



INFRASTRUCTURE IN INDIA

INVESTMENT PRIORITIES, OPPORTUNITIES AND KEY CHALLENGES

AN APPROACH PAPER

National Council of Applied Economic Research

MARCH 2021

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FOREWORD

The COVID-19 pandemic has reversed several years of economic gains globally. The recent World Economic Report projects a severe contraction in global GDP of 3.5 per cent in 2020, and an even larger fall in GDP for India, at 8 per cent. However, the recovery from the pandemic has been more promising than expected, with India being the fastest growing nation in the world, at a projected 11.5 per cent in 2021 and 6.8 per cent in 2022, as compared to the corresponding growth envisaged in emerging markets, at 6.3 and 5 per cent, and in advanced economies, at 4.3 and 3.1 per cent over the same time period.

In view of these economic challenges, the time has now come to build back better with strengthened resilience and greater competitiveness. Addressing critical infrastructure gaps across various sectors will be important to jumpstart and sustain long-term growth. With the country's infrastructure needs estimated at close to US \$350 billion a year, the 2021-22 Union Budget has risen to this challenge, projecting a 26 per cent increase in capital expenditure. The Government of India has also recently launched a multi-year US\$ 2.1 trillion National Infrastructure Pipeline (Rs 158 trillion), in which the private sector is expected to play a key role.

Quite surprisingly, despite the global attention being paid to infrastructure needs and infrastructure gaps, there is no wide-lens methodology in the literature for prioritising infrastructure spending, which is vital for ensuring that spending is efficient and is providing the interlinkages to strengthen multiplier effects. This Approach Paper seeks to bridge this gap in the literature by developing a new framework, perhaps the first its kind, to help prioritise investment projects by taking into account the complex interplay of factors that influence decision-making by both the public and private sectors. This new methodology, called **NCAER's Infrastructure Investment Prioritisation Index (N-IIPI)**, stands on 9 pillars, 30 sub-pillars, and 70 indicators.

The nine pillars of N-IIPI provide a holistic approach for capturing the tugs and pulls and the balancing acts involved in infrastructure investment decision making, using criteria based on social welfare, spatial needs, market failures, economic climate, multiplier effects, risks, financial opportunities, nature of the investment, and the institutional framework. In conceptualising

N-IIPI, NCAER has built on its success in launching another first of its kind Index in 2016 - *NCAER's State Investment Potential Index (N-SIPI)*, which was also supported by the Foreign Commonwealth Office of the British High Commission, New Delhi. N-SIPI 2016, and successive editions in 2017 and 2018, which offer a single composite investment rating of how the Indian states are positioned to encourage and attract investment, signify a pioneering effort in creating metrics of competitiveness and growth opportunities at the state level.

This Approach Paper delineates the broad outline of the new N-IIPI. It has been built with the hope of further developing this innovative methodology to prioritising infrastructure investments in the next phase of research. We hope to roll out the N-IIPI 2021 in September 2021. It should be a path-breaking exercise in prioritising infrastructure investments, not just across sectors, but also across geographies, while also spelling out opportunities for private sector engagement in infrastructure. The N-IIPI should be useful in facilitating better investment decisions by both the public and private sectors, eventually aiding economic recovery and promoting long-term growth coming out of the Coronavirus pandemic.

I would like to thank the Foreign, Commonwealth and Development Office of the British High Commission, New Delhi, for their support for this work. I would also like to thank NCAER Professor Indira Iyer and her highly motivated team at NCAER comprising Dr Soumi Roy Choudhary, Dr Samarth Gupta, Dr Shayequa Zeenat Ali, Dr Madhura Dasgupta, Ms Anupma Mehta, Ms Devyani Chaturvedi, Mr Rishabh Singh and Ms Shashi Singh. Led by Dr Iyer, within a short time frame the team has assessed the opportunities and challenges for infrastructure development in India and conceptualised this Approach Paper outlining ways to prioritise infrastructure investment. We believe that this roadmap for infrastructure development will be invaluable for building better and building faster in India in the coming years.

March 31, 2021
New Delhi

Shekhar Shah
Director General, NCAER

ACRONYMS

AERA	Airports Economic Regulatory Authority of India	FEI	Financial-Economic Index
AIF	Alternate Investment Funds	FDI	Foreign Direct Investment
ADB	Asian Development Bank	FIPB	Foreign Investment Promotion Board
BRICS	Brazil, Russia, India, China, and South Africa	FPI	Foreign Portfolio Investors
BE	Budgeted Expenditure	GAIL	Gas Authority of India Limited
BOO	Build Own Operate	GCI	Global Competitiveness Index
BOOT	Build Own Operate Transfer	GST	Goods and Services Tax
BOT	Build-Operate-Transfer	GoI	Government of India
BOOST	Build-Own-Operate-Share-Transfer	GMR	Grandhi Mallikarjuna Rao
Capex	Capital Expenditure	GDP	Gross Domestic Product
CO2	Carbon dioxide	GSDP	Gross State Domestic Product
CPCB	Central Pollution Control Board	G20	Group of 20
CPSE	Central Public Sector Enterprises	GIFT	Gujarat International Finance Tec
CWC	Central Warehousing Corporation	HUDCO	Housing and Urban Development Corporation Ltd
CMIE	Centre for Monitoring Indian Economy	HAM	Hybrid Annuity Mode
CIAL	Cochin International Airport Limited	HC	Hydrocarbons
CGE	Computable General Equilibrium	IFC	Investment Finance Company
CBA	Cost-Benefit Analysis	IIFCL	India Infrastructure Finance Company Ltd
CRISIL	Credit Rating Information Services of India Limited	ICRIER	Indian Council for Research on International Economic Relations
DDA	Delhi Development Authority	IFSC	Indian Financial System Code
DMIC	Delhi-Mumbai Industrial Corridor	IIS	Industrial Information System
DND	Delhi-Noida-Direct	ICT	Information and Communications Technology
DPIIT	Department for Promotion of Industry and Internal Trade	InVeits	Infrastructure Investment Trusts
DEA	Department of Economic Affairs	IL&FS	Infrastructure Leasing & Financial Services
DB	Design Build	ICRA	Investment Information and Credit Rating Agency
DBM	Design Build Maintain	IPF	Investment Prioritization Framework
DBFOT	Design-Build-Finance- Operate-Transfer	JBIC	Japan Bank for International Cooperation
DBOT	Design-Build-Operate-Transfer	KM	Kilo-meters
DFI	Development Finance Institution	LARR Act	Land Acquisition, Rehabilitation and Resettlement Act
EAP	East Asia and Pacific	LIC	Life insurance Corporation of India
ECB	External Commercial Borrowings		
FY	Financial Year		

MRO	Maintenance, Repair and Overhaul	PSU	Public Sector Undertaking
MPD	Master Plan Delhi	PPP	Public–Private Partnership
MoU	Memorandum of Understanding	REITs	Real Estate Investment Trusts
MEITY	Ministry of Electronics and Information Technology	RFP	Request for Proposal
MoHRD	Ministry of Human Resource Development	RFQ	Request for Qualification
MoSPI	Ministry of Statistics and Programme Implementation	RAND	Research and Development
NAFED	National Agricultural Cooperative Marketing Federation of India Limited	RBI	Reserve Bank of India
NCAER	National Council of Applied Economic Research	R&R	Resettlement and Rehabilitation
NCRB	National Crime Records Bureau	ROI	Return on Investment
NHI	National Highway Institute	RE	Revised Expenditure
NHAI	National Highways Authority of India	RFCTLARR	Right to Fair Compensation and Transparency in Land Acquisition, Rehabilitation and Resettlement Act
NIP	National Infrastructure Pipeline	Rs or INR	Rupees
NITI Aayog	National Institution for Transforming India	SEBI	Securities and Exchange Board of India
NSSO	National Sample Survey Organization	SIA	Social Impact Assessment
N-IIPI	NCAER-Infrastructure Investments Priority Index	SEI	Social-Environment Index
N-IIPS	NCAER-Infrastructure Investment Prioritization Score	SWF	Sovereign Wealth Funds
N-SIPI	NCAER-State Investment Potential Index	SPV	Special Purpose Vehicle
NPV	Net Present Value	SOEC	Substantial Ownership and Effective Control
NTBCL	Noida Toll Bridge Company Ltd	SDG	Sustainable Development Goals
NBFC	Non-Banking Finance Companies	TDS	Tax Deducted at Source
NCDs	Non-Convertible Debentures	TPC	Total Project Cost
OECD	Organization for Economic Co-operation and Development	UKIBC	UK India Business Council
PM	Particulate Matter	UK	United Kingdom
PGCIL	Power Grid Corporation of India Limited	UN	United Nations
PIB	Press Information Bureau	UNCTAD	United Nations Conference on Trade and Development
PPI	Private Participation in Investment	UNIDO	United Nations Industrial Development Organization
PPPAC	Public Private Partnership Appraisal Committee	USD	United States Dollar
		US or USA	United States of America
		VGF	Viability Gap Funding
		WEF	World Economic Forum
		WHO	World Health Organization

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EXECUTIVE SUMMARY

The prevalence of critical infrastructure gaps across various sectors and the absence of world-class infrastructure are among the most significant challenges to India's growth prospects. The big push towards building infrastructure is reflected both in India's Union Budget of 2021-22 and in the recently launched multi-year National Infrastructure Pipeline (NIP). As discussed in Chapter 1 of this Approach Paper, the transport sector accounts for almost half of the 7848 projects in the NIP, with an average cost of Rs 1689 crore- per project, while 11 per cent of the projects in the social infrastructure sector have the lowest average cost, at Rs 1002 crore. India ranks very high in private sector investments in infrastructure. The World Bank's Private Participation in Investment Report (2019) ranks third in the world in private sector investment commitments after China and Brazil. Domestic private investment in infrastructure in India has come mainly in the form of Public Private Partnerships (PPPs), with over 1100 PPPs projects under execution in the country as of November 2020. Over the past decade, more than one-third of the infrastructure investments in India have come from the private sector.

Apart from domestic private investments, Foreign Direct Investment (FDI) plays a significant role in closing investment gaps. Chapter 2 discusses the trends in FDI and overall investment activity across various states in India. India has been a significant recipient of FDI inflows in the world and accounted for close to 90 per cent of these inflows in the South Asian region in 2019. Over the period 2015-16 to 2019-20, inflows from Singapore and Mauritius dominated the total FDI inflows into India over those from the US, UK, and Japan. The manufacturing sector received the largest share of inflows, though the shares of the retail and transport sectors have also seen a rise in recent times. The states of Maharashtra, Karnataka, and Haryana are among the top five recipients of FDI inflows from the UK, US, and Japan. Since there is a significant variation in inflows across both the sectors and states, the decisions taken by investors on how to allocate investments is often driven by the investment potential of the individual states. In order to help systematise such information, NCAER's single composite investment rating, called

the State Investment Potential Index (N-SIPI) acts as a "go-to" reference for assessing how the states in India are positioned to encourage and attract investment. N-SIPI has also been a valuable resource for framing some indicators for prioritising infrastructure projects in this study.

This study also analyses two highly significant challenges for infrastructure investment, viz., infrastructure financing and acquisition of land for infrastructure. Financing the infrastructure gap in India is not just challenging but also complicated due to the diverse infrastructure requirements across states, sectors, and geographies. Chapter 3 highlights the increasing role of the private sector, particularly in the form of PPPs, in infrastructure financing and the measures taken to augment it over the past two decades. It has been observed that Maharashtra has the largest share of PPP projects, followed by Uttar Pradesh, Gujarat, and Andhra Pradesh. In terms of the sector-wise distribution of PPPs, the transportation sector tops the list, followed by the energy sector. While PPPs can be of many types, the most prevalent form in India is seen to be the Build-Operate-Transfer (BOT) model, accounting for 44 per cent of the total PPP projects in the country. In order to attract greater PPP participation and to ensure transparency, the government has initiated several policies, such as setting up of Public Private Partnership Appraisal Committees, posting guidance notes on websites, and using model standardised contracts. Among the most important of these measures is revamping of the Infrastructure Viability Gap Funding Scheme for attracting more PPPs in infrastructure, which is also discussed in Chapter 3.

The existence of a properly functioning land market is extremely important for infrastructure development. Chapter 4 explores the issue of 'Land for Infrastructure' from both the supply and demand sides, through a discussion of Urban Master Plans. The supply-side factors deal with problems in the acquisition or availability of land for industrial purposes and the evolution of the Land Acquisition Act (2013). It has been found that till March 2021, about 9 per cent of all infrastructure projects have been abandoned or stalled, with land acquisition problems being the reason

in 7 per cent of the cases. The setting up of Industrial Parks is an excellent solution to this problem but several plots remain vacant due to lack of information about their existence among prospective users. Presently, Maharashtra accounts for the highest number of Industrial Parks, followed by Karnataka, Rajasthan, and Gujarat. With urban and peri-urban areas being the centres for infrastructure development, a case study of the Master Plan Delhi 2021, which aims to make Delhi a “global metropolis and a world-class city”, has also been discussed in this chapter to highlight the need and opportunities for private participation in infrastructure investment. Finally, since land acquisition has been a major bottleneck in infrastructure development for decades, some recommendations have been offered to enable smoother PPP engagement in acquiring land for infrastructure.

Given the availability of limited resources for fulfilling ever-growing needs of the increasing population in the country, the allocation of infrastructure investments across sectors and geographies is a challenging task. In addition, while the objective functions of the government and the private sector differ along key dimensions, both public and private sector investments need to complement each other to maximise growth. Chapter 5 suggests a new and unique framework for prioritising infrastructure investments by developing NCAER’s Infrastructure Investment Priority Index (N-IIPI). The N-IIPI is based on nine pillars, 30 sub-pillars, and 70 indicators, which capture the different objectives of public and private sector players in the infrastructure development space.

