Orissa Journal of Commerce
Vol. 43, Issue 1, January-March 2022
ISSN: 0974-8482

URL: www.ojcoca.org
DOI: https://doi.org/10.54063/ojc.2022.v43i01.01

Editorial Article

Dichotomy of Infrastructure Projects in India: Improved Performance amid Persistent Overhangs

Malay Kumar Mohanty[1], Amiya Kumar Mohapatra[2] and Pradeepta Kumar Samanta[3*]
[1]Former Professor & Head, GM College and Dean, Faculty of Commerce and Management, Sambalpur University, Sambalpur, Odisha. E-mail: dr.malaykumarmohanty@gmail.com
[2]Deputy Director, FOSTIIMA Business School, Dwarka, New Delhi. E-mail: amiyaeco125@gmail.com
[3]Sr. Associate Professor, National Institute of Construction Management and Research, Pune, Maharashtra. E-mail: samanta.pk@gmail.com
[*]Corresponding Author

To cite this paper
Mohanty, M.K., Mohapatra, A.K., & Samanta, P.K. (2022). Dichotomy of Infrastructure Projects in India: Improved Performance amid Persistent Overhangs *Orissa Journal of Commerce*. 43(1), 1-8.

Keywords
Infrastructure, Investment, Capital expenditure, Time overrun, Cost overrun, India

JEL Classification
H54, H61, L74, R42, O32

Abstract: Infrastructure development is a critical factor in boosting the economy. An increase in investment in infrastructure opens-up employment opportunities because of its backward and forward linkages. The changing demographics and environment will need the converged development of various infrastructure facilities in India. The government has promoted railways, roadways, ports, and civil aviation in recent decades, as evident from policy and programs. Even with the accelerated growth in infra projects in India, most of the infrastructure projects are delayed, primarily owing to regulatory approvals, land acquisition issues, shortage of skilled resources, ineffective dispute resolution mechanisms, and geological challenges. This paper highlights the prospects and progress of infrastructure projects along with issues and challenges.

1. Introduction

Infrastructure development is critical for boosting the economy and in providing better growth prospects. Investment in infrastructure through its multiplier effect generates further investments and creates employment opportunities because of its backward and forward linkages with other sectors. In order to improve India's global competitiveness, creating new and upgrading existing infrastructure will be critical. It is estimated that India would need to spend $4.5 trillion on infrastructure by 2030 to realise the vision of a $5 trillion economy by 2025 and continue on the escalated trajectory until 2030. India needs to spend about $1.4 trillion over these years on infrastructure. The government has raised the Capex (Capital Expenditure) by 24.3 per cent from the estimated Rs. 6 trillion in 2021-22 to Rs. 7.50

trillion in 2022-23. The Capex allocated for 2022-23 is 2.9 per cent of GDP. In FY 2023, 19 per cent of the total expenditure was to be spent on building infrastructure, which was 16 per cent in FY 2022. The envisaged economic growth will be accompanied by a shift in the underlying demographics of the country – an increase in urbanization levels, a growing workable population, and an increase in the share of employed individuals in the services sector in urban areas.

1.1. Increasing Urbanisation

According to World Bank data, India's population has increased at a CAGR of 1.2 per cent during 2011-2017 and is expected to reach 1.52 billion by 2030. In the last decade, the urban population in India has increased at an annual rate of 2.4 per cent. By 2030, it is estimated that around 42 per cent of India's population would be urbanised in comparison to 31 per cent in 2011. Also, the number of metropolitan cities in India is estimated to increase from 46 as per Census 2011 to 68 by 2030. Plugging the infrastructure deficiency will smoothen urbanization by promoting ease of living and facilitating economic activities. It will thus help in realizing the full potential of a growing urban economy and raise its contribution to GDP.

1.2. Demography and Environment

Various studies have forecasted the working-age population of India to grow by 1.2 times during 2015-2030. India is expected to have the world's largest working-age population of 1.03 billion (68% of the population) by 2030, compared with 0.97 billion in China and 0.22 billion in the US. By 2030, India will have a median age of 31 years versus 43 years in China and 40 years in US. This rich demographic dividend will be an essential growth booster. Resilient infrastructure is critical for peoples' well-being, quality of life, and economic prospects.

Meanwhile, recent disasters indicate that up to 66 per cent of total public sector losses in weather and climate-related extreme events are related to infrastructure damage. There is a clear need to ensure that all new and existing infrastructure systems are climate and disaster-resilient. The changing demographics and environment will need the converged development of various infrastructure facilities. From providing housing to water and sanitation services to digital and transportation needs, there is a compelling demand for increased and improved delivery across the entire infrastructure spectrum. Delivering the full spectrum of required infrastructure will ensure economic growth, ease of living, and improved competitiveness across sectors.

