

Conceptual Study of analyzing the impact of infrastructure on the economic condition of the India

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Abstract

Infrastructure plays a vital role in the growth and development of a country and its impact can be easily studied by analyzing the economic conditions of the people in terms of their consumer price index and its going to show its impact on the social conditions of the dwellers. Infrastructure is a broad term, so as to study its impact it is classified as social and economic infrastructure. Social infrastructure comprises of schools, hospitals, recreation places and many others which are for the welfare of people and Economic infrastructure means the Networking, transport, water supply, electricity supply and many other sectors which focus on improving the economic condition of the dwellers, focus on all these will surely help to reduce the cost of production and increase the productivity of the particular sector where investment is made. The study is done with the help of all secondary data, literature which helps us to know the impact of infrastructural development on the progress of India. Many studies using different econometric tools are already conducted outside India but such study is not conducted in India specially using any econometric tools. Study done in India are on the conceptual basis and all these studies can be further analyzed to reach a conclusion regarding the infrastructure.

Keywords: Infrastructure, OLS, literature,

Introduction

The role of infrastructure in spearheading economic development of a country and also setting its pace can hardly be over emphasized. Like a foundation in an edifice, the place of infrastructure as well as its soundness, are crucial to the nation's total development. The economic growth of a country has evidently happened hand in hand with the development of its infrastructure. To quote famous economist Dr. V.K.R.V. Rao, "the link between infrastructure and development is not a once 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 a self-accelerating process of economic development".

A sound infrastructural foundation is the key to the overall socioeconomic development of a state. This acts as a magnet for attracting additional investment into a state and thus provides a competitive edge to it over other states. Availability of adequate and efficient infrastructural set up not only promotes rapid industrialization but also improves the quality of life of the people. The all pervading importance of infrastructure would be more clear from the fact that it encompasses the whole spectrum of vital services such as roads, railways, civil aviation, shipping, power generation transmission, telecommunications, postal facilities and urban development. Adequate infrastructure facilities are an absolute necessity for rapid achievement of sustainable economic growth. Infrastructure facilities are like wheels of development without which the economy cannot function properly.

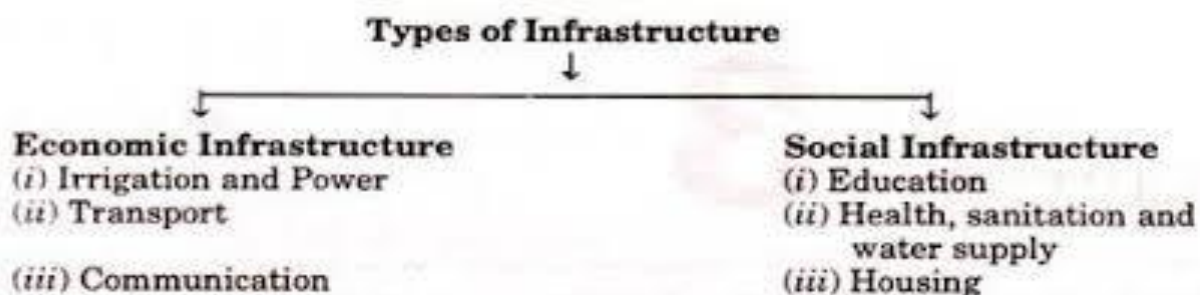
Infrastructure is the system of public works in a country, state or region, including roads, utility lines and public buildings (United Nations, 2000).

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).

Infrastructure is the basic facilities and services that are necessary for carrying out the economic activities and which help in the economic development of the country. These basic facilities do not produce goods and services but facilitate the production and distribution processes.

Infrastructure may be owned and managed by governments or by private companies, such as sole public utility or railway companies. Generally, most roads, major ports and airports, water distribution systems and sewage networks are publicly owned, whereas most energy and telecommunications networks are privately owned. Publicly owned infrastructure may be paid for from taxes, tolls, or metered user fees, whereas private infrastructure is generally paid for by metered user fees. Major investment projects are generally financed by the issuance of long-term bonds.

Hence, government owned and operated infrastructure may be developed and operated in the private sector or in public-private partnerships, in addition to in the public sector. In the United States, public spending on infrastructure has varied between 2.3% and 3.6% of GDP since 1950.^[1] Many financial institutions invest in infrastructure.