The nine pillars of N-IIPI include three pillars that exclusively capture the factors driving investment decisions for public sector players, four pillars correspondingly pertaining to private sector players,

and two common pillars under the PPP umbrella. The factors impacting public sector investment decisions are integrated under the social welfare pillar that focuses on income, and social and human capital; the spatial needs pillar which addresses discrepancies associated with regions and locations; and the market failures pillar that accounts for the under-provision of assets. Next, N-IIPI identifies various factors influencing private sector decisions under the following four pillars: the risks pillar covering political uncertainty and implementation risks; the financial opportunities pillar; the institutional framework pillar; and the nature of the asset pillar that focuses on the intensity of land required for the project and the degree of excludability. The pillars common to both the public and private sectors, and hence categorised under PPP, include the economic climate pillar, which captures the external macro-factors conducive for running a businesses; and the multiplier effects pillar, which covers multipliers arising from large public sector investments on employment and growth as well as on ancillary opportunities. The N-IIPI methodology entails a combination of qualitative and quantitative methods to be aggregated within and across the pillars for ranking and prioritising infrastructure projects.

The current focus on infrastructure in both the Budget 2021-22 and future Government projects is imperative for not only recovering from the pandemic-induced recession but also for creating jobs and sustaining long-term economic growth. Moving forward, NCAER plans to build on the new framework conceptualised in this Approach Paper for mapping both the existing and future infrastructure projects by priority sectors and geographies as part of a separate project. This could become a crucial reference point for decision-making at both the Central and State levels, as well as for private sector investors.

CHAPTER 1

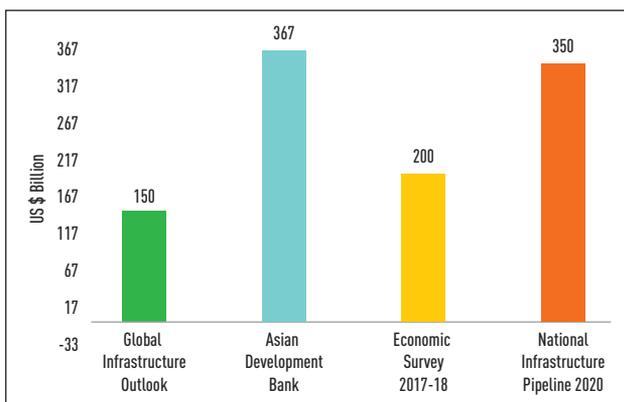
INFRASTRUCTURE INVESTMENT IN INDIA SECTORS AND GEOGRAPHIES

1.1 The Big Infrastructure Push

Among the most significant challenges to India's growth are critical infrastructure gaps across various sectors and the absence of world-class infrastructure in the country. According to estimates by the Asian Development Bank (2017), there is need for infrastructure financing at around US \$367 billion per annum over the next decade, while the corresponding more conservative estimate of Global Infrastructure Outlook (a G20 initiative) is US \$150 billion per annum. The Economic Survey of 2017-18 estimates India's total infrastructure financing needs at \$4.5 trillion by 2040, which amounts to roughly \$200 billion a year. More recently, the National Infrastructure Pipeline (NIP) has estimated the infrastructure financing needs at \$350 billion a year till 2025 (Figure 1.1). Despite the wide range of these estimates, what is significant is that even as per conservative estimates, there are tremendous opportunities for investment in infrastructure though organising funds for investment remains a challenge.

Figure 1.1

Annual Infrastructure Investment Financing Estimates: 2020-2025



Source: Global Infrastructure Outlook, 2019; ADB, 2017; Economic Survey, 2017-18; National Infrastructure Pipeline, 2019.

The current trends in infrastructure investment are consistently below the investment needs at the national level. According to the Global Infrastructure Outlook (2020), the investment in infrastructure projects across all the sectors taken together stands at 4.34 per cent of GDP as compared to the need for spending at 4.88 per cent of GDP (Figure 1.2). If one also takes into account the investment needs to achieve the UN's Sustainable Development Goals (SDGs) for universal access to

At around \$350 billion a year, India offers significant opportunities for investment in infrastructure. The challenge, however, lies in prioritising infrastructure investment given the availability of limited financial resources.

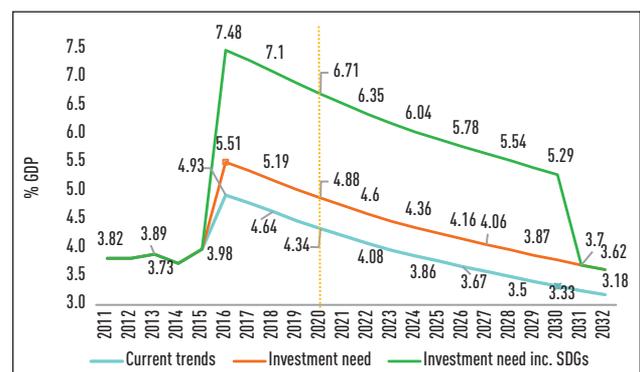
drinking water, sanitation and electricity by 2030, the infrastructure investment needs increase by almost 2 per cent of GDP to 6.71 per cent.

The infrastructure gap essentially implies the difference between what *should* ideally be spent and what is *actually* spent, and the need to address this gap has become critical in recent years. Yet, despite the attention being paid to this gap, there is no wide-lens methodology in the extant literature for prioritising infrastructure spending.

This Approach Paper seeks to develop a methodology, perhaps the first of this kind, delineated in Section 1.4 in this chapter, and in greater detail in Chapter 3, which could help prioritise investment projects. This can be achieved by taking into account the complex interplay of factors that go into decision-making by both private and public sector players pertaining to infrastructure investments.

Figure 1.2

Infrastructure Investment at Current Trends and Needs



Source: Global Infrastructure Outlook, 2020.

The rest of this chapter proceeds as follows. Sub-section 1.1.1 discusses the meaning of priority sector infrastructure, followed by a discussion on capital expenditure and investment in the Union Budget for

FY 2021-22, in sub-section 1.1.2. Section 1.2 analyses state-level infrastructure spending patterns and the sectoral and geographical composition of the National Infrastructure Pipeline. Section 1.3 explores private sector participation in the infrastructure landscape, while Section 1.4 highlights the factors that influence decision-making for infrastructure investment by both the public and private sectors.

1.1.1 Priority Sector Infrastructure Investments

Infrastructure, as it is generally understood, refers to some physical or human capital asset, which is an important input for industrial and overall economic development. Despite the fact that infrastructure investment is regarded as being fundamental to growth, there is no clear definition of infrastructure investment or even of priority sectors, according to the current usage of the term in India.

Traditionally, infrastructure is mainly referred to as physical and economic infrastructure. However, more recently, investment in social and green infrastructure have also become important for achieving the UN's Sustainable Developments Goals (SDGs).

The Ministry of Statistics and Programme Implementation (MoSPI), in its “Manual on Infrastructure Statistics (2012)”, states that “in spite of being extensively discussed, there is no standard definition of infrastructure”. According to MoSPI's definition, investments in infrastructure should satisfy the following six criteria: (i) natural monopoly; (ii) high sunk costs or asset specificity; (iii) non-tradability; (iv) non-rival consumption; (v) possibility of price exclusion; and (vi) presence of externalities. Based on these six criteria, the Manual identifies infrastructure investment as government spending in six sectors, viz., transport, energy, communication, drinking water supply and sanitation, irrigation, and storage. These criteria also constitute an important component of the indicators for prioritisation of investment discussed in Chapter 3 of this paper.

Building on MoSPI's six criteria, investments in physical infrastructure qualify for tax exemptions and incentives under Section 80-IA of the Income Tax Act. The Economic Surveys do not specifically define infrastructure spending though they generally discuss this in terms of Gross Fixed Capital Formation by the public sector, private sector, and households.

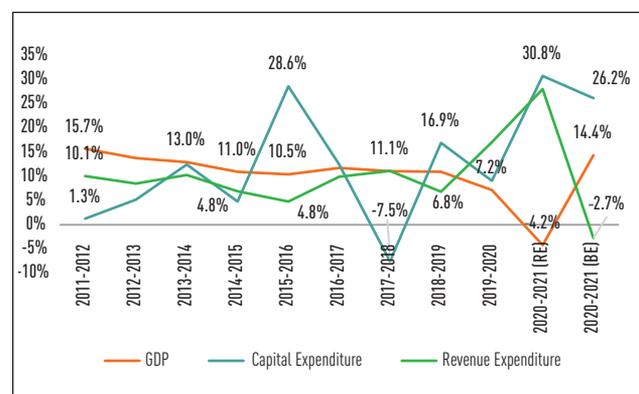
The National Infrastructure Pipeline (NIP) follows the broader definition of infrastructure. Under the NIP

ambit, infrastructure includes commercial infrastructure, logistics, transport, water and sanitation, energy, and social infrastructure. Social infrastructure is defined as the infrastructure that promotes health, education, and public goods. While the criteria for the selection of projects is not laid out in the NIP, it can be inferred that the projects in this plan are priority sector projects being implemented by both the public and private sectors.

1.1.2 Infrastructure Focus in the Union Budget of 2021-22

The need for enhancing infrastructure investment has widely been acknowledged in the Union Budget of 2021-22 for promoting sustained and rapid economic recovery after the COVID-19 pandemic. Capital expenditure in the Budget has increased by 26 per cent from Rs 4.4 lakh crore in FY 2020-21 to Rs 5.54 lakh crore in FY 2021-22. The growth in capital expenditure has outpaced the growth in revenue expenditure in five of the last eleven years, viz., FY 2013-14, FY 2015-16, FY 2018-18, FY 2020-21, and in the current Budget (Figure 1.3). In fact, in the current budget, the allocation to the revenue expenditure has fallen by 2.7 per cent, reflecting the Government's focus on increased capital expenditure.

Figure 1.3 Rate of Growth of GDP, Capital Expenditure and Revenue Expenditure



Source: Union Budgets.

Almost 40 per cent of the capital expenditure in FY 2021-22 is slated to be spent on road and rail infrastructure (Figure 1.4). Some of the major focus areas in road infrastructure include additions of 8,500 kms to the Bharatmala Pariyojana project and of 11,000 kms to national highway corridors.

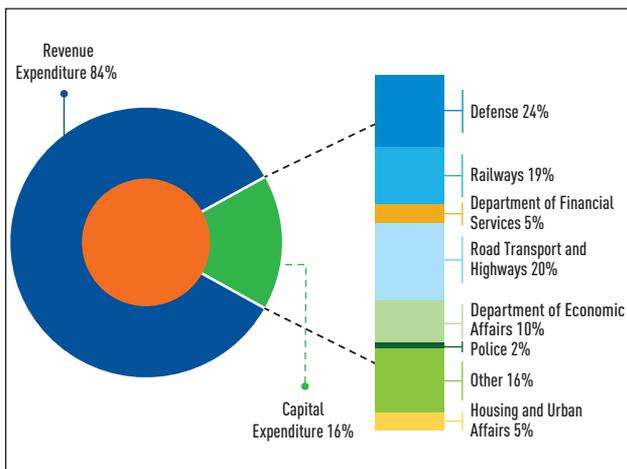
The other infrastructure initiatives in the Union Budget are building economic corridors in Tamil Nadu, Kerala (including the Mumbai-Kanyakumari corridor in Kerala), West Bengal, and Assam; a focus on futuristic rail infrastructure under the “National Rail Plan for India for 2030”; a big push towards expanding metro rail networks

“The NIP is a specific target which this government is committed to achieving over the coming years. I propose to take concrete steps to do this, in three ways: firstly, by creating the institutional structures; secondly, by a big thrust on monetising assets, and thirdly by enhancing the share of capital expenditure in Central and State budgets”.

Finance Minister Nirmala Sitharaman, Union Budget Speech, 1 February 2021.

and city bus services through innovative Public–Private Partnership (PPP) models in Tier 2 cities; developing seven major ports through PPP models; and developing modern fishing harbours and fish-landing centres along rivers and waterways. In addition, there has been a greater emphasis on affordable housing and rental housing, and a renewed focus on textiles, chemicals, and renewable energy.

Figure 1.4 Rate of Growth of GDP, Capital Expenditure and Revenue Expenditure



Source: Union Budget, 2021-22.

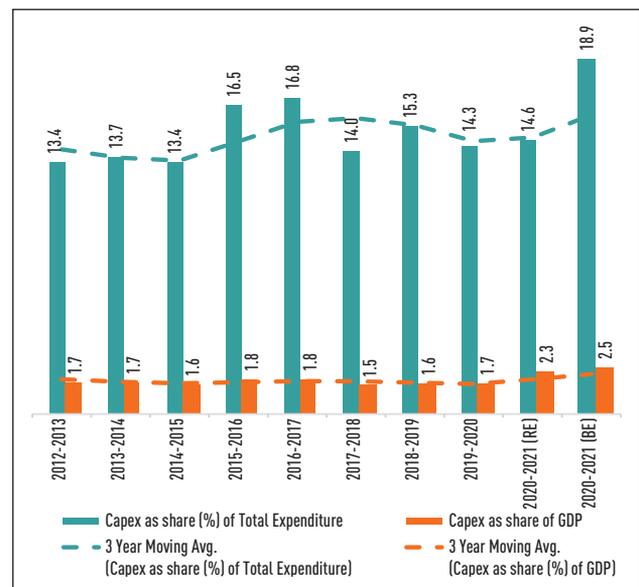
Incentives for infrastructure financing have also received a boost in the earlier Union Budgets. In the Union Budget 2020-21, the tax exemption for notified Sovereign Wealth Funds (SWFs) and the launch of new government-sponsored Infrastructure Investment Trusts (InVeits) and Real Estate Investment Trusts (REITs) have made infrastructure investments more attractive. Further, in the Union Budget 2021-22, Finance Minister Nirmala Sitharaman announced that a national strategy for monetisation of potential brownfield infrastructure assets would be launched soon, a professionally-managed Development Finance Institution (DFI) would be set up, and that the government would revamp the Infrastructure Viability Gap Funding (VGF) scheme in order to make investments more attractive. Annexure 1 lays out in

greater detail these infrastructure financing initiatives in the recent Union Budgets.

