Research Guru
Online Journal of Multidisciplinary Subjects (ISSN : 2349-266X)
Volume-13, Issue-1, June 2019
Impact Factor: 4.081
www.researchguru.net

A Study of Infrastructural Paradigm in India: Need, Problems and Prospects

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Abstract

Infrastructure occupies an important place for the development of any economy and for its efficient working. Development of physical infrastructure like roads, transport, airways, ports, railways etc lies at base of any sector, whether talking about agriculture, industrial or service sector. Infrastructure and its development have always attracted the attention of all the policy makers and planners. Even today, after several decades of our independence, the focus to the development of infrastructure has not reduced. For any kind of development or for reaping fruit of any direct productive activity (DPA), development of infrastructure focuses the first attention.Infrastructure and its development have been recognized as the key factor for sustaining the economic growth of any country and no country in the world can negate this fact. The present paper highlights, why there is need for the development of infrastructure in India, what is the current scenario of infrastructure in India, what are the problems in the way of development of infrastructure in India and what are the steps that are needed to be taken for solving these problems. For the same, paper uses an extensive study of literature and secondary data from different sources like World Bank Indicators, Census of India- 2001 & 2011, MNRE, report 2017,BP Statistical Review of world energy, 2016etc.

Key words: Infrastructure, DPA, problems, sustaining economic growth etc.

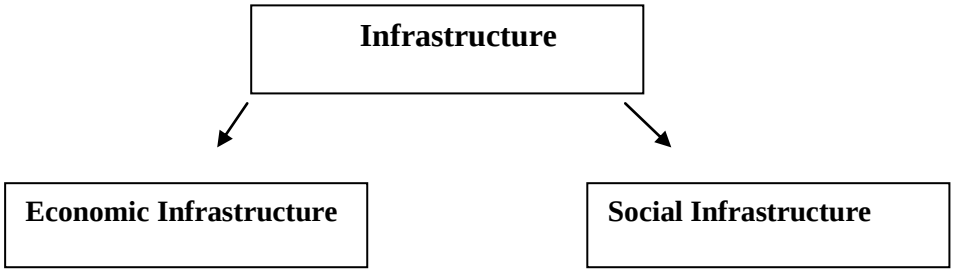
Introduction

Infrastructure is the base for every social, economic and human development. For every economy, infrastructure is very crucial for improving the quality of life, increasing employment, urban and rural development, reduction poverty reduction, improvement in the condition of the people, developing efficiency in investment, developing competitiveness in manufacturing sector, development of exports, etc. From the security point of view, development of infrastructure at the borders, connectivity with remote and hilly areas via transport and railway linkages is very essential (Dhanendrakumar, 2017). Development of basic infrastructure is very essential for rapid economic growth as well as gaining international reputation. Investment in infrastructure for any economy brings multiplier effect to the development of the country both directly as well as indirectly e.g. if in an area, there is development of road and transportation, there will be development of educational system, generation of employment, agricultural development via improvement in the connectivity to the places where the finished product will be sold, development of small scale industries, educational institutes etc(Aschauer, 1989; Easterly and Rebelo, 1993; World Bank, 1994; Röller and

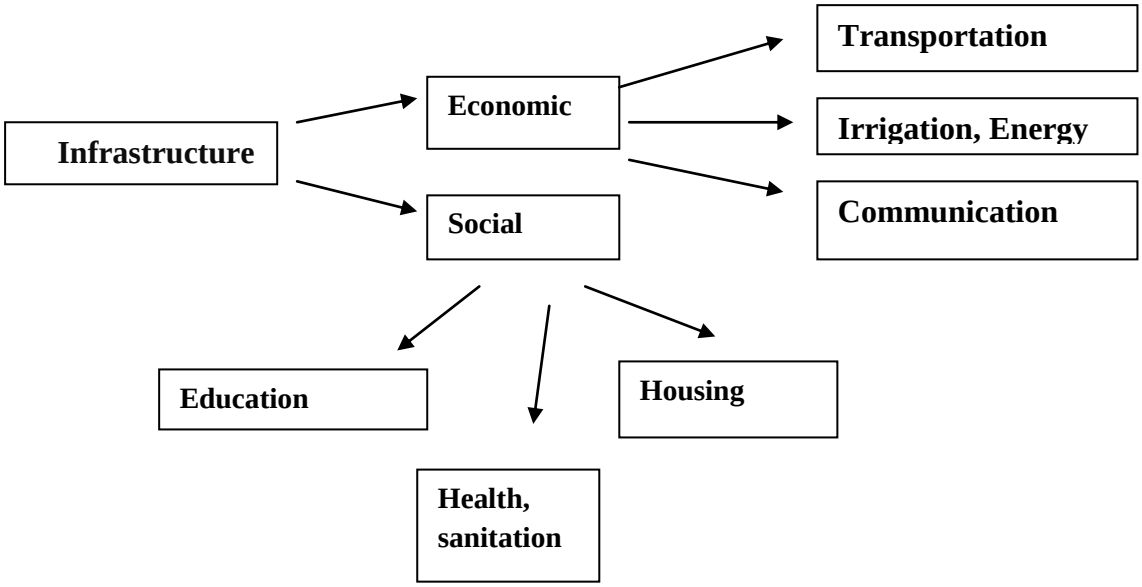
Waverman, 2001; Calderon and Serven, 2003; Canning and Pedroni, 2004;Estache, 2006, Sahoo and Dash 2008; Sahoo, and Dash, 2009, Agarwal, P. 2015).