Economic Indicators of Infrastructure Development

1. Per Capita Electricity Consumption
2. Per Capita Energy Use (kg of oil equivalent)

3. Telephone Line Per 1000 Population
4. Rail Density Per 1000 Population
5. Air Transport,
6. Freight Million Tons Per Kilometer
7. Paved Roads As Percentage of Total Roads

Social Indicators of Infrastructure Development

1. Number of Hospitals Bed Per 10000 Population
2. Number of Hospitals Per 1 Lakh Population
3. Number of Primary and Middle Schools Per 10000 Population
4. Number of High Schools Per 10000 Population

Focus on all these sector will probably need a great concern because focus on these will have an impact on the economic sector and will led to the increase of GDP contribution of infrastructure and will have an impact on the social condition of people living in the particular area.

Quality of infrastructure in India and in peer countries

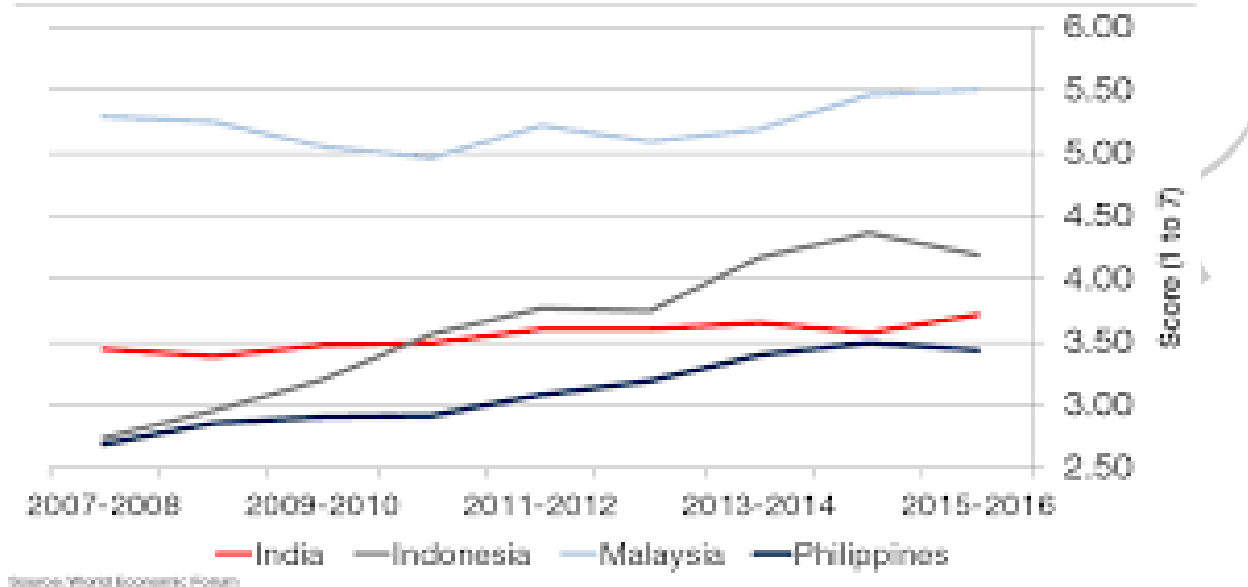


Fig 1. Graph showing the comparative data of infrastructural development of India with other countries

The above picture shows the infrastructural scenario in India with comparison to other countries and it clearly states that the situation of infrastructural growth in India is very poor and its not able to fulfill the present need to growth and development dur to which the full utilization of resources is not done and this would also led to unemployment and further the position of India would be at a critical stage. Graph clearly states that the infrastructure of Malaysia is from the year 2007-2016 is upgrading and this also states that the investment made in this sector is also done at its fullest level which acts as a base of other sector too, then comes Indonesia with slowly upward moving graph from the time period of 2007-2016 and this shows that the emphasis is made by the government towards the improvement of this sector which had surely bought the improvement in the GDP contribution of this country

and now moving on to India with a dwindling movement of infrastructure this show the importance given to this sector in India and due to which the progress of country is somewhere hampered and it also shows that India do not contribute much towards this sector and this is the reason that India’s growth and development is hampered.