2. Sectoral Growth of Infrastructure in India

2.1. Road Transport

The importance of road infrastructure is widely recognized as a crucial parameter of socio-economic integration and is vital for the country's economic development. Road transport is one of India's most cost-effective and convenient modes of transportation for freight and passengers. The road network of the country consists of National Highways, State-Highways, District Roads, Rural Roads, Urban Roads and Project Roads of over 63.72 lakh kms (kilometres) of roads as of 31 March 2019, which is the second-largest in the world, after US. There has been a consistent increase in the construction of National Highways/roads since 2013-14, with 13,327 kms of roads constructed in 2020-21 as compared

to 10,237 kms in 2019-20, indicating an increase of 30.2 per cent over the previous year. The extent of road construction per day increased substantially to 36.5 kms per day in 2020-21 from 28 kms per day in 2019-20, a y-o-y rise of 30.4 per cent. The significant rise in road construction in 2020-21 was due to the 29.5 per cent y-o-y increase in public expenditure - a reflection of the impetus given to a critical sector that generates employment and supports infrastructure during a pandemic year. Another ambitious program of the central government, the Bharatmala Pariyojana project aims to bring smoother connectivity across the nation with improved roads and infrastructure by constructing elevated corridors, bypasses, ring roads, lane expansion, and Logistics Park. The project is divided into 7 Phases and Phase-I is currently under progress. Out of the total length of 83,677 km, Phase-I is 24,800 km long with an addition of 10,000 km of ongoing National Highway Development Program (NHDP) project, so a total of 34,800 km with a total budget of Rs. 5.35 lakh crore is in progress.

2.2. Railways

Indian Railways (IR) with over 68,102 route kms is the third-largest network under single management. It strives to provide a safe, efficient, competitive, and world-class transport system. During 2014-2021, an average of 1835 track kms per year of new track length has been added through new-line and multi-tracking projects compared to the average of 720 track kms per year during 2009-14. IR is also adopting indigenous new technology such as KAVACH for safety, Vande Bharat trains and redevelopment of stations to have safe and better journey experience. During FY21, IR carried 1.23 billion tonnes of freight and 1.25 billion passengers.

The Capex increased substantially for IR from an average annual Capex during 2013-14 of Rs. 45,980 crores to Rs. 2, 15,058 crores during 2021-22, which is more than five times. Despite facing unprecedented COVID-related challenges, IR has been able to move millions of people and keep the national supply-chain running. IR is targeting 100 percent electrification of its network by December 2023. The National Rail Plan lays down the road map for capacity expansion of the railway network by 2030 to cater to the growth up to 2050. It envisages the creation of a future-ready railway system that not only meet the passenger demand but also increase the modal share of railways in freight to 40-45 per cent from the present level of 26-27 per cent. To give further fillip, the railway capacity enhancing projects have been categorized as supercritical and critical, 58 projects have been identified as Super Critical and are targeted for completion by December 2022. Similarly, 68 projects have been identified as Critical and targeted for completion by March 2024. These projects are focused on increasing capacity on routes that serve primary mineral and industrial hubs along with ports and major consumption centers.

2.3. Ports

Port performance is crucial for the trade competitiveness of an economy. Expansion of port capacity has been accorded the highest priority through implementing well-conceived infrastructure development projects. The capacity of 13 major ports which was 871.52 million tonnes per annum (MTPA) at the end of March 2014, has increased by 79 per cent to 1,560.61 MTPA by the end of March 2021. Sagarmala is a National Programme aimed at accelerating economic development in the country by harnessing the potential of India's 7,500 km long coastline and 14,500 km of potentially navigable waterways. The Sagarmala projects include port modernization & development of a new port, enhancement of port connectivity, port-led industrialization, coastal community development, coastal shipping and Inland water

transport. Currently, under the Sagarmala Programme, there are 802 projects worth investment of Rs. 5.54 lakh crore for implementation by 2035. Out of which 181 projects worth Rs. 94,712 crore have been completed and 223 projects worth Rs. 2.11 lakh crore is under implementation. Further, 398 projects worth Rs. 2.48 Lakh crore are under various stages of development.