Infrastructure is the system of public works in a country, state or region, including roads, utility lines and public buildings (United Nations, 2000). Infrastructure refers to the substructure or underlying foundation or network used for providing goods and services; especially the basic installations and facilities on which the continuance and growth of a community, state, etc. depend (U.S. EPA, 2009).

So, in simple words, infrastructure term is used for the basic physical systems of any nation which include transportation like roads, railways, communication, sewage, water and electric systems. These systems involve high-cost investments and these are very essential for any country's economic growth and development. Broadly, it can be divided into two type:



Economic and social infrastructure can be further be categorized into following types



Source: Author's own demonstrations

Economic Infrastructure: It includes irrigation, power, transport, communication and other basic facilities and services which directly supplement the process of production and distribution of an economy.It broadly includes the following:

- Transportation: Transportation like roads, bridges, cycle highways, rail, airports and ports.

- Energy: Itinvolves the production and delivery of energy including electric grids. Most nations are nowadays shifting attention towards sustainable energy sources like solar panels and wind.
- Water infrastructure: It include supply of clean water and management of the water resources.
- Safety & Resilience: It isprovided by Institutions and systems which allow a region to endure stresses like a natural disaster as earthquake detection systems, tsunami shelters and a resilient source of local food.
- Financial markets and services: These provide the support basic economic processes like raising capital, investing it, storing wealth, payments and managing the risk.
- The Basic technology: It involves the services like networks.
- Environment Systems: These include the whole systems which improvethe environmental conditions like rain gardens and green roofs.

  Social Infrastructure: Social infrastructure include education, health, sanitation and water management etc. which, in addition of achieving certain social objectives, are indirectly supplementing the various economic activities via spreading education via which scientists, technologists and engineers are produced which lie at the core for the development of any country. Social infrastructures like education and health are vital for the promotion of better utilization of human resources and physical infrastructure which itself is improving economic growth and quality of life (Hall and Jones 1999; DeandGhosh2003).Social infrastructure includes:
- Education and health Institutions: These are essential providing basic quality of life like hospitals and schools.
- Cultural institutions: These include museums that attract tourists and companies to a region.
- Rules, standards and regulations which are forwarded by Institutions are helpful in productive competition, stewardship of common resources and protection of quality of life are also part of social infrastructure.

Both physical as well as social infrastructure is important for the development of a country and there exist strong linkage between the two. Economic infrastructure, on one hand is an important determinant of domestic production while good social infrastructure, on the other hand is vital for both human development as well as for economic progress, providing better educated, better skilled, and healthier citizens (Agarwal, 2015).

Importance of Infrastructure

Good and quality infrastructures are very crucial for an all round development of an economy.It ensures not only for faster economic growth but also for an inclusive growth which means involvement of all and the benefits of growth being shared by all in a country. Steps towards inclusive growth are always helpful in the alleviation of poverty, reduction in income inequality in the country and are helpful in enhancing globalization; it means development of infrastructure is helpful in this regard. Infrastructure (Economic and social) are like basic wheels of development which are crucial for driving the vehicle i.e. our economy. In fact, for smooth functioning of any economy, deployments of Infrastructural facilities are very essential. Following points will highlight the importance of infrastructure in various fields:

In Agricultural sector: The basic infrastructure is very essential for agriculture and rural development. With the development of roads, transport and communication there is development network and channels through which the farmers get connected to the urban areas where they sell their products. In a study of 13 States in India, Binswanger [1993] observed that investments in any rural infrastructure, lowers transportation costs, increases the farmer access to markets and leads to a substantial agricultural expansion. In one of World Bank study conducted in 1994, it has been observed that the growth of farm productivity and non-farm rural employment are positively linked to infrastructure development. Besides it, development of infrastructure is helpful in commercialization of agriculture in rural areas [Jaffee and Morton, 1995].