Trends of Infrastructure Development in India

Figure 1 : Share of Infrastructure in GDP

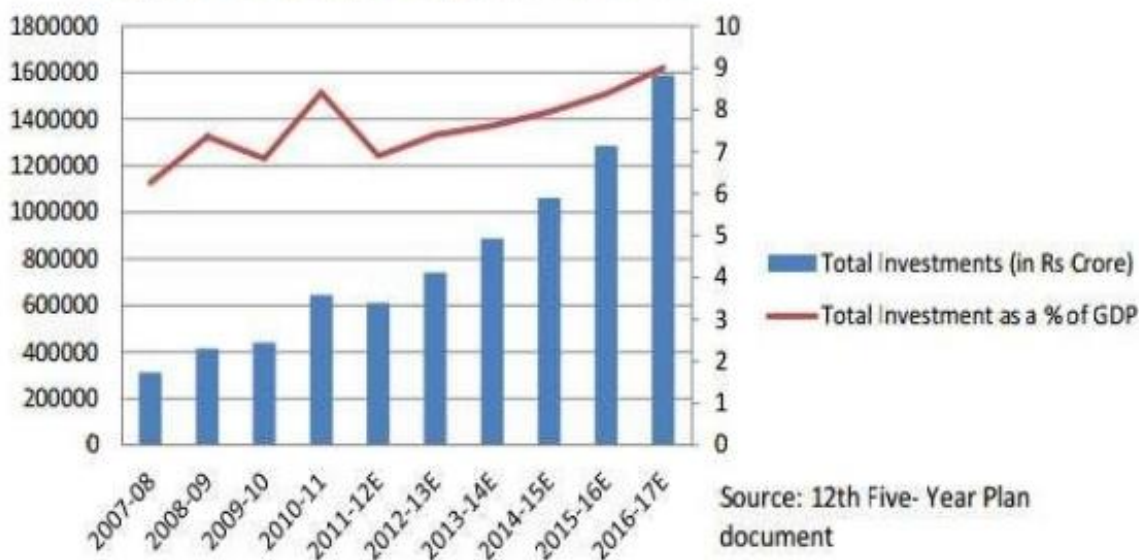


Fig 2. Graph showing the trends of infrastructural in India from the past 10 years

After the comparison of India’s infrastructural development with other countries, there is a comparative data of India’s infrastructural growth from the last 10 years i.e. from the year 2007-2017 and it clearly depicts the changing pattern of India’s infrastructure, the growth increased from the year 2008-2009 and then again shows a decreasing trend and further increases again till 2010-2011 the again decreases till 2012-2013 but after this it shows an increasing trend ,this shifts our view that government is slowly and gradually increasing its investment in the sector which is going to benefit India in the long run, because it is going to change the trend of production and the availability of products in the market will change and this could be better studied in the Schumpeter’s innovation theory.