Trends in Capital Expenditure of the Union Government

The capital expenditure by the Central Government has remained in the range of 1.5 to 2.3 per cent as a share of GDP for the period of 2010-22. We can observe a sharp rise in Capex from 1.7 per cent in 2019-20 to a budgeted Capex of 2.5 per cent in 2021-22 due to the adverse impact of the pandemic when private sector investments were hit by the huge demand shock of the Coronavirus lockdown during the year (Figure 1.5). The Central Government has picked up the mantle of increasing investments in infrastructure to boost employment and demand. Besides the pandemic years, Capex remains steady in the range of 1.5-1.8 per cent during the period 2011-19.

Figure 1.5 Capital Expenditure as Share of Total Expenditure and GDP (%)



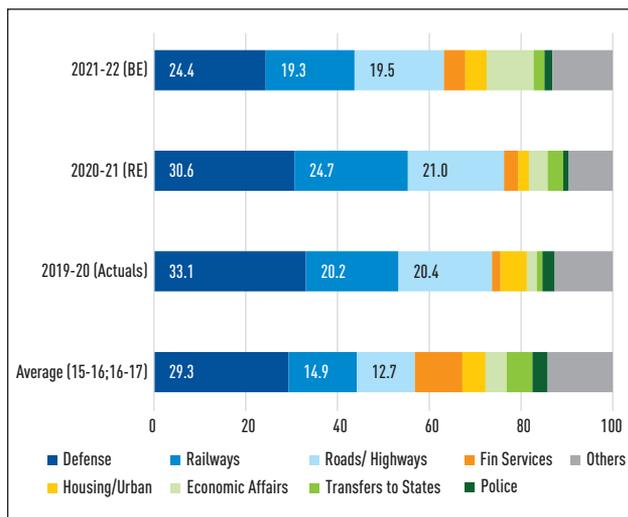
Source: Union Budgets.

Focus Areas

Since 2015, two-thirds of the capital expenditure (Capex) of the Central Government is spent by just three Ministries, viz, Defence, Railways and Road Transport (Figure 1.6). Besides these ministries, significant Capex allocations are also made for Housing and Urban Welfare and Atomic Energy. While the Capex by the Central Government is mainly spent on the creation of physical infrastructure, this may not be necessarily the case for Capex in the Department of Economic Affairs, Financial Service and Transfers to States.

Figure 1.6

Share of Capital Expenditure across Central Government Ministries (%)



Source: Union Budgets.

1.2 The National Infrastructure Pipeline (NIP)

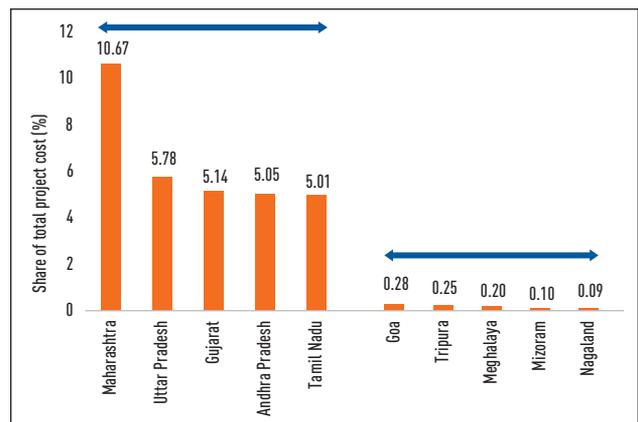
1.2.1 State Infrastructure Spending

A compendium of infrastructure project database shows that a total of 9,242 projects have been undertaken in India at a total expenditure of Rs 6,813,003 crore as of December 2019. Maharashtra tops the list, accounting for the highest share of total infrastructure project cost at 10.67 per cent (Figure 1.7). It is followed by Uttar Pradesh, which accounts for half the share of Maharashtra at 5.78 per cent. Significant disparities are observed among states at the top and bottom of the ladder. Of the five states that received the lowest infrastructure funding, four are from the North-East.

The top ten states account for 68 per cent of all infrastructure projects. Maharashtra not only accounts for the highest share of the total investment cost in infrastructure but is also host to the highest number (1154) of projects (Figure 1.8). It is followed by Madhya Pradesh and Karnataka, which account for 9 per cent and 8 per cent, respectively, of the total number of projects. These states are followed by Rajasthan, Uttar Pradesh, and Gujarat, accounting for 6 per cent each of the infrastructure projects. It may be noted that though Uttar Pradesh had the second highest share of project costs, it did not have a relatively high number of projects. In contrast, though Rajasthan and Karnataka featured among the top five states based on the number of projects, they did not account for high-cost projects.

Figure 1.7

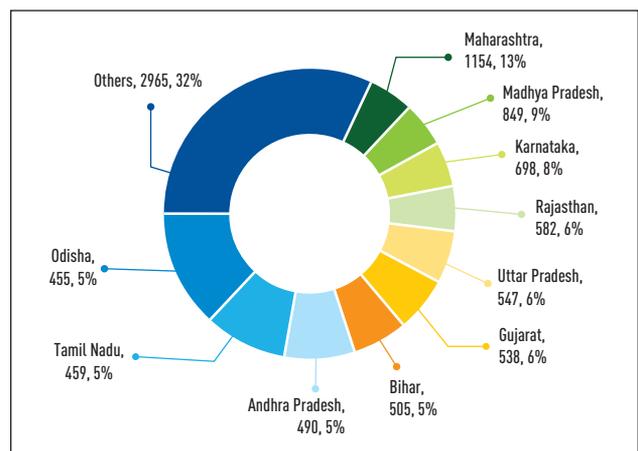
States with the Highest and Lowest Shares of Infrastructure Project Costs



Source: Department of Economic Affairs, Gol.

Figure 1.8

State-wise distribution of Number of Infrastructure Projects (1991-2020)



Source: Department of Economic Affairs, Gol.

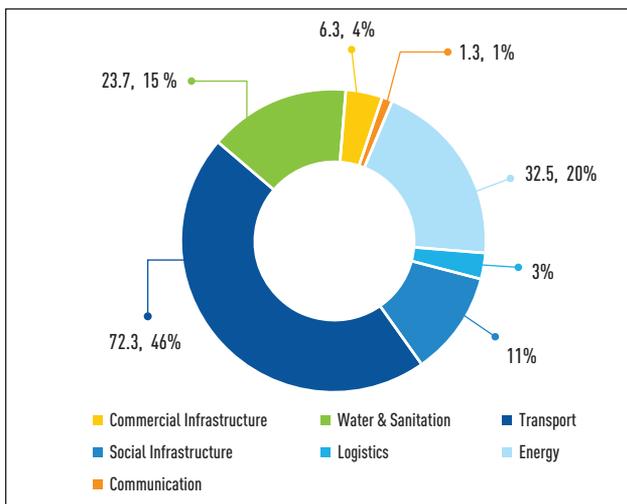
1.2.2 The National Infrastructure Pipeline (NIP)

With India now slowly moving out of its pandemic-induced recession, investment in infrastructure has become one of the key policy priorities for jumpstarting growth. Recognising this, the Government of India recently launched a multi-year Rs 158 trillion (US \$2.1 trillion) National Infrastructure Pipeline (NIP), which aims at coordinated investments at the Central and State levels over the five-year period of FY 2020 to FY 2025. The funding by Central and State governments in the total pipeline is roughly 40 per cent each, with the balance 20 per cent being funded by the private sector.

The objective of NIP is to improve both project preparation as well as attract investments in infrastructure, particularly from the private sector. Private sector investment in infrastructure is mainly in the form of PPPs. The four main sectors of focus in terms of project costs in the five-year NIP are transport (46 per cent), energy (20 per cent), water and sanitation (15 per cent) and social infrastructure (11 per cent) (Figure 1.9). Almost half of the 7848 projects are in the transport sector (Figure 1.10). As seen in Figures 1.11 and 1.12, projects that are spread across several states have larger outlays (at 27.5 per cent) but are fewer in number (less than 3 per cent). Maharashtra is seen to be the topmost state in terms of project costs, while Madhya Pradesh tops the list in the number of projects. Annexure 2 contains further details for state and sector wise distribution of NIP.

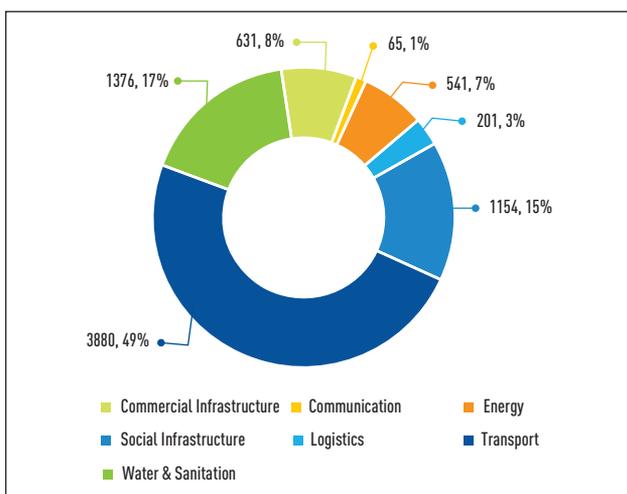
Close to half of the Rs 158 trillion NIP projects are in the transport sector. Maharashtra is the topmost state in the transport sector in terms of both the cost of the projects (14.7 per cent) and the number of projects (9.7 per cent). On an average, the cost of a project in the transport sector is Rs 1689 crores, while the corresponding figure in the energy sector is Rs 2868 crores. Projects in the social infrastructure sector are seen to have the lowest average cost, at Rs 1002 crores.

Figure 1.9 Sector-wise Distribution of NIP by Cost in Rs Trillion (Rs Lakh Crores)



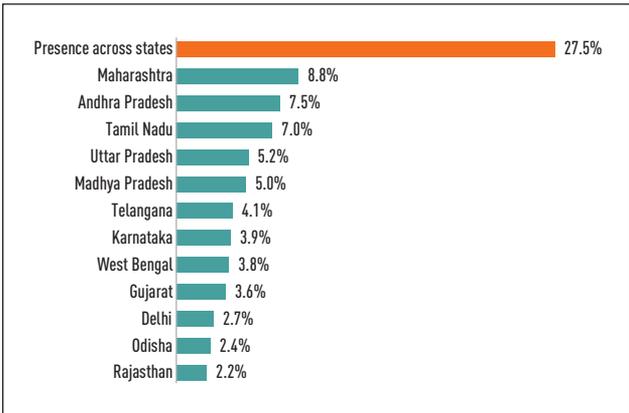
Source: DPIIT, Gol.

Figure 1.10 Sector-wise Distribution of NIP by Total Number of Projects



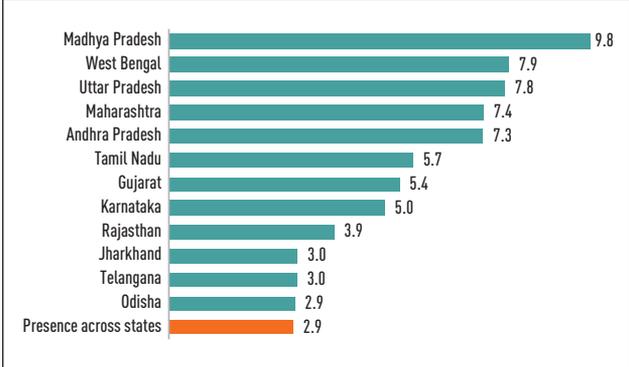
Source: DPIIT, Gol.

Figure 1.11 NIP Projects by Geography: Percentage of Total Costs



Source: DPIIT, Gol.

Figure 1.12 NIP Projects by Geography: Percentage the total number of projects

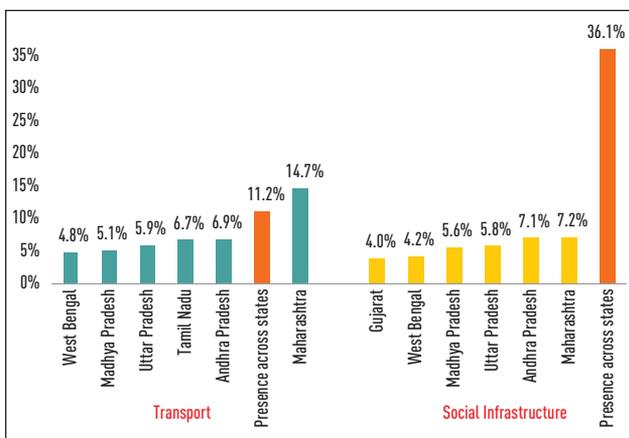


Source: DPIIT, Gol.

As regards the sectoral distribution of projects, Maharashtra accounts for almost 15 per cent of the cost of projects in the transport sector, while West Bengal and Madhya Pradesh account for 5 per cent each of the costs. Although less than 3 per cent of the social infrastructure projects (mainly water and sanitation) are spread across states, they account for over one-third of the total project costs (Figures 1.13 and 1.14). The average cost of projects

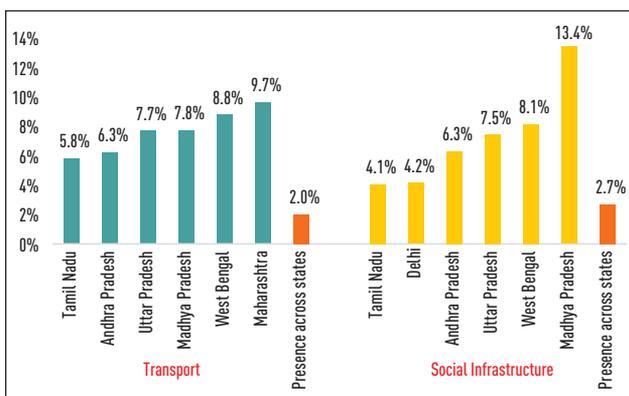
in the energy sector, at Rs 2868 crores per project, is almost four times the average cost of projects in the commercial sector, at Rs 805 crores (Figure 1.15). An analysis of the State-wise size of projects indicates that Delhi accounts for the highest cost per project, at Rs. 3523 crores while the corresponding figures for Odisha and Gujarat are Rs. 1669 crore and Rs. 1329 crores respectively (Figure 1.16).