In Industrial sector: For the Industrial production there is not only requirement of machinery and equipment but also a requirement- Energy, skilled manpower, management, banking, insurance and transportation services are crucial. Availability of these facilities will directly result in the development of the industrial sector of the economy.

In Employment Generation: Infrastructure and its development play a crucial role in the generation of employment opportunities. It improves mobility, efficiency and productivity of labour in an economy. Larger investment in infrastructure results in development of industry and agriculture, which further enhances the employment opportunities.

Improvement in Production and Productivity: Development of infrastructure like transportation facilities, health infrastructure, education etc. increase both production as well as productivity. Investment in infrastructure like development of science and technology as well as development of R&D is the basic building block which helps in improving the economic productivity.

India's Current Infrastructure Scenario

Every year World Economic forum come with, the Global competitive index framework which is built by taking into consideration 12 main drivers of productivity like Institutions, Infrastructure; Technological readiness; Macroeconomic context; Health; Education and skills; Product market; Labour market; Financial system; Market size; Business dynamism; and Innovation. It means infrastructure and its development has been given importance while ranking the countries. India got89th rank in basic infrastructure as per the Global Competition Report 2011-12 which has 71st in 2015 and further improved to 58th position in 2018-19. It means one of the basic pillar i.e. infrastructure is improving over years. Our economy being the second fastest growing country in the world but still we are lagging behind in infrastructure which is the main stumbling block in the way of its progress. This is the reason that infrastructure development has been always the priority of every government.

Road, Railways and Inland Water Ways in India

India is having the second largest road network in the world has a huge road network of over 5,903,293 kilometers i.e. 3,668,136 mi as of 31 January 2019. After 1995, government took major efforts to modernize the country's road infrastructure, which before were not paid heed to. The length of national highways in India over years has increased from 70,934 km (2010-11) to 101,011 km (2015-16) (MRT,

2018). Two biggest road developments took place in October 2017, when central government approved BHARATMALA PARIYOJNA, SETU BHARATAM Projects, covering an area of about 24, 800 kms with an estimated expenditure of about 3.85 lakh cr. This has been the second major development in NHs after the first policy of 1998 during Atal Bihari Vajpayee government which launched National Highway Development Programme (NHDP) with two components covering 5846 kms, under Golden Quadrilateral connecting four major cities i.e. Mumbai- Delhi Chennai and Kolkatta.

Talking about Indian Railways (IR), it is the fourth largest railway network in the world by size with a total of 67,368-kilometre (41,861 mi) route. Routes which are electrified with 25 KV AC electric traction while 33% are double or multi-tracked.IR has a total of 4,337 operating railway stations with operating on a multi-gauge network of broad, meter and narrow gauges. Indian Railways has been divided into 16 zones and Locomotives are consist of electric and diesel locomotive (IR, 2016-17).

Inland waterways in India cover rivers, canals, backwaters and creeks. In India the total navigable length is 14,500 km (9,000 mi), 5,200 km (3,200 mi) belonging to river and 4,000 km (2,500 mi) canals can be utilized by mechanized crafts. The total cargo moved (in tonnekilometres) by inland waterways was 0.1 percent of the total inland traffic in India which is very low in comparison to the 21 percent for the United States.

Roads are the lifeline of all the countries and proper connectivity as well as transportation is very crucial for the country as these help a common man to reach places faster. Government has been creating improved roads and highways under Sabarmala project. Similarlygovernment of India has giving a big push to the transformation in rail infrastructure as well as in land waterway routes via integrated transport network which will not only improve the transport capacity but to correct the transport modal mix that mostly has been imposing huge cost in Indian economy.