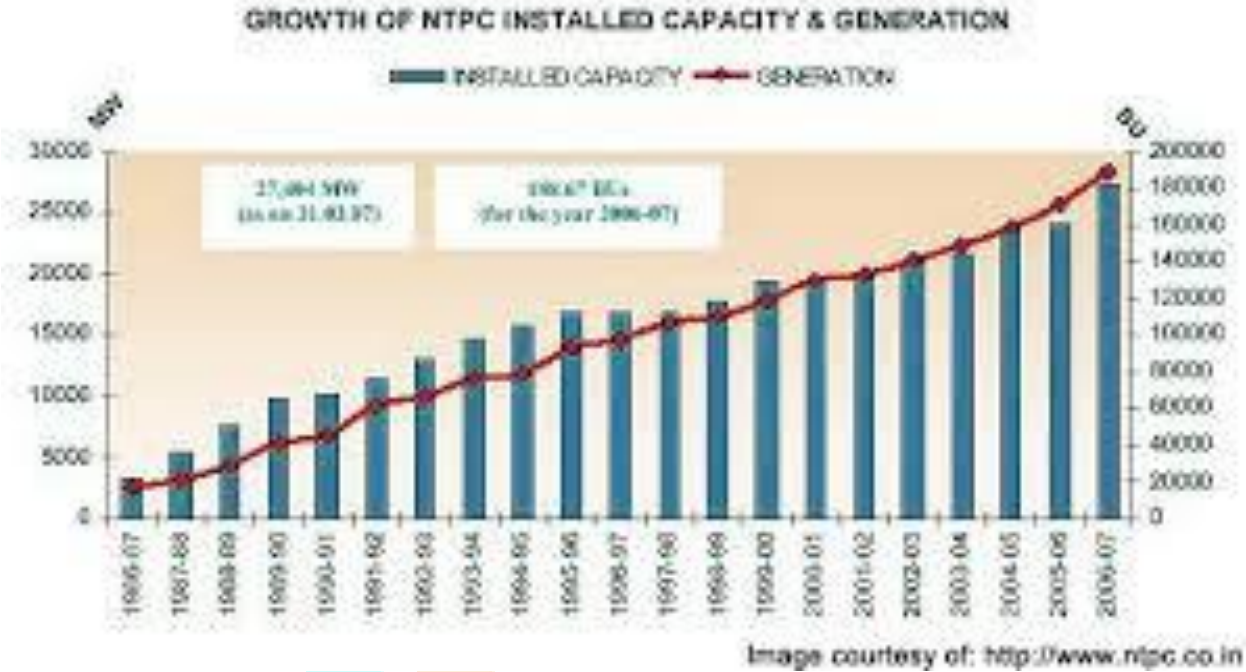


Fig 3. Graph showing the increasing trend of NTPC installed capacity and generation

Graph showing the increasing trend of installed and generation capacity of NTPC i.e. National Thermal Power Capacity generation. Electricity generation is an important contributor of economic infrastructure and increasing productivity of this sector shows the increased investment in the sector and this growing investment if surely going to be have a positive impact on the Indian economy. Economic infrastructure some where acts as a base of development of social infrastructure.

Total Number of Telephone Subscribers in India (million)

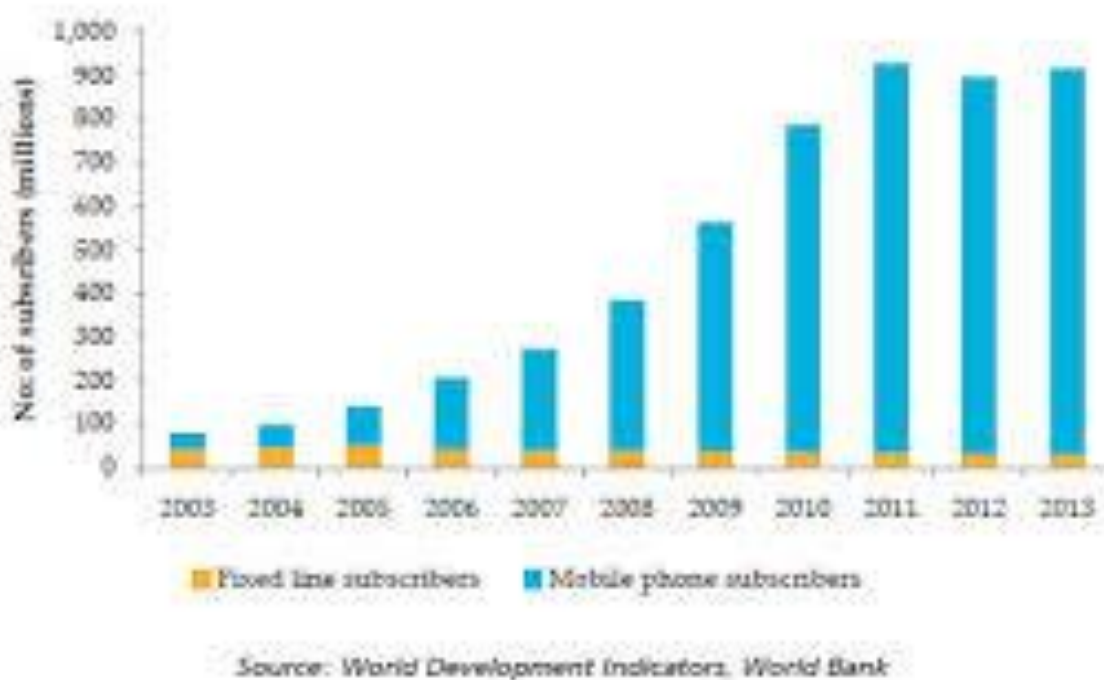


Fig 4: Graphs showing the increasing trend of telephone subscribers in India

The above data from the year 2003-2013 shows the increasing use of fixed line subscriber and mobile phone subscriber and it again comes under economic infrastructure and this increasing use of mobile phones and fixed line subscriber shows that the interaction gap between the people is decreasing and they are able to receive the information in the more faster mode and this help them to react towards the situation in the faster way and but this data is till the year 2013 but this is 2018 and we know that everyone is using mobile phones and it has helped in faster distribution of information but focusing on the digitalization scheme of our honorable Prime Minister ,he too has to take initiative to launch campaigns so that information is properly distributed among the rural people which helps in building the social and economic infrastructure.