Figure 1.13 NIP by Sectors and Geographies by Percentage of Total Cost



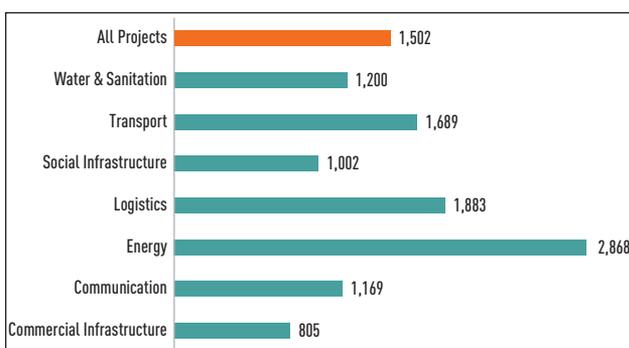
Source: DPIIT, Gol.

Figure 1.14 NIP by Sectors and Geographies by Percentage of Total Number of Projects



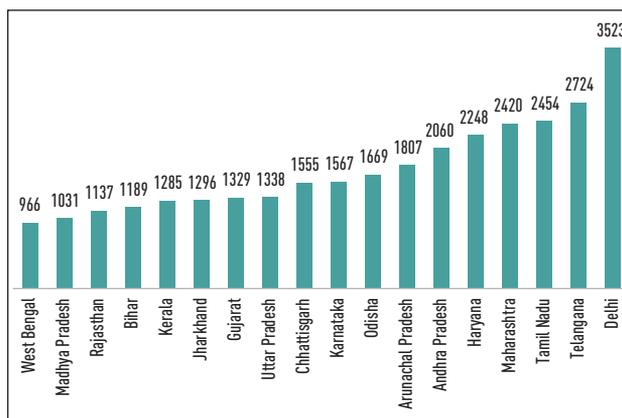
Source: DPIIT, Gol.

Figure 1.15 Average Cost of Infrastructure Projects by Sector (Rs Crores)



Source: DPIIT, Gol.

Figure 1.16 Average Cost of Infrastructure Projects by State (Rs Crores)



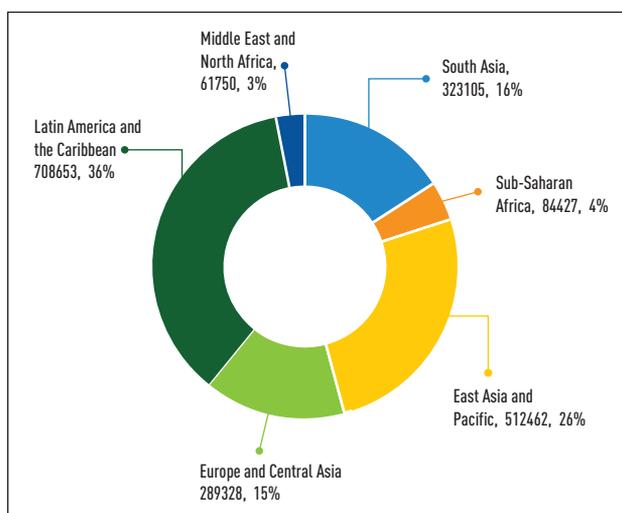
Source: DPIIT, Gol.

1.3 Private Sector Participation in Infrastructure Investment

1.3.1 PPPs in the Global Landscape

As per the Private Participation in Infrastructure database of the World Bank, over a 30-year period from 1990 to 2020, close to 8300 PPP projects worth \$2 trillion reached financial closure globally. Over one-third of these projects were located in the Latin American and Caribbean countries, about one-fourth in East Asia and Pacific (EAP) region, and 16 per cent in the South Asia region (Figure 1.17). Over this same period, in the South Asia region, India accounted for a majority of the PPP project cost at 85 per cent. In the EAP region, China accounted for 47 per cent of the PPP project cost, while Brazil accounted for 60 per cent of the total project cost in Latin America and the Caribbean region.

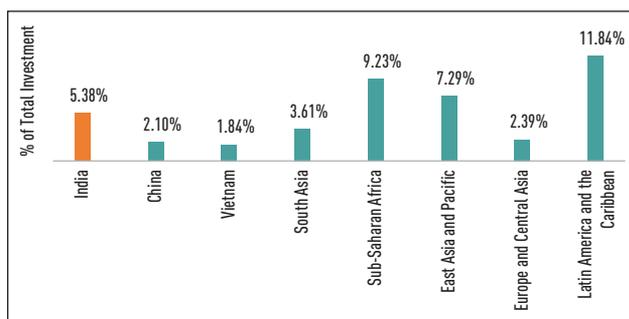
Figure 1.17 Global Distribution of PPP Projects, 1990-2020



Source: Private Participation in Infrastructure Database, World Bank.

Figure 1.18

Private Infrastructure Projects Cancelled or Under Distress (1990-2020)



Source: Private Participation in Infrastructure Database, World Bank.

India ranks very high in private investments in infrastructure. In 2019, almost 40 per cent of the global private investment in infrastructure was in the EAP region. During the same year, India was ranked third in the world in private sector investment commitments after China and Brazil. However, while the proportion of projects that were cancelled or in distress in India stood at 5.38 per cent, which was better than the corresponding EAP average of 7.29 per cent, what is of greater significance is the comparatively low rates of cancelled projects in China and Vietnam, at 2.1 per cent and 1.84 per cent, respectively, since both these countries compete with India for Foreign Direct Investment (FDI) inflows (Figure 1.18).

1.3.2 PPPs in India

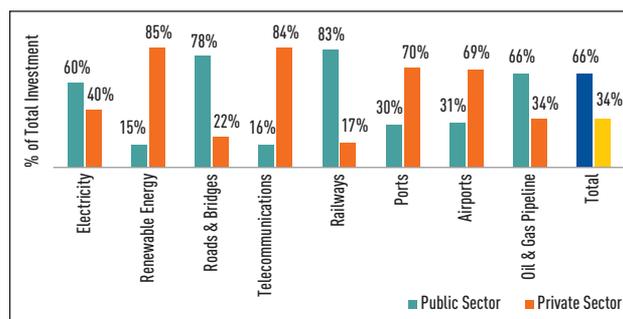
Notably, a key component of the infrastructure development strategy of the government is to attract private sector investment, which is expected to play an important role in plugging the infrastructure financing gap in the country. There is a greater emphasis on PPPs in social and economic infrastructure both in the NIP as well as the Budget of 2021-22. Simultaneously, FDI is also expected to play an important role in plugging the infrastructure financing gap in the country. The October 2020 10th Round of the Ministerial UK-India Economic and Financial Dialogue also underscored the growing importance of private sector initiatives. Chapter 2 discusses FDI flows across sectors and geographies in further detail.

PPPs in India are evaluated “from an economic perspective (to ascertain whether the project is warranted – public need), then whether the project generates positive value to the private sector (financial viability) and finally which of the defined viable PPPs is most attractive (VfM analysis)”.

- The Draft National Public Private Partnership Policy (2011).

Figure 1.19

Public and Private Sector Shares in Infrastructure Investment (Average 2012-2017)



Source: Twelfth Five Year Plan.

In India, private investment in infrastructure has come mainly in the form of PPPs. More than one-third of the infrastructure investment in India in the past decade has come from the private sector. Private sector investment in the renewable energy sector is the highest, at 85 per cent, followed by telecommunications, at 84 per cent, ports at 70 per cent, and airports at 69 per cent. It is seen that investments in roads, bridges and railways are predominantly made by the public sector (Figure 1.19).

PPPs are critical to India’s infrastructure development. The Public Private Partnership Appraisal Committee (PPPAC) is responsible for the appraisal of PPP projects for the Central Government. The PPPAC has recommended several passenger train projects, station redevelopment projects, eco-tourism projects, and projects in the ports sector.

There are several types of PPP models in India. These include user-fee based BOT models, performance-based management/maintenance contracts, and modified design-build (turnkey) contracts. As of November 2020, there were \$275 billion worth of committed investments in 1,103 PPP projects in India. The Infrastructure Viability Gap Funding (VGF) is expected to attract more private investment in the social sectors like health, education, solid waste management, and water supply.

Financing infrastructure investments in a sustained and efficient way is a significant challenge. Chapter 3 of this study offers a detailed analysis of the role of the public and private sectors in infrastructure financing, the sectoral opportunities for private sector infrastructure financing, and the incentives and challenges for infrastructure financing in India.

1.4 Prioritisation of Infrastructure Investment

It is important to point out that from the viewpoint of the government as a social planner, inclusive growth requires investment in both physical and social infrastructure. The

objective function of an ideal government is to invest in priority sectors with greater distributional and welfare goals. Hence, the objective function of the government is quite different from that of the private sector, which focuses primarily on profit maximisation, among other goals. Figure 1.20 maps out the various factors that impact the decision-making of the public and private sectors for investment.

Several factors impact public sector investments in infrastructure. The large canvas for a social planner includes the need to assess market failures, to provide public goods, to create positive externalities and complementary private sector spending, to generate growth and employment, and to ensure social development and improvement in social welfare. While private sector infrastructure spending would critically depend on the financial rate of return, other important aspects that drive private investment spending include policy uncertainties, competition, the ease of doing business, the kind of interlinkages and ancillary opportunities that are available, the lock-in period of the project, the ease of acquiring land, and the availability of various incentives and financing options like the VGF.

PPP projects are at the intersection of the objective functions of the public and private sectors. PPPs constitute an important vehicle for economic development, as they provide much-needed market orientation, operational efficiency, and additional resources for investment and

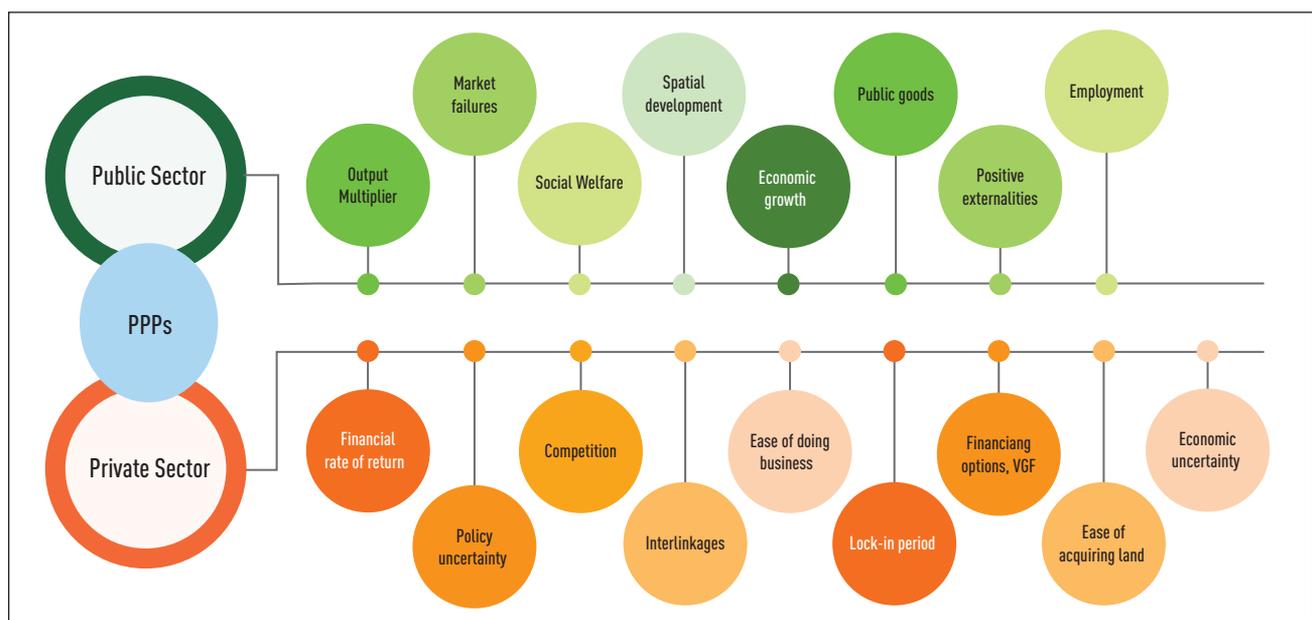
The global infrastructure spending needs over this decade (2021-2030) have been estimated at US \$3 trillion per year by the World Economic Forum and at US\$ 6.3 trillion by the OECD. Both estimates are currently being revised upwards to take into account the devastating impact of the COVID pandemic.

A Report by the McKinsey Global Institute on Bridging Global Infrastructure Gaps states that “while most countries have recognized the need for such spending, not much progress has been made on identifying and prioritizing the three to five key interventions that would make the biggest difference in the short to medium term.

Equally challenging for countries is choosing the optimal forms of service provision, including the private sector’s role in developing and financing infrastructure investments.”

the provision of public assets. PPPs are playing an increasing role in infrastructure development in India, and the factors that drive PPP growth form an important aspect of the process of developing a new methodology for prioritising infrastructure investment. Chapter 5 provides an in-depth review of the methodologies used by the public and private sectors to guide their investment decisions, and thereafter proposes a new framework to prioritise infrastructure investment while keeping in mind the separate goals and objective functions of all the players in the infrastructure development space.

Figure 1.20 Objective Functions Driving Investment in the Private and Public Sectors



Source: The NCAER Study Team, 2021.

CHAPTER 2

INVESTMENT OPPORTUNITIES IN INDIA

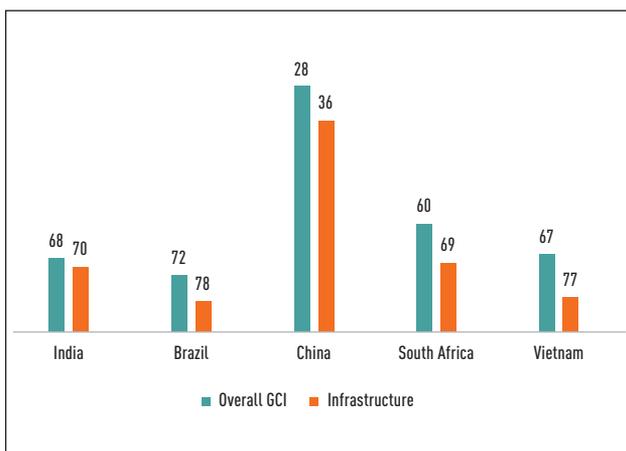
CROSS STATE COMPARISON

2.1 Measuring Business Environment of India on a Global Scale

The World Economic Forum's (WEF) Global Competitiveness Index (2019) (GCI) covers 141 economies and determines a nation's competitiveness on the basis of a set of institutions, infrastructure, macroeconomic policies, and other relevant factors.¹ According to the GCI 4.0, India was placed at the 68th position (Figure 2.1) in 2019, slipping down 10 places from its 58th place in 2018. Although India is the best performer in the South Asian region, among the BRICS economies, with a notable improvement in Information and Communications Technology (ICT) adoption, China is at the top, at around 40 positions above India. In terms of infrastructure, India ranks 70th in the world, while China is ranked 36th and Vietnam is at the 78th position. In terms of market size and innovation, both of which are important factors that drive investments, India did better in terms of GCI rankings, occupying the 3rd and 35th places, respectively.