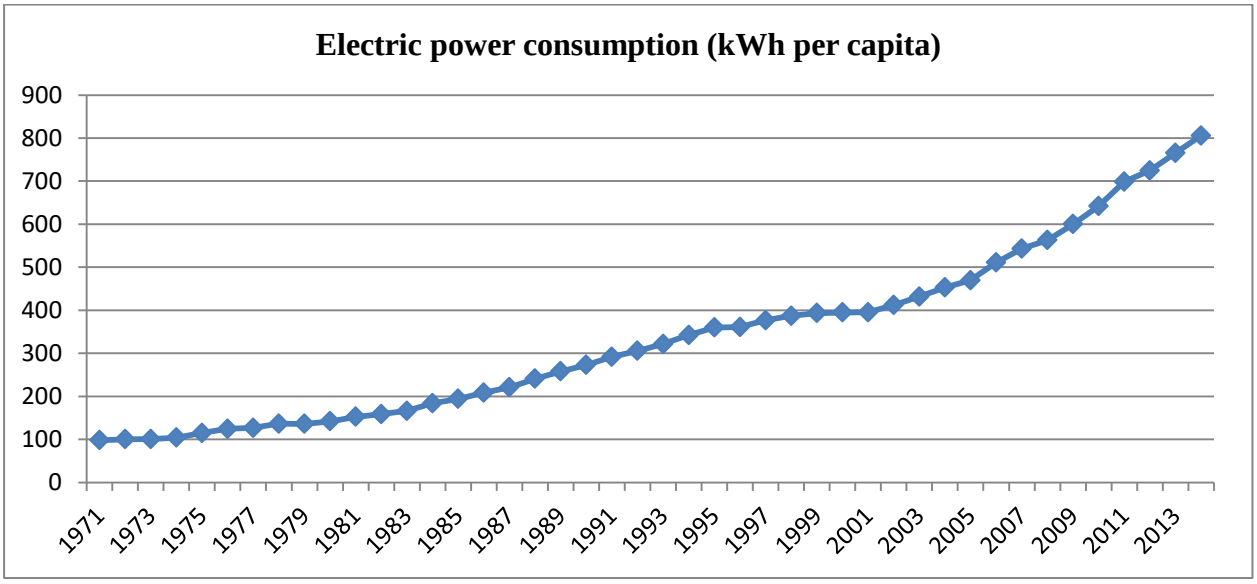
Power Generation in India and Shift towards the Renewable Energy

Inefficient utilization of the existing facilities in the power sector can have a ripple effect on the economy by resulting in low productivity, less sales and income erosion (Pradhan and Swaroop, 1993). India at present is the world's third largest producer as well as consumer of electricity. The utility electricity sector in India with one National Grid has an installed capacity of 350.162 GW as on 28 February 2019(CEA, 2019). During 2017-18, the total gross electricity generated by utilities in India was 1,303.49 TWh and the total electricity generation (utilities and non utilities) in the country which increased to 1,486.5 TWh (CEA, 2017-18) and the gross electricity consumption was about 1,149 kWh per capita in the year 2017-18 (CEA, 2017-18). During the last four and half years there is an enormous infrastructure development in every segment- in power generation be it generation, transmission or distribution. Changes in the electricity act along with new tariff policy have totally made paradigm change in the power sector. In the last four years,there is an addition of almost one lakh circuit kilometers to inter-state transmission capacity which has been connecting the entire nation to one grid. This has been for the first time that there has been One Nation- One Grid i.e. the whole network operating on one

frequency. On 28th April 2018, a major landmark has been achieved i.e. our country has achieved 100% electrification.

In Sep. 2017, with the aim of achieving universal household electrification, PM Narendra Modi announced the Sahaj Bijili Har GharYojna- Soubhagya i.e. most important feature of this scheme is simple, effortless or easy and Har Ghar i.e. inclusive universal electrification. The most important success of this scheme is that 2.5 crore households have already been electrified. In addition of providing connectivity, government launched an integrated power development scheme which aim at strengthening power infrastructure in urban areas covering- distributing network, metering of distribution, and automation of distribution sector. Our country has made tremendous progress in ease of getting electricity as we have jumped from 111thrank2014 to 24thrank in 2018.

Figure 1: Trends in per capitaelectric power consumption (kWh)



Source:World Development Indicators, 2018

Figure 1 shows that the access to electricity has been improving over the years. In the year 1990 only 43.3 percent of population had access to electricity which in 2015 improved to 88 percent of population having access to electricity. Even talking about the per capita Electric power consumption (kWh) has also increased over years as in 1971 it was98.05646 (kWh) has increased to 805.5992 (kWh) in 2014 which conveys an improvement in electricity sector (World Development Indicators, 2018).

Use of renewable Energy

In the recent times much stress has been placed on the use of renewable sources of energy. Countries of the world are day by day taking steps towards launching more solar power plants, biogas, harnessing wind energy etc. These are becoming attractive sources in the present scenario as these are linked with indefinite supply, low carbon emission, price stability in the energy market and various economic benefits. (Vandaele, N. et. al., 2015, Giraldo et al., 2014; Hidayatullah et al., 2011, Antahal& Batool, M. 2018).