Rural Healthcare: Challenges



Fig 5: Picture depicting the challenges of health infrastructure

Pyramid shows the basic problem of rural healthcare in India and we are all very well aware that our health sector is not so accomplished that it could all the requirement of people suffering and these challenges of the sector can be categorized as rural people challenges and organizational challenges and the organizational challenges explains the problem of distribution and reaching of the people concerned i.e. doctors, nurses, medicines, it also focuses on recruiting more manpower and also creating awareness among the people and it contribute in building the social infrastructure which helps in building the healthy environment for the people to live.

Objectives

Major objective of the paper was to analyze with the help of literature that does investment in infrastructure plays any role in growth and development of the country.

Methodology

Method used for the collection of data which helped in attaining the objectives of the paper was with the help of newspapers, Google, magazines and previous research papers which played a vital role in collecting secondary data.

Literature Review

- INTERNATIONAL ASPECTS OF PUBLIC INFRASTRUCTURE INVESTMENT (Spiros Bougheas et.al (2000)):** This is a discussion paper by the scholar and professors from University of Nottingham, and their work focuses on the investment in public infrastructure and further its effects is analyzed on the long run and this is done with the help of econometric tool. The theories proposed by economists of the discussion paper have been tested by econometric tools and equations were made and these equations were further tested to draw the conclusion i.e. the current paper takes the argument several steps further. Most importantly, it addresses the question of whether the equilibrium level of infrastructure would be optimal. The answer to this question not only has significant implications for international policy coordination but also fills an important gap in the existing literature on infrastructure which has not, so far, provided theoretical models to explain why public infrastructure may be supplied at sub-optimal levels. Furthermore, the generalized nature of the model, particularly the relaxation of symmetry, provides better scope for empirical testing.
- The Role of Infrastructure in Economic Development(Naoyuki Yoshino , Masaki Nakahigashi(2000) :** This is a chapter dealing with the study explaining the role of infrastructure in economic development and there are also sub topic which deals with its effect on productivity The estimation method sketched out below follows Yoshino and Nakajima(ed.) (1999). The effect of infrastructure on productivity is defined here as an increase in the potential productive capacity of the private sector. The private sector is assumed to engage in production activities given infrastructure and based on profit maximization. The production technology of the private sector is represented by the following production function. $Y = f(KP, L, KG)$ (1)
 where Y denotes output (in value added) in the private sector. The output is produced by combining private capital stock, KP, labor input, L, and infrastructure stock, KG. In this paper, we assume the translog production function. $\ln Y = \alpha_0 + \alpha_K \ln KP + \alpha_L \ln L + \alpha_G \ln KG + \beta_{KK} \frac{1}{2} (\ln KP)^2 + \beta_{KL} \ln KP \ln L + \beta_{KG} \ln KP \ln KG + \beta_{LL} \frac{1}{2} (\ln L)^2 + \beta_{LG} \ln L \ln KG + \beta_{GG} \frac{1}{2} (\ln KG)^2$ There are instances where models derived from the production function ,further it also lays a details of effect of infrastructure on productivity in Thailand and Japan ,correlation between poverty and infrastructure is also laid down and this is analyzed with the help of regression analysis .After this the conclusion drawn was First, infrastructure did have an effect on productivity in both Thailand and Japan, but it differs, depending on particular infrastructure in different industries. Second, to examine the effect of infrastructure on income disparities, Gini coefficient was used and tried to find the relationship between per capita income level and infrastructure. The evidence

points toward no direct relationship. Infrastructure also effect production activities in the developing countries, implying a close relationship between infrastructure and economic development. Growth theory has often argued that the development of infrastructure is not an effective tool.