Figure 2.1

WEF's GCI Rankings in 2019



Source: World Economic Forum.

India has been a significant recipient of foreign direct investments (FDI) over the years. As per the World

As per the Global Competitiveness Index, India was placed 3rd in the world in terms of market size, 35th in terms of innovation and in the 68th position overall in 2019.

Investment Report (2020) by UNCTAD, India was the ninth largest recipient of FDI and among the top five host economies of FDI in the 'Developing Asia' region. In 2019, the FDI inflows into China, at \$156 billion, were over three times of that into India at \$51 billion (Figure 2.2). However, the net FDI inflows into China have decreased over time, while the net FDI inflows into India have almost doubled from \$27 billion to \$51 billion over a decade from 2010 to 2019.

Figure 2.2

Comparison of Net FDI Inflows (current US \$ billion)

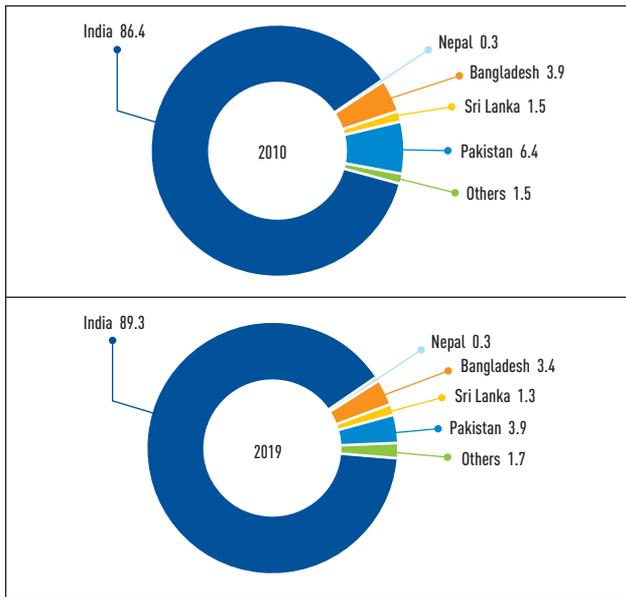


Source: World Development Indicators.

India has been the largest recipient of FDI inflows in the South Asia region. India's share has grown over the years from 86.4 per cent in 2010 to 89.3 per cent in 2019 (Figure 2.3). In 2019, Pakistan attracted the second largest share of FDI at 3.9 per cent, followed by Bangladesh at 3.4 per cent, Sri Lanka at 1.3 per cent, and Nepal at 0.3 per cent.

¹The GCI 4.0 is the product of an aggregation of 103 individual indicators, derived from a combination of data from international organisations as well as from the World Economic Forum's Executive Opinion Survey. Indicators are organised into the following 12 'pillars': Institutions; Infrastructure; ICT adoption; Macroeconomic stability; Health; Skills; Product market; Labour market; Financial system; Market size; Business dynamism; and Innovation capability.

Figure 2.3 India's FDI as Compared to Its Neighbours



Source: World Development Indicators.

Box 2.1: Sector-specific Challenges to Liberalisation - The Aviation Sector

The aviation sector in India is one of the most liberal markets around the world. The reforms introduced in 2016 permitted the sector to receive foreign investments up to 100 per cent. This is a significant step from the earlier situation of State monopolisation.

In spite of the advent of such reforms, the extent of liberalisation in the aviation sector is still limited due to certain challenges faced by the sector. Specifically, while foreign investors are allowed to have a 100 per cent stake in the airlines, for increasing ownership beyond 49 per cent, they will have to seek prior government permission. Thus, being a majority stakeholder in an airline is still subject to bureaucratic clearances. Further, the sector's 'Substantial Ownership and Effective Control' (SOEC) policy requires foreign airlines to partner with local investors, and with the fact that substantial ownership resides with Indian nationals, foreign airlines are often dissuaded from investing into the sector. In other words, the aviation sector can be regarded as a case of restricted liberalisation.

Foreign investor confidence in India remains high. In 2019, India was ranked 15th in the Kearney's FDI Confidence Index. While some sector-specific challenges remain (see Box 2.1), the overall investments in the manufacturing sector received a boost due to government policies like the removal of the Foreign Investment Promotion Board (FIPB); the liberalisation of FDI thresholds for the retail, aviation, and the biomedical industries; and the "Make in India" initiative.

The pandemic has slowed FDI investments, not just in India, but also globally. The World Investment Report

2020 has observed that FDI in South Asia is expected to contract in 2020 and that "in India, the biggest FDI host in the sub-region, the number of greenfield investment announcements declined by four per cent in the first quarter of 2020, and merger and acquisitions contracted by 58 per cent". The report further added that while the logistical challenges during the lockdown and the recovery periods will continue to pose a big disadvantage for FDI, India is expected to keep attracting FDI as the economy rebounds during the post-COVID-19 period.

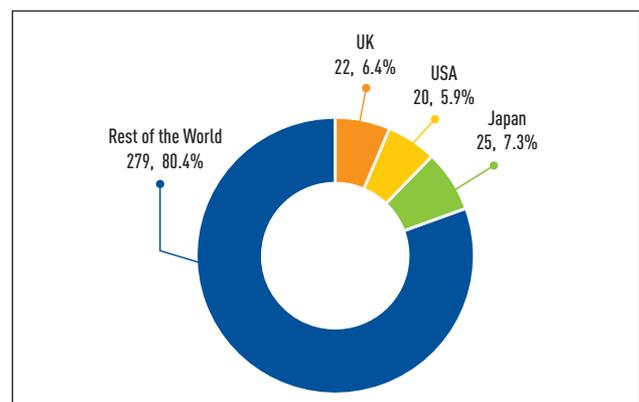
FDI Inflows into India: Country-wise and Sector-wise

The cumulative FDI inflows from the United Kingdom from 2010 to 2019 were approximately worth US \$ 22 billion and accounted for roughly 7 per cent of all FDI inflows over this decade (Figure 2.4). During the same period, the cumulative share of inflows from Japan was worth US \$ 25 billion (7.3 per cent) and that from the USA was worth US \$ 20 billion, accounting for 7.3 per cent and 5.9 per cent, respectively, of all FDI flows over this decade.

Singapore and Mauritius dominate the FDI inflows into India (Figure 2.5). In 2019, the inflows from Singapore were worth US \$ 12.6 billion, from Mauritius worth \$ 7.5 billion, from USA, \$3.4 billion, from UK, \$1.1 billion, and from Japan, \$2.3 billion.

The largest share of FDI inflows has been to the manufacturing sector, though its share has been decreasing over the years. In 2019, FDI inflows to the manufacturing sector stood at \$ 8.2 billion, followed by FDI inflows to the communications sector, at \$6.8 billion (Figure 2.6). In recent years, however, the share of FDI flowing into retail and wholesale trade, hotels and restaurants, and the transport sector, have been on the rise. For instance, FDI inflows into the transport sector have increased from \$0.9 billion in 2016-17 to \$2.3 billion in 2019-20.

Figure 2.4 Cumulative FDI Equity Inflows from 2010 to 2019



Source: Reserve Bank of India.

Figure 2.5

Country-wise FDI Inflows to India (US \$ Billion)

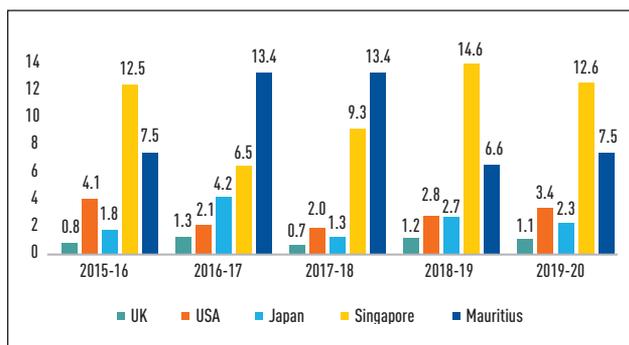
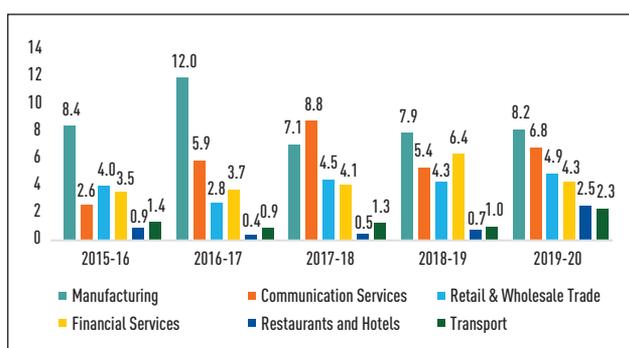


Figure 2.6

Sector-wise FDI Inflows to India (US \$ Billion)



Source: Reserve Bank of India

2.2 Distribution of FDI Inflows within India

The flow of FDI tended to have a strong regional concentration till 2012. Six of the most developed states in India in terms of their physical, institutional, and social infrastructure, that is, Maharashtra, Delhi, Karnataka, Tamil Nadu, Gujarat, and Andhra Pradesh, together accounted for more than 70 per cent of FDI equity flows during the period April 2000 till June 2012 (Mukerjee, 2011). A greater aptitude towards adopting novel and innovative technologies aids in greater FDI inflows. This correlation between the two can be understood by looking at the Innovation and the E-Readiness Indices. According to NITI Aayog, while Delhi topped the Innovation Index in 2019, Maharashtra topped the E-Readiness Index in 2016, with Delhi in the second place.

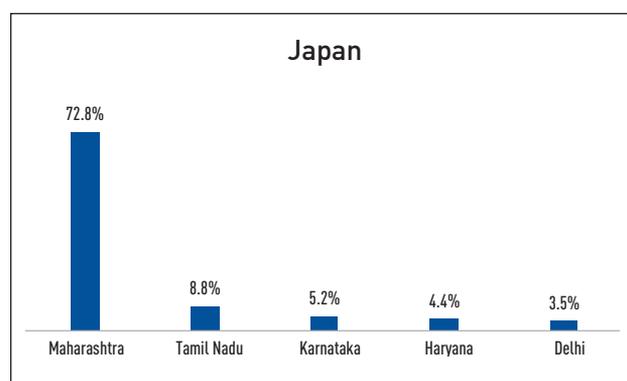
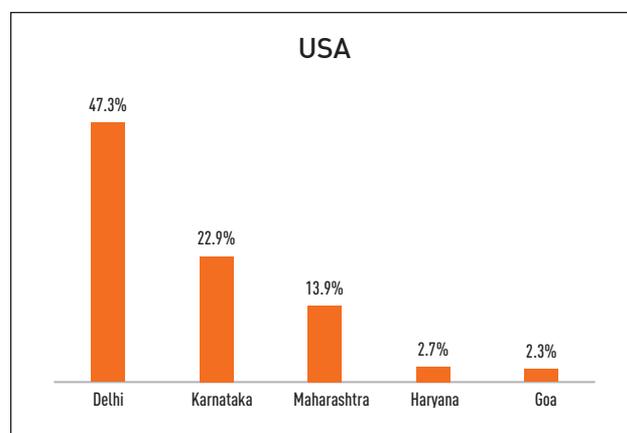
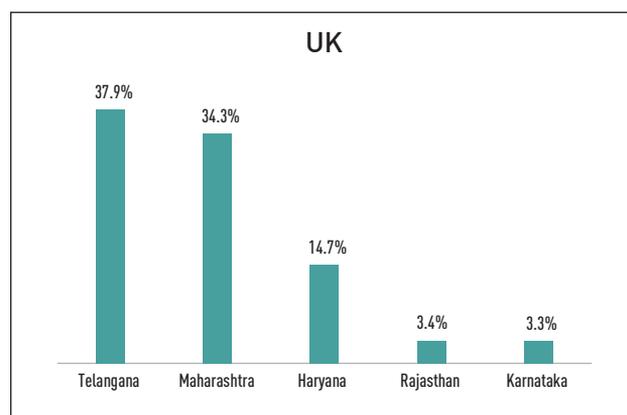
However, in recent years, investment activity has been more uniformly distributed across the states as compared to the distribution around two decades ago. While the aggregate share of the state economies of Maharashtra, Tamil Nadu, Gujarat, and Karnataka, in investment activities has declined over time, new states and Union Territories like Haryana, Rajasthan, Assam, Jharkhand, and Goa are attracting more FDI investment.

State-wise FDI Inflows

The top five states attracting FDI inflows from the UK, USA, and Japan differ from each other (Figure 2.7). While, Maharashtra, Karnataka and Haryana are the common states, Telangana and Rajasthan; Delhi and Goa; and Delhi and Tamil Nadu; attract FDI inflows from the UK, USA, and Japan, respectively. Telangana, Delhi, and Maharashtra top in the list of incoming flows from the UK, US, and Japan, respectively.