India receives a solar energy equivalent to more than 5000 trillion kW/h per year, which is far more than its total annual consumption.The Prime Minister has launched on the 11th January, 2010, with an ambitious target of deploying of about 20,000 MW of grid connected solar power by 2022 which mainly aims to reduce the cost of solar power

generation in the country (Muneer et. Al 2005; MNRE, 2014, Batool M. &Antahal P. C. 2019).To make electricity clean and green, a road map has been developed to achieve 175 GW of solar power by 2022. The overall installed capacity of renewable energy has been doubled in the last few years from 34000 MW to 75000 MW which has resulted that India at present stands at 5th position in the use of renewable sources of energy (MNRE, 2017). Recently with a view of training 50,000 trained solar photovoltaic technicians by March 2020 Surya Mitra scheme has been launched and until 31st March 2017, a total number of 7500 Surya Mitra'shave been trained by 31.03.2017. (Batool, M. &Antahal, P., C, .2019). A number of initiatives like households LED bulb distribution programme- UJALA and SLNP have been replacing the conventional street lighting system. Government has been shifting the attention towards these renewable sources and there is more need to switch the attention from non renewable sources (Fossil fuels) of energy to renewable sources of energy (Habib, M., 2019).

Education

Education and health are the part of social infrastructure and are very essential to promote better utilization of both human resources and physical infrastructure. Up to 1.7 per cent of annual economic growth in East Asia from 1965 - 1990 can be attributed to the massive improvements in public health and education(Hall and Jones 1999; Wagstaff, 2002, DeandGhosh2003)

In Indian Constitution, free and compulsory education has been provided as a fundamental right to children between the ages of 6 and 14 and India has made tremendous progress in increasing the attainment rate of primary education. In 2011, around 75% of the population, from 7-10 years, was literate in comparison to around 19.3 % 1947. Various institutions like National Council of Educational Research and Training, State Government Boards of Education, Central Board of Secondary Education (CBSE) etc. are working.

The Midday Meal Scheme has been launched (largest programme in the world) to improve the nutritional status of school-age children nationwide, supplying free lunches on working days for children in primary and upper primary classes in government, government aided, local body, Education Guarantee Scheme which has been serving 120,000,000 children in over 1,265,000 schools.

The 12th Plan Document has fixed targets of 25.2 % Gross Enrolment ratio (GER) by 2017-18 and 30% GER by 2020-21. According to All India Survey on Higher Education (AISHE) 2017-18, the Gross Enrolment Ratio (GER) in higher education has increased from 24.5% in 2015-16 to 25.8% in 2017-18. (MHRD, 2017). For higher education various schemes for University and Higher Education have been launchedlikeRashtriyaUcchatar Shiksha Abhiyan (RUSA), National Research Professorship (NRP), National Initiative for Design Innovation, Establishment of New Central Universities, setting up of Indira Gandhi National Tribal University etc.

For Technical Education schemes likeIndian National Digital Library in Engineering, Science & Technology (INDEST-AICTE) Consortium,Sub-Mission on Polytechnics under the Coordinated Action for Skill Development, Scheme of Apprenticeship Training, Support For Distance Education & Web Based Learning

(NPTEL)etc. have been launched.Ayushman Bharat Yojna is also playing a good role in the promotion of medical education.

Table 1: Literacy in India (In % age)

Census year	Persons	Males	Females
1951	18.3	27.2	8.9
1961	28.3	40.4	15.4
1971	34.5	46.0	22.0
1981	43.6	56.4	29.8
1991	52.2	64.1	39.3
2001	64.8	75.3	53.7
2011	73.0	80.9	64.6

Source:OfficeoftheRegistrarGeneral&CensusCommissioner,India (website:http://censusindia.gov.in/)

From table 1 it is clear that the literacy rate in India has been improving as only 18.3% of population was literate in 1951, after many decades and efforts taken by GOI, it has improved to 73%. One of the factor that can be responsible for it is the increase in number of institutions imparting education at primary, secondary and tertiary level over years. Table 2 further highlights the fact.

