
PSYCHO ANALYSIS OF INFRASTRUCTURAL DEVELOPMENT OF ENERGY SECTOR IN INDIAN ECONOMY

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ABSTRACT

Some traditional economic multipliers and nontraditional economic multipliers like energy multiplier, infrastructure multiplier etc. in order to assess the impact of India's economic growth. Input-output technique has been adopted as a method of analysis. This paper is an attempt to estimate output multiplier and energy multiplier as discussed in the literature. In addition, given the need of the hour, specific formula for infrastructure multipliers related to input-output theory has been put forward. Also, output, energy, and infrastructure multipliers for Indian economy are estimated and interpreted. In this changed economic environment the findings of infrastructure and energy multiplier will help the economic planners to evaluate development alternatives in a logical and quantitative manner. This is because the multiplier analysis would enhance our understanding through estimates of the effects of a change in the direct use of energy and infrastructure on total energy and infrastructure use. Once the information regarding infrastructure and energy multipliers are known for various sectors economic planners can better evaluate development alternative in a logical and quantitative manner.

KEY WORDS: Indian economy, economic planners

INTRODUCTION

The development of economic infrastructure requiring huge investments and longer gestation period is the prerequisite for industrialization and economic development of the newly developing economies like India. Energy being an important ingredient of economic infrastructure and pre-condition for the accelerated pace of economic development, needs huge capital investment in the initial years. In the context of labour-intensive, capital-scarce, technologically deficient and industrially under-developed Indian economy, it was conceived by Indian leaders even before the Independence, that economic irrigation needs of rural India alone justify rural electrification of the Planning Commission as well as two studies of the National Council of Applied Economic Research of Punjab and Kerala throw considerable light on these benefits. Apart from the energy requirements for irrigation in agricultural sector in India, as in many third world countries, "Production of fertilizers and mechanisation of cultivation, the manufacture of capital goods for agriculture in large scale industries and transportation of surplus products to the marketing centres will also call for an increasing use of commercial power. Thus, adequate application of energy to agriculture not only increases productivity of land and labour but also reduces human drudgery and open avenues, for inter-dependent agro-industries. In India context, large scale dependence on left-irrigation due to uncertainly and seasonal character of monsoon rainfall, inadequate and unassured availability of surface water supplies, on account of under-developed irrigation infrastructure, power becomes indispensable factor for sustained agricultural growth which is the dominant sector of Indian economy.

INFRASTRUCTURE, GROWTH: INDIAN CONTEXT

However, the importance of infrastructure goes far beyond its impact on growth. It speeds up the nations production and distribution of economic output as well as to its citizens" overall quality of life. It is often said that infrastructure can be considered, if not the engine, then the wheels of economic growth. This is one part of the infrastructure story. The other part is that infrastructure helps to spread the benefits of growth, which makes the development process more inclusive. Lack of such infrastructure facilities is considered to be a major structural weakness, which holds back to underutilization of existing productive capacity and constrain, that may have unfavorable impacts on profits and production levels adversely.

Weak and inadequate infrastructure leaves the country backward and allows its people to stagnate in poverty and a lower standard of living. Investigate the relationship between physical infrastructure and per capita NSDP. What is the impact of infrastructure development on poverty? Patra and Acharya (2011) examine the spatial disparities in infrastructural facilities across 16 major states in India and in turn analyses its impact on regional economic growth. Empirical evidence suggests that there is a positive relationship between Infrastructure Development Index & Per Capita Net State Domestic Product and negative relationship between Infrastructure Development Index & Poverty. Hence, effort should be directed to create more infrastructure facilities at the state level to raise the state domestic product and reduce the level of poverty and unemployment of the people concerned.