Figure 2.7

State-wise Break-up of FDI Inflows to India in 2019



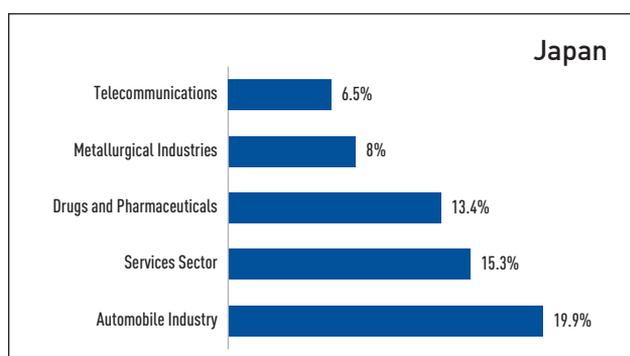
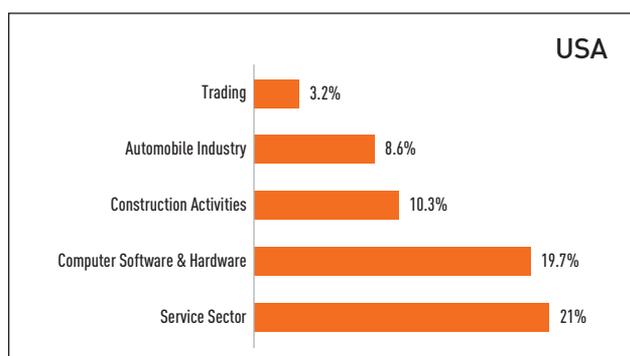
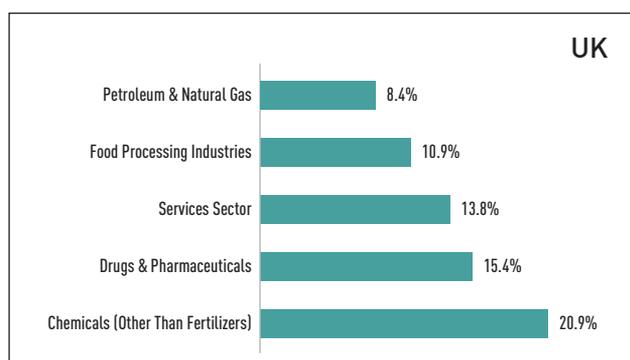
Source: Reserve Bank of India.

The Government of Telangana and the UK India Business Council signed a Memorandum of Understanding (MoU) in 2018 facilitating investments in advanced manufacturing, such as aerospace, defense, and heavy engineering. Additionally, the UK India Business Council (UKIBC) will also make investments in the pharmaceutical industry and higher education, as per this MoU.

FDI Inflows by Sectors

The sectoral break-up of FDI in 2019 suggests different focus areas for each country. The inflows of FDI from the UK are mainly into the chemicals sector, at 20.9 per cent, followed by those into the drugs and pharmaceuticals sector, at 15.4 per cent (Figure 2.8). The inflows of FDI from the USA are mainly into the services sector (21 per cent) and the computer software and hardware sectors (19.7 per cent). On the other hand, FDI from Japan is more concentrated in the automobiles sector (19.9 per cent), followed by the services sector (15.3 per cent).

Figure 2.8 Sector-wise Break-up of FDI Inflows to India in 2019



Source: Reserve Bank of India.

Multi-State Foreign Investment Project in India: The Delhi-Mumbai Industrial Corridor

The Delhi-Mumbai Industrial Corridor (DMIC) covers the states of Uttar Pradesh, Haryana, Rajasthan, Madhya Pradesh, Gujarat, and Maharashtra. The estimated cost of this project is \$100 billion. Of this, \$4.5 billion is being funded by the Japanese Government as a loan at a minimal interest of 0.1 per cent. Within the project, equity of 49 per cent is held by the Government of India, of 26 per cent by the Japan Bank for International Cooperation (JBIC), and the remaining by government financial institutions such as Housing and Urban Development Corporation Ltd (HUDCO), Life Insurance Corporation of India (LIC), and India Infrastructure Finance Company Ltd (IIFCL).

The project aims to create an industrial corridor that would facilitate local and international investments and sustainable development.

There has been quite a significant difference in FDI inflows across sectors and across states. The decision by foreign investors of where to invest, how much to invest, in which sectors to invest, and how to prioritise investment decisions is driven by, among other factors, the investment competitiveness or the investment potential of the individual states. In order to better understand state-specific and sector-specific investment opportunities, NCAER developed the State Investment Potential Index (N-SIPI), the details of which are discussed in Section 2.3.

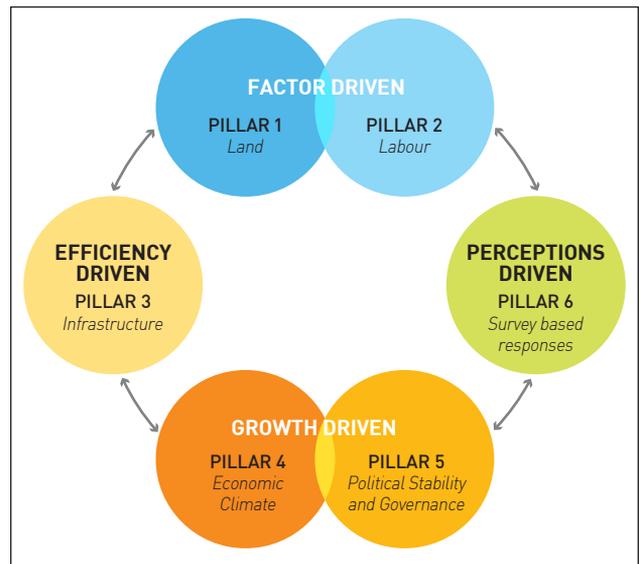
2.3 NCAER's State Investment Potential Index

The NCAER's State Investment Potential Index (N-SIPI) is a composite score that ranks the states of India on the basis of its investment potential. Built in 2016, it was conducted for three successive years from 2016 till 2018. NCAER's N-SIPI, a pioneering evaluation and the first of its kind, was originally funded by the Prosperity Fund of the British High Commission in 2016.

2.3.1 Overall Index and the Pillars

N-SIPI focuses on the policy and the structural backdrop determining the business environment in a state. It offers a holistic approach to rank the investment potential of a state through its policies via access to the key pillars necessary for investment. There are six pillars in N-SIPI 2018 that can be classified under the following four broad categories: factor-driven (land and labour), efficiency-driven (infrastructure), growth-driven (economic climate, and political stability and governance), and perceptions-driven (based on surveys) (Figure 2.9). Each of the pillars is, in turn, based on a number of sub-pillars and indicators (52 indicators in all). An increase in a state's ranking points to a more conducive environment for conducting business operations in that state. The N-SIPI has been a very useful "go-to" Index and, as seen in Box 2.2, been widely used by the states and the industry to guide investment decisions in recent years.

Figure 2.9 N-SIPI and State Competitiveness



Source: The NCAER State Investment Potential Index, 2018.

Box 2.2: N-SIPI as a Reference Point to Guide Investment Decisions

"This year, the N-SIPI report's findings are surprising, and show how easing regulatory and operational hurdles have catapulted previously non-performing states to the top."

-India Briefing, 30 August 2018.

"Kerala ranks fourth on how it is perceived as an investment destination, after Gujarat, Haryana and West Bengal. Kerala has emerged an achiever in the State Investment Potential Index 2018."

-Ascend Kerala Summit, 10 February 2019.

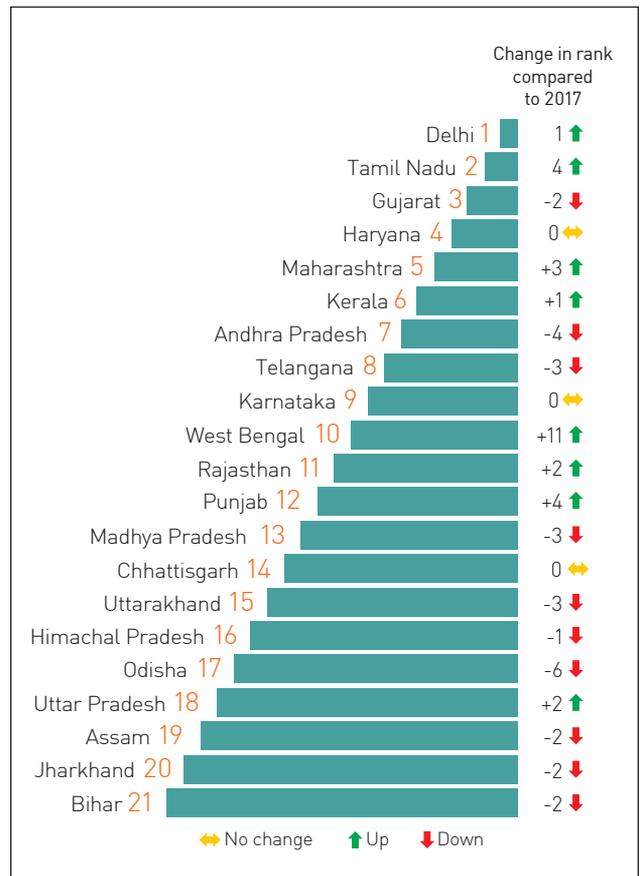
"The ADB estimates that the Odisha Economic Corridor would need a total investment of Rs 123 trillion. Odisha was ranked 11th with respect to the ability to attract investments as per the findings of a study conducted by NCAER in 2015-16, supported by the Foreign and Commonwealth Office, British High Commission, India."

-Business Standard, 30 March 2018.

"The 'perceptions' survey of N-SIPI gives interesting insights. Bihar and Karnataka face serious challenges in the procurement of land, while Telangana, Madhya Pradesh, and Tamil Nadu are ranked as the top states for getting land."

-Mint, 3 August 2018.

Figure 2.10 N-SIPI Ranking of States in 2018



Source: The NCAER State Investment Potential Index, 2018.

There has been a continuous improvement in the index to better track the progress of states and their respective investment climates. For instance, the land pillar was added in 2017-18, congestion as a sub-pillar was added in 2018-19, and questions on the newly introduced GST were added to the perceptions survey in 2018-19. In 2018, Delhi, Tamil Nadu, Gujarat, Haryana, Maharashtra, and Kerala were found to be the top six states for business investment (Figure 2.10).

Land and Infrastructure are the most crucial inputs for increasing productivity, employment opportunities, and economic growth in any country. Previous studies, including N-SIPI, have shown that land and the availability of credit are among the major constraints to investment in infrastructure due to the quantum of investment, the risks involved, and the long gestation period before which the investments become profitable. Both land and infrastructure form key pillars in N-SIPI, and have been discussed below. Table 2.1 ranks the top six states in N-SIPI 2018 in terms of land and infrastructure for investment purposes, while Figure 2.11 details the land and the infrastructure sub-pillars and indicators used in this ranking.

Table 2.1

Top Six States in N-SIPI for Land and Infrastructure

Rank	Land	Infrastructure
1	Telangana	Delhi
2	Madhya Pradesh	Punjab
3	Tamil Nadu	Maharashtra
4	Kerala	Haryana
5	Andhra Pradesh	Kerala
6	Maharashtra	Tamil Nadu

Source: The NCAER State Investment Potential Index, 2018.

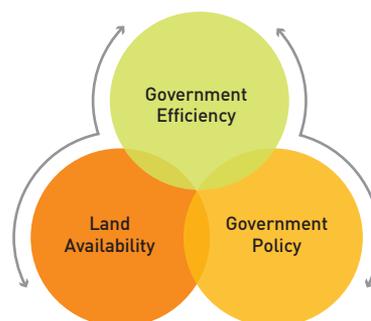
The Land Pillar in N-SIPI: The ease of land acquisition and the availability of adequate land is a significant factor impacting investment decisions by the private sector. The 'Land' pillar reflects on government efficiency and policies regarding the ease of land acquisition for business purposes and the availability of land for industrial purposes.

The Infrastructure Pillar in N-SIPI: In India, the infrastructure financing needs are enormous and the challenges to address demand are complex as the infrastructure requirements vary across states, across sectors, and across geographies. The infrastructure pillar captures how states stack up in terms of the various facets necessary for continuous growth and capacity utilisation, including the availability of power, roads, and credit.

Figure 2.11

The Land and Infrastructure Sub-pillars and Indicators in N-SIPI 2018

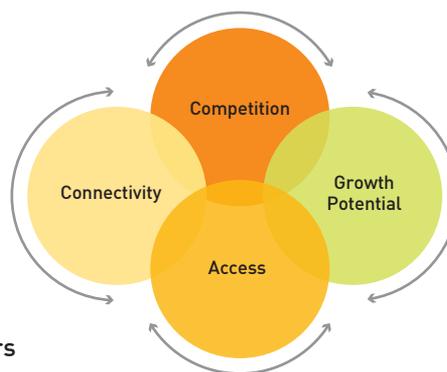
Pillars	Sub-Pillars
Land	What does Land Pillar indicate?



Indicators

- Digitised land records
- Land-related stalled projects
- Industrial parks in the state
- Land available for industrial purpose

Pillars	Sub-Pillars
Infrastructure	What does Infrastructure Pillar indicate?



Indicators

- Rail density
- Road density
- Cargo handled per day per airport
- Average electricity tariff for industry
- Power shortage as a percentage of total demand
- Groundwater availability
- Groundwater withdrawal by industries
- ICT-Readiness Index
- Bank branches per lakh population
- Statutory towns in smart cities as a percentage of the total in a state

Source: The NCAER State Investment Potential Index, 2018.

N-SIPI complements the World Bank's/DPIIT's Ease of Doing Business. While the World Bank/DPIIT Index assesses procedures to facilitate the ease of doing business and transactions, N-SIPI focuses on the policy and structural backdrop that determines the business environment in a State. In other words, DPIIT captures the transaction costs of business while N-SIPI reflects the opportunity cost, investment potential, and business environment. Both N-SIPI and DPIIT's Index facilitate investments and induce State-level competitiveness. Conceived as an annual index, N-SIPI provides a

systematic, consistent, and reliable “go-to” measure for potential investors to make locational and strategic choices.

Going forward, NCAER would look to build on this pioneering work to roll out N-SIPI 2021, which would also incorporate questions related to the impact of the pandemic on investment opportunities in the Perceptions pillar. Thus, N-SIPI 2021 might play a fundamental part in the recovery of the economy in the post-pandemic scenario, given the urgent need for large-scale private investment.