Table 2: Number of institutions at primary, secondary and higher education

	(in hundreds)				(In absolute numbers)	
Level/ Year	**Primary**	**Upper Primary**	**Secondary**	**Senior Secondary**	**College**	**University**
1950-51	2097	136	NA	74	578	27
1960-61	3304	497	NA	173	1819	45
2013-14*	8589	4215	1335	1036	36634	723
2014-15*	8471	4251	1353	1093	38498	760

Source:OfficeoftheRegistrarGeneral&CensusCommissioner, India (website:http://censusindia.gov.in/)

From table 2, it can be clearly visualized that the number of institutions from primary to university level has been increasing over years. Besides increasing the number of institutions more expenditure on education has been taking place in order to convert the huge population into human capital as education is the only means of human capital formation.

Table 3: Trends of Government Expenditure on education (%age of GDP)

Year	1997	2000	2003	2006	2009	2012
Expenditure	13.32223	16.73051	12.4108	11.69371	11.1912	13.99212

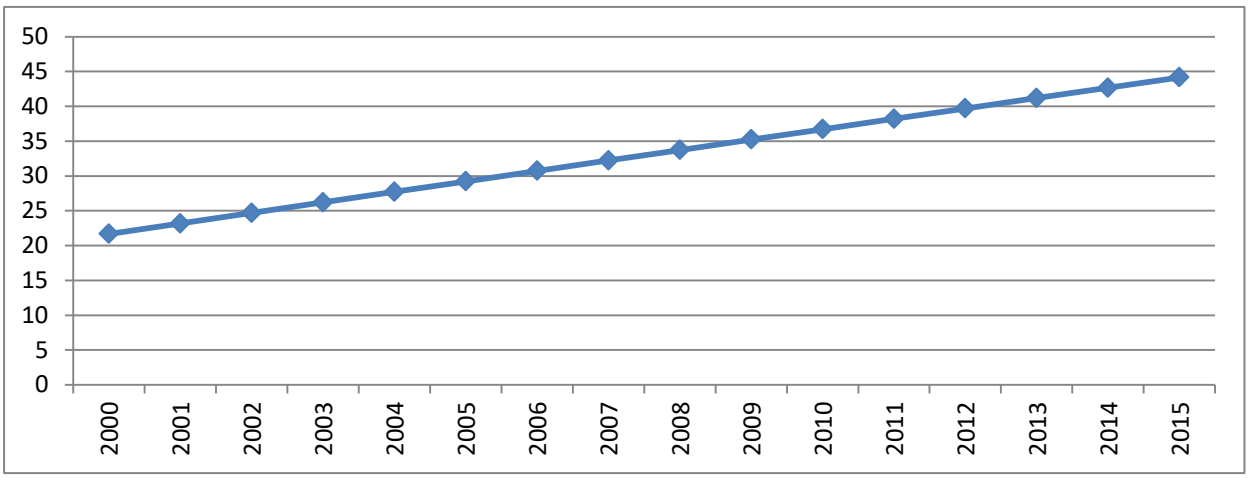
Source:World Development Indicators, 2018

From Table 3, it is clear that the expenditure on education of the total government expenditure has been showing a mix of ups and downs over years. From 1997 to 2000 percentage of government expenditure on education of the total budget expenditure had been increasing then after 2000 till 2009 this expenditure has been decreasing again after 2009 it has improved but still there is need to shift the attention towards education sector as it is the most productive expenditure which can make the country to reap benefits for generations.

Health, Sanitation and Safe Drinking Water

The basic infrastructure in the form of primary health care services, has been provided in both urban and rural areas of India. Primary health care services which include material and child health care services and family welfare services. Specialized health care services have been provided through hospitals in urban areas. There has been control over the deadly communicable diseases like Malaria, TB, small pox, leprosy AIDS, polio etc. Various Maternal and child health services have been provided to people in rural and urban area of India through existing health infrastructure. The services include prenatal and postnatal care, immunization and oral rehybration therapy to fight against diarrhoea. Universal Immunization Programme has been launched. Under this programme vaccination is provided against tetanus, polio, diphtheria, tuberculosis and measles etc.