To propel India to the forefront of the Global Maritime Sector, the Maritime India Vision 2030 (MIV 2030), a blueprint, was released on March 2021 to ensure coordinated and accelerated growth of India's maritime sector in the next decade. The objective is to develop world-class mega ports, and transshipment hubs and ensure infrastructure modernization. MIV 2030 estimates that developing Indian ports will drive cost savings of Rs. 6,000-7,000 crore per annum for EXIM clients. Further, the augmented operations are estimated to create an additional 700,000-1,000,000 jobs. It also estimates the investment requirement for capacity augmentation and development of world-class infrastructure at Indian Ports to be to the tune of Rs. 1,00,000- 1,25,000 crore.

2.4. Civil Aviation

India has emerged as one of the fastest-growing aviation markets in the world. The domestic traffic in India has more than doubled from around 61 million in 2013-14 to around 137 million in 2019-20, registering a growth of over 14 percent per annum. Under the Regional Connectivity Scheme (RCS), also known as UDAN scheme, till February 2021, 54 airports have been opened up, and 317 routes have been operationalized under the RCS. About 5.5 million passengers have benefited from the scheme. During 2019-24, 100 airports are planned to be developed under the RCS, including water aerodromes and heliports.

3. Policy Initiatives for Infrastructure Development

3.1. National Infrastructure Pipeline

Good quality infrastructure is vital for faster economic growth, ensuring an improved human development index and broad-based participation in development with equitable distribution of benefits. Keeping these objectives in mind, a dedicated National Infrastructure Pipeline (NIP) program was launched a few years ago. The total capital expenditure in infrastructure sectors in India during fiscals 2020 to 2025 is projected at Rs. 111 lakh crore, of which sectors such as energy (24%), roads (19%), urban (16%), and railways (13%) amount to around 70 per cent of the projected capital expenditure in infrastructure in India (Table 1). With the Centre and States expected to have an equal share of capital

Table 1: NIP - Sector-wise Annual Capital Expenditure in Infrastructure (Rs. Crore)

Sector	*FY 20*	*FY 21*	*FY 22*	*FY 23*	*FY 24*	*FY 25*	*No phasing*	*FY 20–FY 25*
Energy	233,607	441,522	442,372	468,134	497,768	466,821	139,778	2,690,003
Roads	332,559	383,283	356,966	252,780	240,761	332,659	134,815	2,033,823
Railways	133,387	262,465	308,800	273,831	221,209	167,870	-	1,367,563
Ports	13,357	18,104	20,649	15,863	7,724	10,002	35,495	121,194
Airports	18,667	21,655	24,820	21,334	25,386	5,141	26,445	143,448
Urban Infrastructure	298,174	462,208	404,134	234,858	217,164	159,862	142,867	1,919,267

Source: National Infrastructure Pipeline, Vol. I (GoI)

expenditure at 39 per cent each to be undertaken in the infrastructure sector, the private sector is expected to contribute 22 per cent. Out of the total allocation in NIP, Rs. 44 lakh crore (40%) worth of projects are under implementation, Rs. 34 lakh crore (30%) of projects are at the conceptualization stage, and Rs. 22 lakh crore (20%) are under development.

3.2. PM Gati Shakti - National Master Plan

The PM Gati Shakti is a digital platform that will bring together 16 Ministries, including Railways and Roadways, for integrated planning and coordinated implementation of infrastructure connectivity projects. It aims at developing world-class modern infrastructure and logistics synergy among different modes of movement both people and goods; and the location of projects. This will help raise productivity and accelerate economic growth and development. The data exchange among all modes of operations will be brought on a Unified Logistics Interface Platform (ULIP), designed for Application Programming Interface (API).

4. Major Issues and Challenges of Infrastructure Projects

Amid such policy priority on infrastructure development and much-improved speed of execution of infra projects, there continue to remain several persistent overhangs.

4.1. Time Overrun and Cost Overrun

The success or failure mostly depends on the timely delivery of the project to the client. A project delivered on time is likely to have fewer cost overruns and no loss on account of opportunity cost (Mahamid *et al*, 2012). Delays in construction projects are a universal phenomenon across large and small projects and in developed and developing nations. The delays in project execution result in extra costs and a reduction in financial returns. Delays in any form lead to a loss of revenue for clients and excess cost of overheads for the contractors. Thus, time and cost overruns are a major problem affecting the project implementation globally. Researchers across the globe have given considerable attention to this problem and identified the factors causing delays in projects. The factors causing delays can be country specific, project-specific and location-specific.

Regarding key segments, railways have witnessed the maximum delayed projects mostly due to land acquisition and design approvals. Many large projects have been ongoing for over a decade and costs have increased manifold. On the other hand, road and highways projects have done relatively better (Table 2 & 3). According to the Ministry of Statistics and Programme Implementation (MOSPI) data, out of 1579 projects as on April 2022, only 6 projects are ahead of schedule, 295 projects are on schedule, 664 projects are delayed.