NCAER has benefited from the N-SIPI experience to frame the research on prioritising infrastructure

investment in India. With infrastructure investment becoming increasingly more important, both the government and private sectors have important roles to play. As discussed in Section 1.4 and illustrated in Figure 1.20, with different objective functions of the different players in the infrastructure space, the N-SIPI experience was useful for developing pillars and sub-pillars to rank infrastructure projects. Chapter 3 discusses in detail the existing methodologies for prioritising infrastructure projects and the suggested new framework, called the NCAER Infrastructure Investment Prioritisation Index, or N-IIPI. Just like N-SIPI, N-IIPI is also likely to be the first of its kind in terms of suggesting a methodology for prioritising infrastructure investment projects in India.

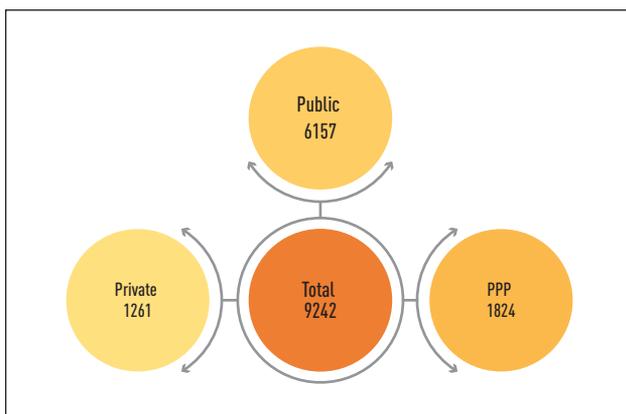
CHAPTER 3

INFRASTRUCTURE FINANCING AN ASSESSMENT OF OPPORTUNITIES AND CHALLENGES

3.1 The Infrastructure Investment Pattern in India

Till the 1990s, the government enjoyed monopoly power in financing infrastructure projects through conventional modes of provisioning. However, several of these projects faced challenges in terms of limited budgets, time and cost over-runs, inadequate maintenance, and technological constraints, ultimately contributing to infrastructure inadequacy in the country. Public-Private Partnerships (PPPs) have thereafter emerged as a principal vehicle for attracting private investments in India. The economic reforms in the early 1990s made it conducive to attract private sector participation (Sahoo and Dash, 2009). It has been seen that though public sector provision has remained dominant, PPPs have gained significance over the years and account for 20 per cent of all infrastructure projects implemented since 1991 (Figure 3.1).

Figure 3.1 Different Players in Infrastructure Projects (1991-92 to 2020-21)



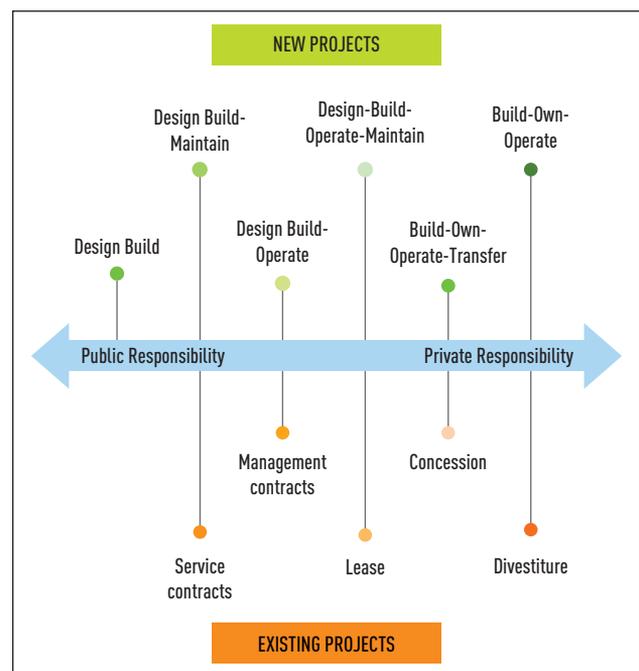
Source: Department of Economic Affairs, Gol.

3.1.1 Types of PPP Models

It has been observed that PPPs serve as an additional source of capital for the government, helping it meet the infrastructure financing gaps. Private participation in public investment has assumed many forms in the last 30 years. Based on the extent of risks and responsibilities shared between the public and private sectors, a variety of PPP models have come into operation, including

Design Build (DB); Design Build Maintain (DBM); Build Own Operate Transfer (BOOT); and Build Own Operate (BOO), among others (Figure 3.2).

Figure 3.2 Types of PPP Models in Operation



Source: The National Council for Public Private Partnerships.

3.2. Compendium of Sector-wise and State-wise PPP Projects

3.2.1 State Share in PPP projects

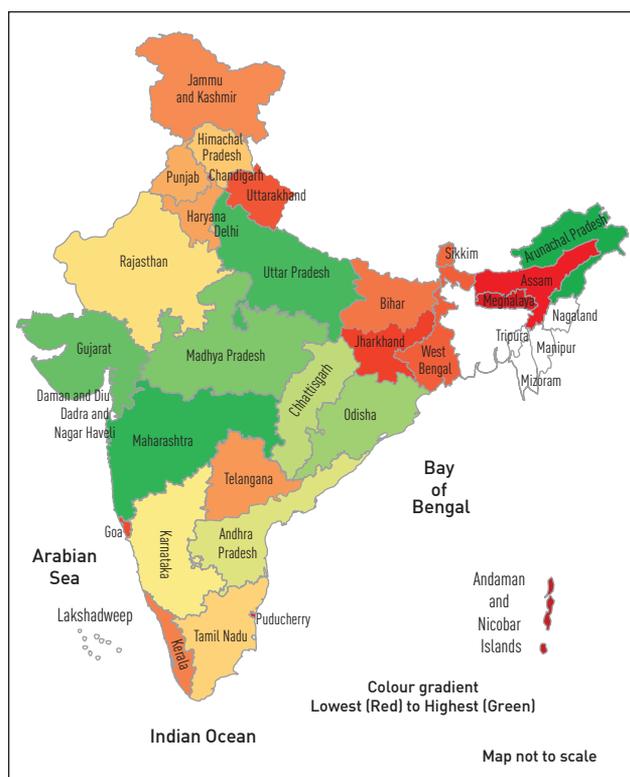
A compendium of PPPs shows that a total of 9,242 projects have hitherto been undertaken in India, accounting for a total expenditure of Rs 6,813,003 crore, as of December 2019. Of these, 1,824 (20 per cent) of the projects were procured through PPPs, 6,157 (67 per cent) through the traditional procurement process, and 1,261 (13 per cent) through private infrastructure. In terms of the number of projects, Maharashtra tops the list, accounting for 11 per cent of all PPP projects, followed by Uttar Pradesh (5.78 per cent), Gujarat (5.14 per cent), Andhra Pradesh (5.05 per cent) and Tamil Nadu (5 per cent). Meghalaya, Jammu & Kashmir, Goa, and

Puducherry are among the states and Union Territories accounting for the lowest shares of PPP.

In terms of the total infrastructure investment, Arunachal Pradesh tops the list, with 11 per cent of all outlays, mainly in hydropower projects. This is followed by Maharashtra (7 per cent), Uttar Pradesh (5.37 per cent), Gujarat (5.24 per cent), and Madhya Pradesh (3.95 per cent). The least share of PPP investment has been incurred in the states of Meghalaya, Assam, Jharkhand, Goa, and Uttarakhand, as of December 2019 (Figure 3.3).

Figure 3.3

Ranking of PPP Investment Outlays across States



Source: Department of Economic Affairs, Gol.

Note: The darker green colour in the figure pertains to states with the highest share of PPP cost while the red colour pertains to states with the least share of PPP cost.

As of November 2018, the Government of Arunachal Pradesh signed Memorandums of Understanding (MoUs) with 17 private companies in sectors like tourism and hospitality, oil and gas, retail, power, equipment manufacturing, and sports during the fifth edition of the North-East Connectivity Scheme. Investments worth Rs 1,200 crore (US\$ 170.99 million) in these sectors are expected to generate employment for about 8,000 people.

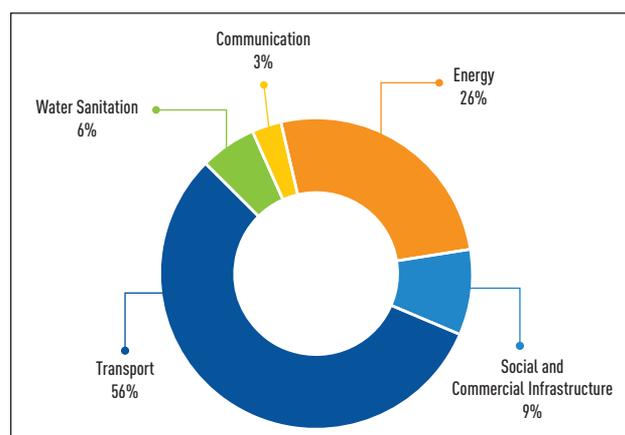
3.2.2 Sector-wise PPP Projects

A look at the sectors with the highest number of PPP projects shows that the transport sector accounted for a majority of the PPP projects (56 per cent) followed by those in the energy sector (26 per cent) [Figure 3.4].

As regards the sub-sectors, 81 per cent of the transport sector projects are related to roads and bridges. They account for 64 per cent of the total value of PPP. Within the energy sector, renewable energy projects account for 72 per cent of the total projects.

Figure 3.4

Sector-wise Share of PPP Projects in India



Source: Department of Economic Affairs, Gol.

There is limited availability of data on the total project cost (TPC) of PPPs. There is no information on the TPC in the case of more than 50 per cent of the transport sector projects listed under the Infrastructure India database. Hence, determining a sector-wise investment share of PPP may be misleading.

However, with that limited information, an insight into the sector-specific costs shows that the average costs of PPP projects in the transport sector is ten times higher than those of the projects under the water, sanitation, and social and commercial infrastructure. The difference is even higher when sanitation and social sector projects are compared with energy sector projects.

3.2.3 Sector-wise Distribution of PPP Models

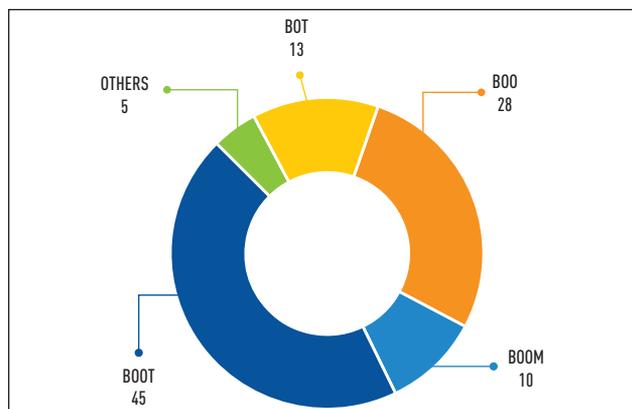
In India, 44 per cent of the total PPP projects follow the Build-Operate-Transfer (BOT) model. This type of PPP model also accounts for the highest share in value (68 per cent). The energy sector has been a frontrunner in the adoption of the PPP model. Within this, the Build-Own-Operate-Transfer (BOOT) model is the one that has been most frequently adopted (45 per cent). This is

also true for the water and sanitation sector (33 per cent). On the other hand, the share of BOT PPP in the total number of PPPs is highest in both the transport sector (63 per cent) and in social and commercial infrastructure sector (45 per cent) (Figure 3.5).

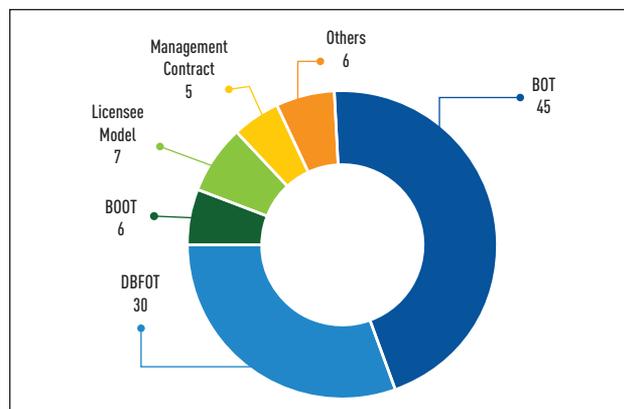
The BOT model accounts for 44 per cent of all projects in the PPP mode, and 68 per cent of the total project costs. However, in recent years, the Hybrid Model has gained more importance.

Figure 3.5 Types of PPP Models across Sectors

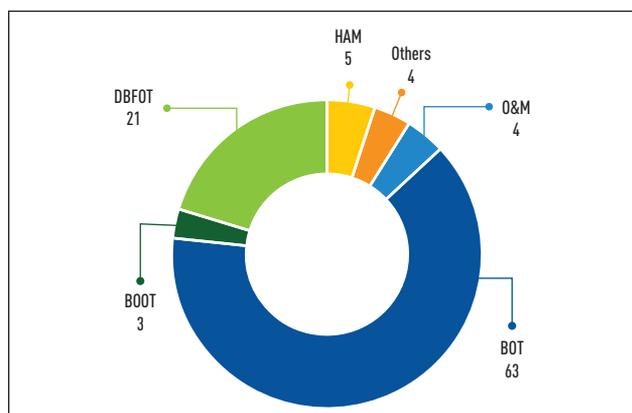
Energy



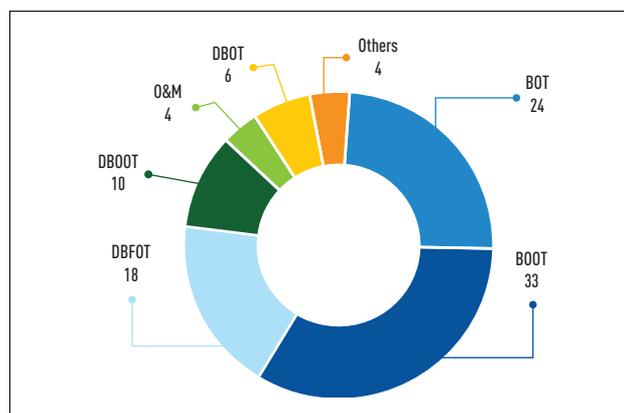
Social and Commercial



Transport



Water Sanitation



Source: Department of Economic Affairs, Gol.