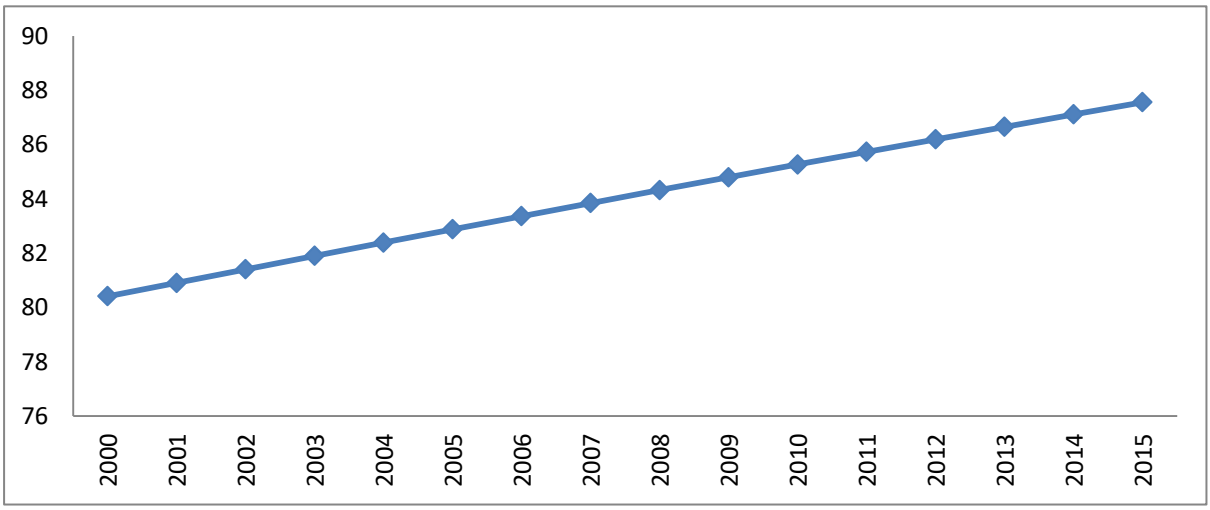
Figure 2: Trends of Basic Sanitation Services in India (% of total population)



Source:World Development Indicators, 2018

From the Figure 2 it can be observed that the population having basic sanitation facilities in India has been increasing continuously but still only 44.15 percent of population has been able to get this service and there is need to improve it.

Figure 3: People using Basic Drinking Water Services (% of population)



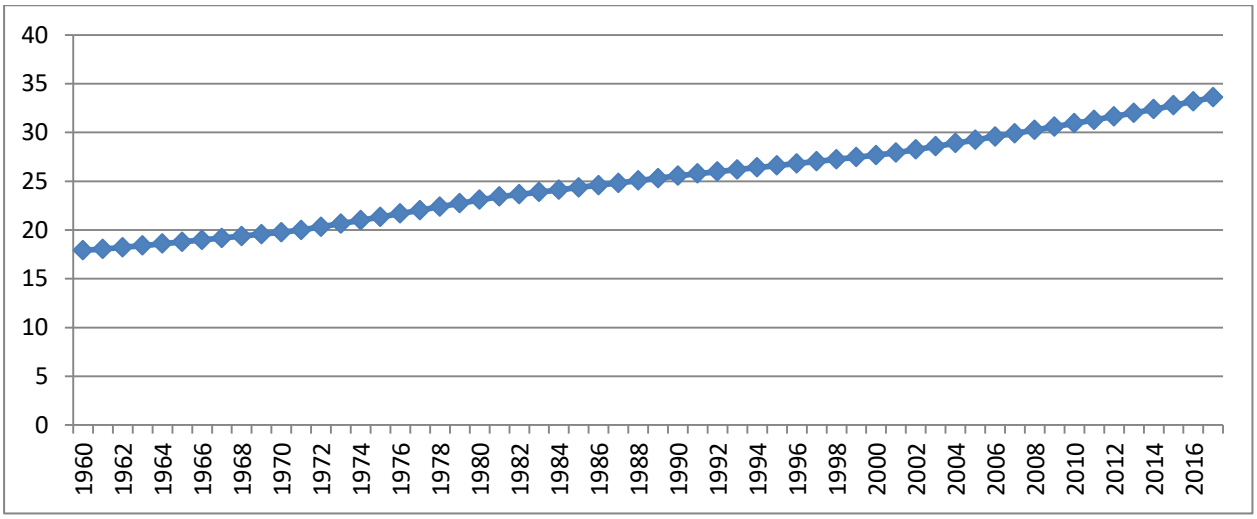
Source:World Development Indicators, 2018

From Figure it is clear that the People using at least basic drinking water services (% of population) has improved over years as in 2000 it was only 80.4% had an access to clean drinking water which has improved to 85.6 % of population in 2015.