- Infrastructure Development and Economic growth: Prospects and Perspective (Dr. B. Srinivasu, P. Srinivasa Rao,2013):** Research work by the authors focuses on the correlation between infrastructural development and economic growth by comparing the investment data of other developing countries and also analyzing its impact on the major infrastructural pillars and finally concluding that Infrastructure services are essential to achieve development targets in any economy some of its major dimensions include the level of economic growth, level of education, level of health services, degree of modernization, status of women, level of nutrition, quality of housing, distribution of goods and services, and access to communication. But neither human well- being nor of economic growth is possible only through the provision of economic infrastructure as well as social infrastructure. Health and education along with support infrastructure such as shelter, sanitation, power, telephony, and road connectivity that can give economic growth a human face. By improving the quality of human resources and enhancing capability, these indicators act as stimulants to growth. As K. C. Pant rightly said, “Infrastructure sector may not always be an engine of growth directly but they are essential rails on which the wheels of economic progress can proceed with sustained speed. Without a strong and viable infrastructure, it is difficult to achieve rapid and sustained growth of the order of 7 to 8 percent, which is necessary for progressively eradicating poverty.”⁵⁰
- GROWTH AND INFRASTRUCTURE INVESTMENT IN INDIA: ACHIEVEMENTS, CHALLENGES, AND OPPORTUNITIES (Aswini Kumar Mishra et.al 2013):** The paper analyses the recent scenario of infrastructure investment in India, with the recognition that inadequate infrastructure is one of the major constraints on India’s ability to sustain high GDP growth. It conducts an overview of the trends in infrastructure investment from the 10th Five Year Plan onwards, and tries to examine the linkage between infrastructure and economic growth. The results exhibit a very high the recent scenario of infrastructure investment in India, with the recognition that inadequate infrastructure is one of the major constraints on India’s ability to sustain high GDP growth. It conducts an overview of the trends in infrastructure investment from the 10th Five Year Plan onwards, and tries to examine the linkage between infrastructure and economic growth. The results exhibit a very high rate of return and also highlight that, since resource constraints will continue to limit public investment in infrastructure in other areas, Public Private Partnership (PPP) project-based development needs to be encouraged wherever feasible, in this research question are concluded with the help of a model i.e. we use here an aggregate production function, which can be written in the form:

$Q=A^* F(K,L,I)$ where A^* is the factor productivity represented by the state of technology, K is the stock of capital, L is the labour force, and I is the amount of infrastructure investment.

Using the Cobb-Douglas form $Q = A^* K^a L^b I^c e^{ul}$, Now, writing (2) in logs gives:

$$\ln Q_t = \ln A^* + a \ln K_t + b \ln L_t + \delta \ln I_t + U_t$$

Here the interpretation of production elasticities α , β & δ is tricky. If one assumes that labour and private capital are paid as per their productivities and finds $\delta > 0$, $\alpha + \beta = 1$ and $\alpha + \beta + \delta > 1$, so that returns to scale are increasing.

As far as second research question is concerned, Principal Component Analysis (PCA) technique has been used to discover the important sector-specific infrastructure investment.

- INFRASTRUCTURE, SPECIALIZATION AND ECONOMIC GROWTH (Spiros Bougheas et.al 1999):** Paper introduces infrastructure as a cost-reducing technology in Romer's (1987) model of endogenous growth. It show that infrastructure can promote specialization and long-run growth, even though its effect on the latter is non monotonic, reflecting its resource costs. It too provides the evidence using data from the US Census of Manufactures which suggests that the degree of specialization is positively correlated with core infrastructure, as predicted by the model. The paper also provides evidence from cross-country regressions, using physical measures of infrastructure provision, which shows a robust non monotonic relationship between infrastructure and growth.
- Infrastructure and Regional Development in the People's Republic of China (Zhijun Zhao Toshiki Kanamori, 2007):** This is a discussion paper from Asian Development Bank Institute; This paper investigates the relationship between infrastructure and rural economic development. It begins by reviewing the progress of Chinese economic and rural reform and analyzes the challenges faced by the government of the People's Republic of China (PRC). Then, based on the review, an endogenous growth model is created to show the channel and mechanism of public infrastructure impacting production and consumption. Next, an empirical study is carried out in order to identify the role of different kinds of infrastructure in rural development. The paper also discusses the interaction between institutional arrangement (soft infrastructure) and hard infrastructure. Finally, some suggestions and implications beneficial to the rural development of the PRC are drawn from theoretical and empirical studies.
- Infrastructure in India A vast land of construction opportunity(Report of infrastructural growth in India from Price Waterhouse Cooper(PWC)),2008:** This is a report of infrastructural growth in different sectors like railways, roads electricity which are the basic components of infrastructure in India and also focuses on the position of India in relation to these factors and also states the importance of infrastructure in increasing the FDI, focuses on various opportunities in the different sectors of growth i.e. Roads and highways, Rail Ports and airports, Power, Public private partnerships.