The percentage of projects with time overrun over the years with respect to the original schedule indicate that the percentage of projects running behind schedule has increased from 29.44 per cent in March 2014 to 42.05 per cent in March 2022. The percentage of cost overrun over the years with respect to the approved initial costs shows that the cost overrun has increased from 19.4 per cent in March 2014 to 22.01 per cent in March 2022 (Fig. 1).

4.2. Possible Reasons of Time Overrun and Cost Overrun

Some of the possible reasons of time overrun and cost overrun for the infrastructure projects in the Indian context are listed in Box 1 as follows (MOSPI 2022):

Table 2: Sector-wise Analysis of Cost Overrun in Infrastructure Projects

Sector	*Total Projects*	*Cost Original (Rs. Crore)*	*Cost Anticipated (Rs. Crore)*	*Cost Overrun w.r.t. Original (%)*
Power	79	198,648,02	258,669,52	30.22
Road Transport	835	496,769.50	546,394.56	9.99
Railways	211	408,405.75	666,542.74	63.21
Civil Aviation	24	15,443.94	16,984.22	9.97
Coal	118	166,313.91	170,665.88	2.62
Petroleum	135	368,598.63	388,067.00	5.28
Urban Development	27	284,108.54	304,523.01	7.19

Source: 120th Project Implementation: An Overview – April 2022; Ministry of Statistics and Programme Implementation, Infrastructure and Project Monitoring Division, (GoI)

Table 3: Status of Infrastructure Projects Showing Time and Cost Overrun

Sector	*Total Projects*	*Time Overrun*		*Cost Overrun*	
		w.r.t. Original Schedule	*w.r.t. Revised Schedule*	*w.r.t. Original Schedule*	*w.r.t. Revised Schedule*
Power	79	46	34	26	19
Road Transport	835	243	204	156	139
Railways	211	126	121	158	144
Civil Aviation	24	21	5	4	4
Coal	118	37	36	10	7
Petroleum	135	79	50	27	10
Urban Development	27	15	9	8	8

Source: 120th Project Implementation: An Overview – April 2022; Ministry of Statistics and Programme Implementation, Infrastructure and Project Monitoring Division, (GoI)

Box 1: Possible Reasons for Time Overrun and Cost Overrun for the Infrastructure Projects

Reasons for Time Overrun	**Causes of Cost Escalation**
• Delay in land acquisition, and obtaining forest/ environment clearances • Lack of infrastructure support and linkages • Delay in tie-up of project financing • Delay in finalization of detailed engineering • Changes in scope, and contractual issues • Delay in tendering, ordering and equipment supply • Inadequate skilled manpower • Delay in technical approval. • Due to COVID-19 pandemic • Delay in getting clearance from local authorities.	• Under-estimation of original cost • Changes in rates of foreign exchange and statutory duties • High cost of environmental safeguards and rehabilitation measures Spiraling land acquisition costs • Changes in the scope of projects • Monopolistic pricing by vendors of equipment services • General price rise/inflation • Time Overrun

4.3. Actions Taken to Minimise Time and Cost Overruns in Projects

In order to reduce the delays and cost overruns in the projects, the Government has taken several steps which include:

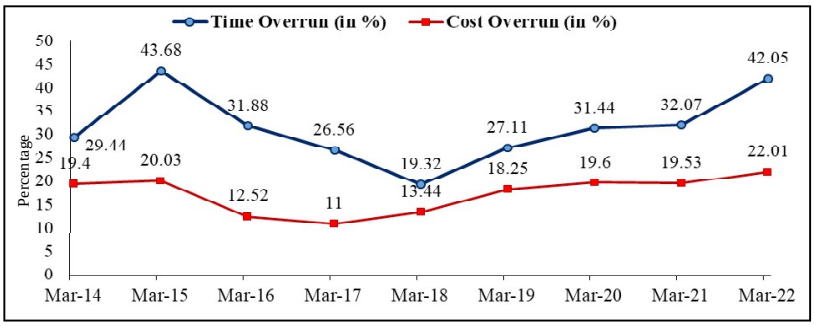

Figure 1: Trends of Projects - Time Overrun & Cost Overrun (in %)

Source: Ministry of Statistics and Programme Implementation, (GoI)

- Rigorous project appraisal;
- On-line Computerized Monitoring System (OCMS) for better monitoring;
- Setting up of Revised Cost Committees in the Ministries for fixation of responsibility for time and cost overruns;
- Regular review of the infrastructure projects by the concerned administrative Ministries;
- Setting up of Central Sector Projects Coordination Committees (CSPs) in the States under the Chief Secretaries to remove bottlenecks and facilitate the speedy implementation of major projects;
- Project review under Pro-Active Governance and Timely Implementation (PRAGATI).