Urban Development

Of the total 121 crore of Indians, 83.3 crore of people live in rural areas while 37.7 crore stay in urban areas which is about 32 % of the population (Census 2011).Various initiatives like decentralization and financial autonomy of urban local bodies called Swarna JayantiShahariRozgaryojna (SJSRY) in 1997**,** JNNURM(Jawaharlal Nehru National Urban renewal mission) in 2005, Rajiv Awas Yojana**,** launched in 2011 for creating "slum free India" have been working continuously. The twelfth five-year plan (2012-2017) proposed to consolidate JNNURM and envisaged its wider role in urban reforms and provisions like Urban infrastructure governance(UIG), covering the Rajiv Awas Yojana (RAY)etc are also working. For urban areas development, Smart cities mission has been launched on june 2015. The Ministry of India has been launching the Cities Investment toInnovate, Intergrate and Sustain (CITIIS) Challenge to collaborate with French Development Bank to invest in selected cities in key sectors of Sustainable Mobility, Public Open spaces, ICT etc. Atal Mission for Rejuvenation and Urban Transformation has also been launched mainly withan aim to provide basic amenities like water supply, urban transport, sewage etc to improve the quality of life of poor and disadvantaged people.

Figure 4: Trends in Urban population (% of total population)



Source:World Development Indicators, 2018

From figure 4shows an increase in percentage of urban population, in 1960 only 18 percent of population was living in urban areas which increased to 23 percent in 1980 and in 2017 it was 33.6 percent. It means the urbanization has been taking place but at smaller pace, still we have not achieved high level of urbanization as it is a positive sign of progress of a developing country like India.

Problems and Challenges of Infrastructure in India

India's infrastructure challenges are a major drag on economic growth. Infrastructure in India faces a lot of problems like- lack of affordability of consumers,

Social apathy towards infrastructure demand, Lack of development goals in quantitative terms, Political unwillingness, Institutional incapacity present in India, lack of private participation, Lack of project database, Lack of finance, Absence of proper assessment of projects for technical and financial viability.

There are large number of problems linked with infrastructure development like no proper land for development of infrastructure, fraud and inflation of costs, very long gestation processes, high price level, Unwillingness by officers to take any decisions, inflation, no rational competition, huge dependence on imports and FDI, no benchmarks to make out sense, non-coordination between ministries, between layers of governments, Poor agreements, no proper financial modeling skills, no well-equipped regulator, non-availability of mechanism for covering costs, risks and provide adequate assistant to make project viable, failure to implement the urban planning, more incomplete reform and very slow, delay in securing land for projects, progress in project implementation, more delay in getting approval from various regulators.

Investment in public education in India is very limited. Even after so many decades of keeping free and compulsory elementary education, still it has not been achieved 100%. Even after the rapid gains in various aspects like enrolment and attendance, average levels of educational attainment and basic skill acquisition, including (3 R's) reading, writing and basic arithmetic, still we are behind in attainment of full literacy which will is necessary to develop the human capital and there by contributing to the economic growth at an aggregate level (Hanushek and Woessmann 2008).

While investing in infrastructure one of the major problem has been the land acquisition which acts as a single stumbling block in the development of infrastructure due to which several projects have been stalled or delayed due to land acquisition issue.

Many projects in India find delay while in regulatory and environmental clearance. In health sector we have an inadequate and inferior infrastructure, poor public service delivery at the ground level, lack of quality choices for consumers and lack of proper access of health services for the poor as there is high dependence on relatively expensive privately provided services, heath expenditure by government is also too low, Adverse impact of user fees and privatization of health services.

Conclusion

The role of infrastructure in our economy can be presented in nutshell by the words of economist Dr. V. K. R. V. Rao, "The link between infrastructure and economic development is not a once and for all affair. It is a continuous process… and progress in development has to be preceded, accompanied, and followed by progress in infrastructure, if we are to fulfill our declared objectives of generating a self-accelerating process of economic development."So there is an urgent need to focus infrastructure and its development and steps should be taken on reducing the key challenges that are being faced by it. From an analysis of the trends of various development indicators like electricity coverage, educational expenditure, sanitation facility and basic water availability in the present study, shaft of light has been emerging as these reflect an improvement over time in the infrastructure of India but it is hapless that even today India has not achieved the level of infrastructure like that

of developed countries. As the availability of adequate socio-economic infrastructure is a basic requirement of the country various efforts should be made by government of India like allowing more public-private partnership in the development of infrastructure, developing welcome attitude towards FDI in infrastructure, more development of health infrastructure like the establishment of health institutions i.e. medical colleges, nursing homes, hospitals along with an easy availability of doctors and nurses, ensuring that unexploited power potentialities especially of the renewable sources of energy should be properly utilized.

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