- **Socio-Economic Impact of Infrastructure Investments (Vytautas Snieska, Ineta Simkunaite, 2009):** This paper reviews the existing scientific literature analyzing theoretical and practical results of infrastructure impact on social and economic development. There is no unique concept in scientific literature for determining the notion of infrastructure, for distinguishing and measuring its components and various models which provide different results are used for measuring the impact of infrastructure. Lack of unique methodology in academic literature hinders evaluation of the infrastructure investments impact on social and economic development. The analysis of infrastructure development impact is based on three main factors: definition of infrastructure, determination and measurement of its components, formation of a model for evaluation of the impact. They are crucial for accurate testing of the impact of infrastructure investments. The authors of the paper present scientific approaches on these factors and provide hypothetical test of the impact of infrastructure on the development in the Baltic States: Lithuania, Latvia and Estonia. Statistical measurement of relationship between infrastructure and economic growth determinants in the Baltic States proved that several variables are not enough to evaluate the impact of infrastructure on development.
- **On the economic effects of public infrastructure investment: A survey of the international evidence (Alfredo Marvão Pereira et.al, 2010):** It's a working paper, to present a comprehensive discussion on the empirical research on the impact of public investment in infrastructure on economic performance in terms of the methodological approaches, method employed for the work was with the help of autoregressive model and with this it reveals some important areas for future research and highlights the natural convergence of the literature with the macro literature on the effects of fiscal policies.
- **Study Of Infrastructural Development Of Energy Sector In Indian Economy (Subharani Basin et.al, 2014):** Research papers discuss that impact of investment in infrastructure in economic growth and development but this paper discusses its need for sustainable and inclusive economic growth. It is critical for the effective functioning of the economy and industry. The key to global competitiveness of the Indian economy lies in building a high class infrastructure. To accelerate the pace of infrastructure development and reduce the infrastructure deficit, the Government has initiated a host of projects and schemes to upgrade physical infrastructure in all crucial sectors. Despite several challenges, the positive results of the Government's initiatives are showing in some sectors.
- **INFRASTRUCTURE AND ECONOMIC GROWTH (SHADMANOV SHUKHRAT SHERKULOVICH)(2015) :** Paper details with the theoretical aspect of the infrastructural investment and the major research questions are "What do you mean by infrastructure, its impact on economy, and the major discussion was on the empirical evidence off the questions which concludes that, other than providing an immediate demand-side economic stimulus, public infrastructure investment has a

significant, positive effect on long term output and growth This long term output and growth elasticity of infrastructure is important. This impact comes through inputs' productivity and cost reduction which not always means increase of GDP. Productivity through decrease of costs might imply increase of production and hence the GDP, at the same time it decreases prices if the competition is in place which means decrease of GDP. Both cases positively impact the human wellbeing but not the GDP. As it implies many of the benefits of public investment are difficult to measure, and are not always included in the calculation of Gross Value Added and further states that the cost benefit analysis of any project would surely help us to know the importance of any project and help in analyzing the impact.

- **The impact of infrastructure on productivity: new estimates for Québec (Dorothee BOCCANFUSO et.al., 2015):** Many economists previously have worked to find a correlation between the infrastructural investment and its impact on productivity ,economic growth and this practice have been started after the work of Aschauer (1989a) and Munnell (1990),This paper uses dual approach to model ,for the contribution of public spending in infrastructure in the province of Quebec , which is the same approach that was proposed by Harchaoui and Tarkhani (2003) and applied to the Canadian economy. The data of Quebec economy was used to measure the contribution of public capital to sectoral economic growth for the 1997-2002 periods. Further the result confirms a positive relationship between public capital and economic growth albeit of smaller magnitude than those estimated in Harchaoui and Tarkhani (2003).

