure in brief and also explained its types, characteristics, risks associated with infrastructure projects. Mainly this study focused on the status of infrastructure in India. Study found that the rate of infrastructure development is very low as compared to other countries. There are various resources available for infrastructure financing in India but PPP is the best source of financing; it brings a lot of funds as well as better operating techniques which helps to government in well maintaining infrastructure assets and overall development of infrastructure sector. Indian government and policy makers need to focus on to make better operating system for infrastructure sector.

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