METRO RAIL PROJECTS

In order to give proper legal cover to metro/ mono-rail projects, the Metro Railways Amendment Act 2009 was brought into effect in September 2009, providing an umbrella 'statutory' safety cover for metro rail work in all the metro cities of India. The Act has been extended to the National Capital Region, Bangalore, Mumbai, Chennai, Hyderabad, Kochi, and Jaipur metropolitan areas. The Bangalore Metro Rail Project of 42.3 km length is targeted for completion by December 2013. The first leg of 7 km has already been commissioned on 20 October 2011. The government had earlier approved the implementation of the East-West Metro Corridor of 14.67 km length in Kolkata by Kolkata Metro Rail Corporation Ltd. (KMRCL). The project is targeted for completion by 31 January 2015. The Chennai Metro Rail Project of 46.5 km length by Chennai Metro Rail Ltd. (CMRL) at a total estimated cost of ` 14,600 crore is targeted for completion by 31 March 2015. Recently the 103.5 km Phase III of Delhi Metro at a total cost of ` 35,242 crore has also been approved and is targeted for completion by 2016. The metro extension to Faridabad has also been sanctioned. In addition, the government has also approved the extension of Delhi Metro from Dwarka to Najafgarh (5 km), Yamuna Vihar to Shiv Vihar (2.7 km), and Mundka to Bahadurgarh (11.50 km) as part of Delhi Metro Phase III, this year. The Kochi Metro Rail Project of 25.6 km by Kochi Metro Rail Limited (KMRL) at a completion cost of ` 5,181.8 crore has also been approved. In addition, metro rail projects have been taken up in Mumbai on PPP basis for Versova-Andheri-Ghatkopar (11.07 km) and Charkop to Mankhurd via Bandra (31.87 km) and in Hyderabad (71.16 km) with viability gap funding (VGF) from the Government of India. Presently the Government of Rajasthan is implementing 7 km of metro rail with funding entirely from the state government.

RAJIV GANDHI GRAMIN LPG VITARAN YOJNA

The 'Vision-2015' adopted for the LPG sector inter alia focuses on raising the LPG population coverage in rural areas and areas where LPG coverage is low. The Rajiv Gandhi Gramin LPG Vitaran Yojana (RGGLVY) for small-size LPG distribution agencies has been launched in 2009. Under this scheme 75 per cent population is to be covered by 2015 by releasing 5.5 crore new LPG connections. To ensure that growth of LPG usage is evenly spread, public-sector oil marketing companies (OMCs) are assessing/identifying locations in a phased manner under the RGGLVY. OMCs have undertaken to set up 5,261 LPG distributors in 29 states. Out of this 1,591 LPG distributors had already been commissioned as on November 1, 2012. Selection for the rest of the locations is in progress as per policy.

PIPELINE NETWORK AND CITY GAS DISTRIBUTION

There has been substantial increase in the pipelines network in the country with 32 product pipelines with a length of 11,274 km and capacity of 70.688 MMT at present. There are also 16 crude pipelines spreading over 8,558 km with capacity of 106.45 MMT. In addition, there are LPG pipelines of 2,313 km with 3.94 MMT capacity and gas pipelines of 13,428 km with 355 MMSCMD capacity. The gas pipeline infrastructure is being augmented with about 14,889 km of pipeline network with additional capacity to transport 264 MMSCMD of gas by 2015- 16. In addition, around 4,300 km of pipeline network has been authorized by the Petroleum and Natural Gas Regulatory Board (PNGRB) which will further add capacity to transport 184 MMSCMD of gas. With increased availability of gas in the country, the city gas distribution (CGD) network has been enlarged to cover various cities supplying gas for domestic consumers, public transport, and commercial/ industrial entities. At present, there are a total of 588 compressed natural gas (CNG) stations across the country. Vision- 2015 envisages providing piped

natural gas (PNG) to more than 200 cities across the country. The current consumption of gas in the CGD network is around 14 MMSCMD, of which 6.63 MMSCMD is from regasified liquefied natural gas (RLNG). At present, there are a number of entities operating in 43 geographical areas (GAs). The PNGRB has recently invited bids for authorization of CGD in these cities. The CGD sector comprises CNG and PNG customers. The PNGRB has envisaged a rollout plan of CGD network development through competitive bidding in more than 300 possible GAs on the basis of expressions of interest (EOI) submitted to the Board.

CAPACITY ADDITION IN THE ENERGY SECTOR

The all-India installed capacity of electric energy generating stations under utilities was 112 058.42 MW (megawatt) as on 31 March 2014 consisting of 77968.53 MW of thermal, 29 500.23 MW of hydro, 2720 MW of nuclear, and 1869.66 MW of wind energy which as increased to 115 544.81 MW as on 31 January 2013 consisting of 80 201.45 MW of thermal, 30 135.23 MW of hydro, 2720 MW of nuclear, and 2488.13 MW of wind energy. A capacity addition of 41 110 MW has been targeted for the Eleventh Five-year Plan.