5. Way Forward

5.1. Augmenting Shortage of Skilled Manpower

KPMG report for the National Skill Development Corporation (NSDC) highlights that the industry currently absorbs roughly 68 million people, of whom more than 90 per cent are deployed in building construction. Over 80 per cent of those employed in building and construction are minimally skilled. The Infrastructure Equipment Skill Council estimates that roughly 1 million existing and 1 million additional operators and mechanics need to be skilled and certified. India has roughly 0.35 million skilled but uncertified plumbers. The Indian Plumbing Skills Council aims at skilling and certifying 1.2 million technicians by 2022. The current shortage of 1.2 million welders may increase to 1.35 million by 2023. Under the Pradhan Mantri Kaushal Vikas Yojana (PMKVY), CREDAI has taken up the Recognition of Prior Learning Mode of skilling workers. It identifies skill gaps in workers and bridges them through job-role-specific short-term training. The Construction Skill Development Council of India (CSDCI), Infrastructure Equipment Skill Council (IESC) etc. are also trying to fill the gap of skilled manpower for the sector.

5.2. Use of Advanced Technology

For faster delivery of projects, technology will continue to play a major role in the conceptualization, design and execution of projects. To ensure proper planning, manpower management, procurement, safety and risk assessment, quality control, cash-flow analysis etc., technology solutions like BIM (Building Information Modelling) can transform the entire construction process. BIM with block-chain technology is used for contractual claims and dispute resolution. When integrated with IoTs, it

can benefit construction and facility management activities. Similarly, other technologies like Drone for physical monitoring of the large and critical projects, artificial intelligence (AI), augmented reality (AR) & virtual reality (VR) may help the construction of infrastructure projects in a significant way.

Overall technology-driven construction brings efficiencies across the lifecycle from design to build. About 35-50 per cent cost savings and 50 percent time savings over conventional construction due to the adoption of advanced technology. The prime Minister's declaration of 2019-20 as the "Year of Construction Technology" has pushed the large-scale adoption of cutting-edge technology for the execution of commercial real estate as well as infrastructure projects.

5.3. Private Participation

Private investment into physical and social infrastructure is key to putting India on a high growth trajectory. However, attracting private investment has always been challenging for several construction and infrastructure projects. The government support and policy push are critical to reviving private investment. The measures such as; further improvement in ease of doing business, homogeneous regulations at state levels, early resolution of land and labour issues, transparent regulations with lesser scope for shocks, diversification and deepening infrastructure financing landscape etc. will help in attracting more private players to invest and participate in the infrastructure development initiatives.

6. Conclusion

The increased spending in the infrastructure sector acts as a stimulant for economic growth and development. World over, most infrastructure projects are delayed, primarily owing to regulatory approvals, issues of land acquisition, shortage of skilled resources, ineffective dispute resolution mechanisms and geological challenges. In India, the 'Capex Cycle' has been shrinking across sectors, exerting pressure on the construction industry to evolve with new ideas and radical thinking. Moreover, environmental, social and governance (ESG) concerns, supply-chain disruptions, and skilled labour shortages add to the current complexity in medium to large-scale projects. Thus, executing the proposed recommendation may result in the decongestion of infrastructure projects by gradually tackling the primary reasons of time and cost overruns. Since India's infrastructure sector is poised to grow to cater to increased demands, it is, therefore, crucial to identify existing challenges & hindrances and overcome them by adopting appropriate strategies to achieve the vision of sustained infrastructure development.

References

Department of Economic Affairs (2022). Economic Survey 2021-22, Ministry of Finance, Government of India, New Delhi.

Department of Economic Affairs, (2019) National Infrastructure Pipeline (Vol. I). Report of the Task Force, Ministry of Finance, Government of India, New Delhi.

Infrastructure and Project Monitoring Division (2022). 120th Project Implementation – An Overview. Ministry of Statistics and Programme Implementation (MOSPI), Government of India, New Delhi.

Mahamid, I., Bruland, A. & Dmaidi, N. (2012). Causes of delay in road construction projects. *Journal of Management in Engineering*, 28(3), pp. 300-310. https://doi.org/10.1061/(asce)me.1943-5479.0000096.

Ministry of Finance (2022). Budget Documents 2022-23, Government of India, New Delhi.

Ministry of Ports, Shipping and Waterways (2021). Maritime India Vision 2030, Government of India, New Delhi.