Conclusion

After having a deeper knowledge about the definition of infrastructure, its types and its data related to roads, electricity supply in India , contribution of infrastructure in different sectors highlights its role which are given below:

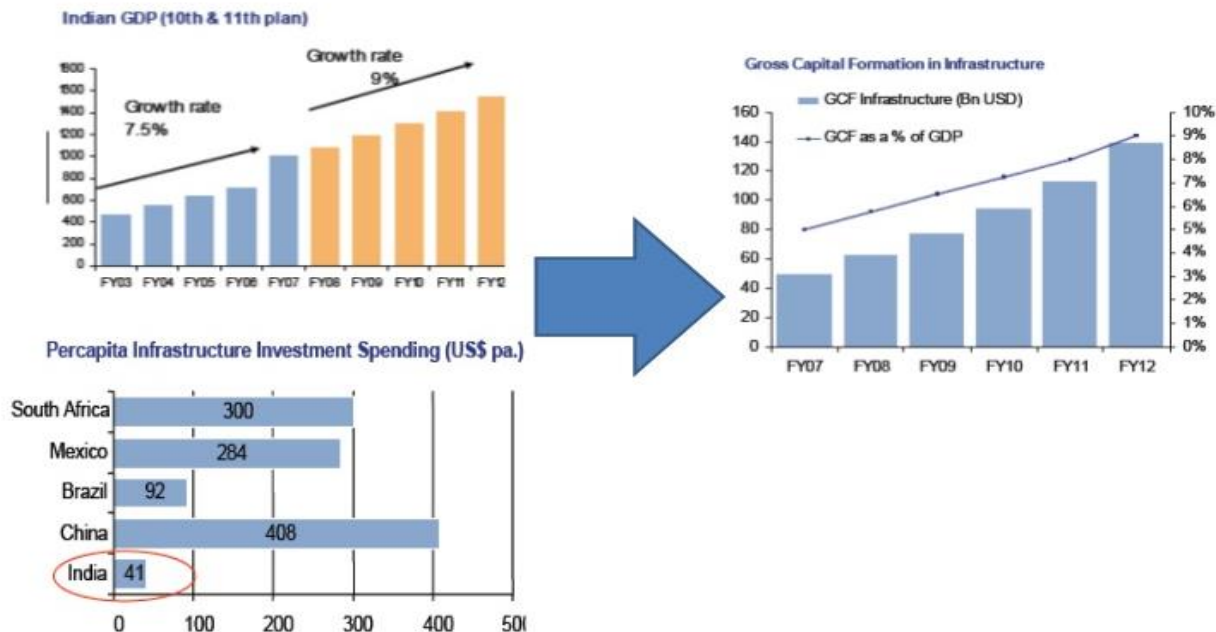
Role of Infrastructure in development

- Contribution to National Income
- Employment Generation
- Urbanization
- Attract FDI , PPP Initiatives
- Capital Formation
- Rural development
- Entrepreneurship



These roles of infrastructural growth, clearly mentions what can be changed in India if we focus on it. After the review of literature it came out that no such important work has been done in India and the work which has been done are only the theoretical studies, no empirical study is done which could help in finding the correlation between infrastructural growth and its impact on growth and development of the country.

Large Increased in infrastructure investments required to sustain growth



The above figure explains the investment in infrastructural growth is very much required for a sustained growth and comparison laid down between the countries explains that India shows a very less growth in infrastructural growth as compared to other countries, that means India need to focus more on infrastructural growth for the betterment of its people.

Problems in Indian Infrastructure

- Land acquisition
- Funding constraints
- Post-award changes in the scope of the project
- Poor planning and execution
- Delays in clearances
- Population



Review of literature also focuses on the problems of Indian Infrastructure that is land acquisition, funding problem which creates a lag in the development and this lag created due o poor funds takes time to be fulfilled and also increased population also plays a vital role in the delay which is caused in the growth because government focuses on fulfilling the basic

requirement of people and they lack in focusing the infrastructural growth but it could better be attained if both public and private welfare companies come together and work.

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.”

(Dr. V. K. R. V. Rao [noted Indian economist, early 1980s])

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