The National Electricity Policy (NEP) stipulates energy for all by 2013 and annual per capita consumption of electricity to rise to 1000 units from the present level of 631 units. To fulfill the objectives of the NEP, a capacity addition of 78,577 MW has been proposed for the 12th plan. This capacity addition is expected to provide a growth of 9.5 % to the energy sector. The break up of the capacity addition target is given as under:

TABLE 1
Capacity Addition Target Source-Wise Break up of Electric Energy (in MW)

Type/sector	Central	State	Private	Total
Thermal	9685	26800	3380	39865 (50.7%)
Hydro	3605	24347	0	27952 (35.5%)
Nuclear	3263	7497	0	10760 (13.8%)
Total	16553 (21%)	58644 (74.6%)	3380 (4.4%)	78577 (100%)

PATTERN OF ENERGY INDUSTRY DEVELOPMENT

Energy is the most convenient and versatile form of energy and plays a crucial role in the economic development of a country. The history of energy development in India dates back to 1887 when first a hydro station was established at Darjeeling. In the early years, most of the energy supply facilities were privately and local bodies owned the catered to the needs of big towns and cities. The first thermal energy station in India was established in Calcutta in 1899 with a total installed capacity of 1000 KW. During the first two decades of the twentieth century steam power stations at Kanpur, Madras and Calcutta of 2,170 KW, 9000 and 15000 KW were commissioned. In 1902, hydro-electric plants of 4,500 KW at Sivasamudram in Karnataka, in 1907, 3000 KW at Mahara in Jammu and Kashmir, in 1911, 500 KW at Simla in Himachal Pradesh, in 1914, 1550 KW at Gokak Falls and in 1915, 40,000 KW at Greater Bombay were installed. Between 1921 and 1940 total installed capacity increased by about 10 times, from about 0.13 million kilowatts to 1.3 million KW². The industrial boom following world war I, realisation of the use of electricity in industries and the interest shown by some of the provincial Government were responsible for this increase. By the end of 1940 that total installed capacity was 0.6 million comprising steam 0.5 million hydro and 0.1 million diesel. The growth of electricity development between 1941 and 1951 was hardly substantial. Steam generating capacity rose by 60 per cent and slow growth were the stresses and strains of the Second World War and the abnormal post war conditions that followed. The available plants were used up to the maximum capacity and were subject to heavy wear and tear and frequent break-downs. Deterioration of coal supply and shortage of fuel oil also worsened the situation. Thus, at the end of the war, the energy supply industry was in a very precarious position. It was only with the beginning of the first five year plan that energy development received a Phillip.

THE GROWTH IN CAPACITY, PRODUCTION

During the first plans (2003-04), construction of a number of major river valley projects like Bhakra-Nangal, Damodar Valley, Hirakund and Chambal Valley was taken up. These projects resulted in the stepping up food production and energy generation. Emphasis in Second Plan was on development of basic and heavy industries and related need to step-up energy generation. During the Third Plan, emphasis was an extending energy supply to rural areas. The significant development in this phase was the emergence of inter-state grid system. The country was divided into five regions, regions electricity boards was established in each region to promote integrated operation of constituent energy system. In the mid-sixties the country experienced successive droughts which influenced the planners to re-orient the emphasis on rural electrification. Thus the three Annual Plans, that followed the Third Plan aimed at consolidating the programmes. initiated during the Third Plan.

During the Ninth plan, IREDA sanctioned capacity of 1261.71 MW and 2.84 lakh metric tonnes coal repacement (MTCR/annum). The financial achievements in terms of loan sanction and disbursement were of the order of Rs. 3851.63 crore and Rs. 2027.03 crore respectively. During the Eleventh plan, capacity addition target of 41,110 MW comprising 14,393 MW hydro, 25,417 MW thermal and 1,300 MW nuclear was fixed for the 11th Plan. The sector wise, type wise summary of this capacity addition target is given in Table below.

TABLE 2
11TH PLAN CAPACITY ADDITION TARGET-SECTOR WISE (Figures in MW)

Sector	Hydro	Thermal	Nuclear	Total (%)
CENTRAL	8,742	12,790	1,300	22,832 (55.5%)
STATE	4,481	6,676	0	11,157 (27.2%)
PRIVATE	1,170	5,951	0	7,121 (17.3%)
TOTAL	14,393	25,417	1,300	41,110 (100%)

A moderate target was set for state and private sectors keeping in view the preparedness of various state power utilities and IPPs.

GROWTH IN GENERATION DURING 11TH PLAN

Electricity is in the concurrent list in the constitution. The National Electricity Policy (NEP), recognizes electricity as a "basic human need" and targets a rise in per capita availability from 631 units to 1,000 units per annum by the end of 2011. To fulfill the objectives of the NEP, a capacity addition of 78,577 MW has been proposed for the eleventh five-year plan. The power sector is expected to grow at 9.5 percent per annum

TABLE 3
Eleventh plan power capacity addition targets (MW & per cent)

Sector	Hydro	Thermal	Nuclear	Total (MW)	Share (%)
Central	9,685	26,800	3,380	39,865	50.7
State	3,605	24,347	0	27,952	35.5
Private	3,263	7,497	0	10,760	13.8
Total	16,553	58,644	3,380	78,577	
Share (%)	21.1	74.6	4.4	100	

A number of projects envisaged for the Eleventh Five-Year Plan have made steady progress, with most of these in a position to be commissioned well within the Plan period. The status of placement of orders for the main plant (thermal projects) and main civil works (for hydro projects) is given in Table-4.

TABLE-4
Status of Eleventh five Year Plan Capacity addition (MW)

Status	Central	State	Private	Total
Commissioned	2,230	4,783	250	7,263
Under Construction	27,945	14,337	8,578	50,860

As per the Integrated Energy Policy (IEP), issued by the Planning Commission, GDP growth rates of 8%-9% have been projected during the 11th Plan. Assuming a higher growth rate of 9% and assuming the higher elasticity projected by the IEP of around 1.0, electrical energy generation would be required to grow at 9% p.a. during the 11th plan period. Also generation has to be collectively met by utilities, captive plants and Non-conventional energy sources. No reliable plans about captive power capacity expansion are available but based on indications available from the manufacturers for addition in captive capacity and present utilization of available capacity, the generation from captive plants is expected to increase from 78 BU to 131 BU per annum. Since the load factor of non-conventional energy sources is very low (about 20% on an average), even though the capacity projected by MNRE from these sources is about 23,500 MW by the end of 11th Plan, the expected generation would be only around 41 BU. The generation from these renewable however has not been taken into account for planning purposes.

CONCLUSION

As mentioned in the Twelfth Plan document, a GDP growth rate of about 8 per cent requires a growth rate of about 6 per cent in total energy use from all sources. Unfortunately, the capacity of the economy to expand domestic energy supplies to meet this demand is severely limited. The country is not well-endowed with energy resources, except coal, and the existence of policy distortions makes management of demand and supply more difficult. Accordingly, the short-run action needed to remove impediments to implementation of projects in infrastructure, especially in the area of energy, includes ensuring fuel supply to power stations, financial restructuring of Discoms, and clarity in terms of the NELP. At the same time, the long-term strategy should focus on issues like coal production, petroleum price distortion, natural gas pricing, and effective management of the urbanization process.

REFERENCES

1. A.C. Sama (2012) - Socio-Economic Impact Of Rural Roads And, Parameters For Evaluation - Central Road Research Institute, New Delhi
2. Banerjee (2012) - On the Road: Access to Transportation Infrastructure and Economic Growth - NBER Working Paper.
3. Chaubey P.K. (2010) – Indian Economic Development – National Council of Educational Research and Training, New Delhi.
4. Datt, R and Sundaram, K.P.M. (2007) “Indian Economy” (56th Edition 2007) chapter 8 pg 115
5. De la Fuente, A. and A. Estache,(2004). “Infrastructure Productivity and Growth: A quick survey” Washington DC., WBIGF, mimeo, 2004.
6. Easterly, William and Sergio Rebelo. (1993) “Fiscal policy and Economic Growth: An empirical investigation.” Journal of Monetary Economics 32(3), Pg. 417-458
7. Hansen, Niles M. "Unbalanced Growth and Regional Development," Western Economic Journal, vol. 4 (1965), pp. 3-14.
8. Harendra Mohan Singh (2014) -Revenue from Road Transport in India – Blue Ocean Research Journal, Vol 3, No 4 (2014).
9. Hirschman,A.O. “The Strategy of Economic Development” (New havens: Yale University press, 1958). P.83
10. Mishra & Choudhury (2011) - Transport Sector in India –Kalyani Publishers, New Delhi.
11. Prudhomme, R (2004).Infrastructure and Development, Washington DC, Paper prepared for the ABCDE (Annual Bank Conference on Development Economics), May 3-5, 2004
12. Sahoo, P and Dash, R.K.(2008),Economic Growth in South Asia: Role of Infrastructure. The Journal of International Trade & Economic Development, Volume 21, Issue 2, April 2012, pages 217-252
13. Singh, S.K. (2008) - Transport Policy for Better Air Quality in Urban India in K. N. Bhatt, eds., Population, Environment, and Health: Emerging Issues - Rawat Publications, Jaipur, India.
14. 'Todaro, Michael P. (1981) “Economic Development in the Third World” published by the Longman (New York & London), 1981 (2nd edition) pp.87
15. World Bank “World Development Report 1994: Infrastructure for development.” published by Oxford University Press. Page No.1