Box 3.1: Different PPP Models under Operation in Odisha

A case study of Odisha shows the different PPP models in operation in the State across different infrastructure sectors (Box 3.1).

Sectors	B00	B0T	B00ST	B00T	DB0T	DBF0T	HAM	Management Contract
Energy	Yes							
Transport		Yes	Yes			Yes	Yes	
Social and Commercial		Yes		Yes		Yes		Yes
Water and Sanitation					Yes	Yes		

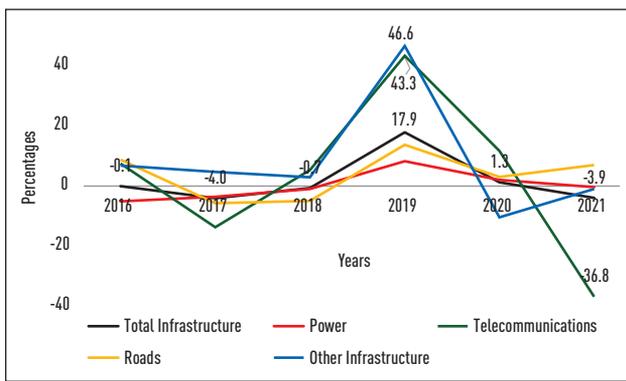
Note: B00: Build Own Operate; B0T: Build-Operate-Transfer; B00ST: Build-Own-Operate-Share-Transfer; B00T: Build-Own-Operate-Transfer; DB0T: Design-Build-Operate-Transfer; DBF0T: Design-Build-Finance- Operate-Transfer; HAM: Hybrid Annuity Mode.

Source: Department of Economic Affairs, Gol.

3.3 Components of Financing

Between 2012-13 and 2018-19, the Central Government's share in the total infrastructure investments increased from 26 to 41 per cent. During the same period, the share of the states saw a decline from 45 to 32 per cent. A decline in private investments is observed from 35 per cent in 2012-13 to 32 per cent in 2014 and thereafter to 23 per cent in the recent years 2015-20. This is mainly on account of the low revenue realization in PPP projects, delays in project execution and limited access to debt financing as explained in more detail in Section 3.4 of this chapter.

Figure 3.6 Growth Rate of Bank Credit in Infrastructure (Year on Year variation)



Source: Reserve Bank of India, various years.

Note: The graph shows year-on-year variation, the value of 2016 represents the growth rate of bank credit between May 2015 and May 2016

Prior to 2020-21, the RBI reported the sectoral deployment of bank credits mainly to Power, Telecommunication and Roads sectors. All other sectors were clubbed under the category 'Other Infrastructure'. Recent data of 2020-21 has disaggregated information on Airports, Ports, Railways (other than Indian Railways) along with 'Other Infrastructure' as a separate category.

Overall, there has been an increase in the amount of bank credit to infrastructure from Rs 9.27 lakh crore in May 2015 to Rs 9.96 lakh crore in January 2021. However, as can be seen in the Figure 3.6, there is a sequential fall in the growth rates of bank credit to infrastructure (on a year on year basis) for most of the years. For example, in 2016, though credit to telecommunication and roads saw a positive growth, there was a marginal decline in the growth of bank credit to total infrastructure (-0.1 per cent). In the following year, i.e 2017, credit to most sectors decreased, leading to a fall in total infrastructure credit by 4 per cent. It was only in 2019 that both sector specific and overall growth in credit saw a double digit positive growth rate (17.9 per cent). This double digit growth in bank credit to infrastructure was mainly driven by Telecommunication

and 'Other Infrastructure' sectors. There was a substantial increase in the amount of credit at 43.3 per cent between 2018 and 2019 to Telecommunication sector and also to the 'Other Infrastructure' category (46.6 per cent). The credit growth was also positive the next year in 2020 at 1.3 per cent but saw a decline in 2021 (at 3.9 per cent). During the same period, non-banking finance companies (NBFCs) have increased their credit to the infrastructure sector from 38 per cent of their total lending portfolio in 2015 to 53 per cent as of September 2020.

The trajectory of total bank credit to infrastructure has slowed down during the last year due to disruption caused by Covid-19. Between January 2020 and January 2021, the fall in the overall bank credit growth to total infrastructure was at 3.9 per cent, with credit to the telecommunication sector falling the most at 37 per cent. Credit to the power sector also marginally declined during the same period. Interestingly, credit to the airport sector maintained a double digit positive growth during this period at 51 per cent.

3.4 Challenges in Infrastructure Financing

3.4.1 Fiscal Barriers

Government funds have competing demands, which poses a limit to the amount of expenditure on particular infrastructure projects. Both the Centre and states faced the challenge of fiscal imbalances, which made them not very reliable partners for private sector participation in infrastructure, particularly in the early 2000s (World Bank, 2006). However, in recent years, there has been an increased impetus to push PPPs in infrastructure with dedicated PPP cells being set up in each Ministry and the introduction of greater transparency measures, the details of which are discussed in Section 3.5.

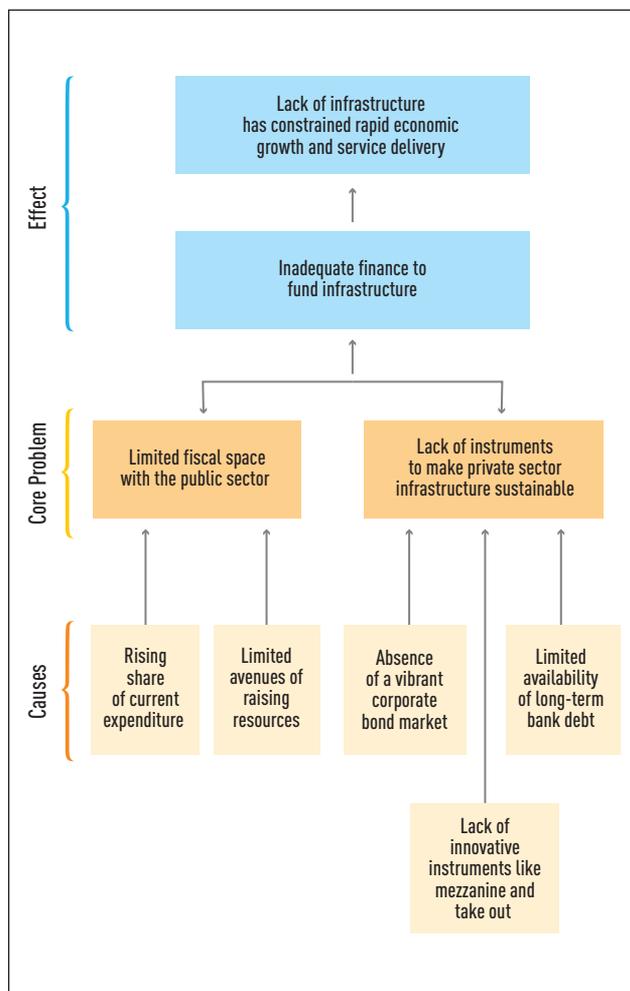
3.4.2 Financial Sector Constraints

In terms of the nature of the assets, infrastructure projects are complex, with long gestation periods and characterised by non-recourse or limited recourse financing.¹ The projects entail a combination of high capital costs and low operating costs, as a result of which the initial amounts of investment constitute a very large proportion of the total amount - something which dissuades private sector participation in these projects. Other equally challenging constraints facing the private sector include raising adequate equity, limited exit options for investors, and lack of innovative financing instruments like mezzanine or take-out financing. Underdeveloped corporate bond markets also pose a barrier to the raising of adequate

¹Non-recourse or limited recourse financing implies that lenders can be repaid only from the revenues generated by the project.

funds. Finally, insurance companies and pension funds, ideal candidates for long-term financing, have also not focused on funding infrastructure (Figure 3.7).

Figure 3.7 Infrastructure Financing Issues



Source: Adapted from ADB, 2013.

3.4.3 Bureaucratic Inefficiencies

Infrastructure projects require multiple clearances at various levels of government. Their implementation also involves coordination between various ministries and government departments. A cascading level of inefficiencies across most of these entities leads to significant delays in the effective operation of the project. While many states theoretically have single window clearances, in practice, however, they need multiple clearances starting at the local government level to clearances from individual government departments at the state and Central levels. Problems in contract negotiations and lack of adherence to the contractual obligations also dissuade the private sector from participating in PPP arrangements.

3.4.4 Sector-specific Risks and Challenges

As mentioned above, there are sector-specific challenges to financing and most of these involve multiple ministries and a lack of coordination thereafter among them. This is the case with the power sector, which predominantly suffers from a structural flaw in the operational and regulatory structure. In the case of the transport sector, the average size of the PPP projects is smaller than in other projects, which leads to the entry of smaller firms with limited technical and financial knowledge, which in turn, also increases the per unit cost of the projects (ADB, 2013). Lack of capacity addition and delays in the awards of PPP projects are major issues in the ports sector, whereas delays in environmental clearances and land acquisition constrain financing in the airport sector.

It is a challenge to obtain financing for infrastructure sectors like roads and water as they do not offer a clear return on investment and predictable cash flows. For example, in the case of the roads sector, it is difficult to set appropriate prices. Drivers resist paying a user fee for using the road. On the other hand, collecting tolls can also be an inefficient process and may violate the contracts between different parties. Due to all these factors, half of the proposed projects on roads go unfinanced. Similar is the case with water and sanitation projects. Since the beneficiaries of sewage infrastructure do not contribute to the cost of cleaning this water, investors find it difficult to assess their financial returns. However, the telecommunications sector manages to attract investors even in poor countries because investors are able to predict a clear financial return coming off those projects (Duvall et al. 2015). In our proposed framework in Chapter 5, more parameters and risk assessment indicators are provided. These pillars and sub-pillars might point to sectors that will find it feasible to raise finance through PPP arrangements.

3.4.5 Transparency Issues

As in any partnerships, there are concerns related to transparency and accountability. The issues are complex and span from procedures to regulation, audit, and oversight. PPPs could benefit from greater clarity in project structuring, the period of concession, the public consultation process, the competitive bidding process, the eligibility criteria, the inputs going into making the Request for Qualification (RFQ) and Request for Proposal (RFP), the bid evaluation process, and the selection of concessionaire. In addition, more clarity in the available subsidies, release of payments, and penalty impositions would also attract partnerships with the private sector in PPP projects.

While PPPs have delivered in several sectors like telecom and roadways, there have been some concerns about adequate transparency and accountability in PPP projects. For instance, in the case of some airport projects, on occasions there have been changes in the criteria for the evaluation and qualification of bidders or in the base for revenue sharing. In PPPs related to ports, there have been changes in ports for common use and priority berthing for key customers; some concerns have also arisen regarding the determination of toll rates and bundling of real estate development, with consequences on land acquisition in the case of highways; and in the case of railroads, a change in the rules of the game for container train operators have changed the incentive structures in PPPs.

In the case of the Delhi-Noida-Direct (DND) highway, the Federation of Noida Residents' Welfare Associations approached the Allahabad High Court in 2012 since the Noida Toll Bridge Company Ltd (NTBCL)—the special purpose vehicle promoted by the project sponsor, IL&FS, to develop, construct, operate and maintain the DND—was charging user fees beyond reasonable revenues. The court scrapped the user fee on the ground that the private company was only given the contract on a BOOT basis and, hence, could not impose user fees, and that by doing so, it had violated the terms of the contract. For a successful partnership, it is, therefore, important that the roles and stakes of different entities are well laid out and that the project information is put up in the public domain.

3.5 Policies to Augment PPP Participation

Recognising the need for greater certainty and transparency, the government has instituted some key elements of the PPP process in India in line with the international best practices detailed below.

3.5.1 Institutional Framework

Setting up of a Committee on Infrastructure: The Government of India (GoI) has a dedicated PPP Cell in the Department of Economic Affairs, Ministry of Finance, to administer various proposals and coordinate the activities to promote PPPs. The GoI has also streamlined the appraisal and approval mechanism of PPP projects by setting up of the Public Private Partnership Appraisal Committee (PPPAC). The PPPAC is an intra-ministerial body comprising officials from the Department of Expenditure, the NITI Aayog, and the concerned Line Ministry, which work to ensure focused and speedy decisions in matters related to key infrastructure projects. Under this, PPP Appraisal Units and Empowered Committees have been set up that

Steps such as setting up of a structured committee for PPP projects, requesting for standardised documents from investors, such as qualifications and contract agreements, and making the PPP project database public, are positive steps towards ensuring transparency.

prepare appraisal notes and provide specific suggestions to the PPPAC.

PPPs need to be evaluated in many critical dimensions due to the risks associated with getting into partnerships that may not yield significant outcomes. To ensure this, each PPP over Rs 250 crore (US \$ 35 million) is recommended by the Public Private Partnership Appraisal Committee (PPPAC) of the Central Government. The PPPAC has recommended the implementation of several passenger train projects, station redevelopment projects, eco-tourism projects, and projects in the ports sector. Annexure 3 details the stages through which a PPP project passes, from the feasibility phase to its implementation.

3.5.2 Guidance Notes Ensuring Transparency

Several ministries have put up clear guidance notes on their websites for PPP projects. For instance, the Ministry of Electronics and Information Technology (MEITY) has clear guidance notes on PPP projects in the IT sector (MEITY, 2017), with details of the characteristics of PPP in e-governance, the preferred PPP models, and the procedural guidelines.

3.5.3 Standardised Documents

Private sector investors need to demonstrate that they are qualified partners in PPPs to mitigate risks, and also that they are competitive. The information for this is captured in the following standardised documents.

Request for Qualification: The government checks the eligibility of the prospective private sector investor. The Department of Expenditure has a Model Request for Qualification (RFQ) document on its website. For example, in order to qualify to be a partner, the concerned private sector entity has to demonstrate that it has the required experience to mitigate risks. In a road project, for instance, the Model Request for Qualification will state that a private agent is a “qualified” investor if his technical experience in projects in that sector is double the cost of the project.

Request for Proposal: The Model Request for Proposal (RFP) states the terms of reference, nature of the project, and bidding parameters. Sector-wise Model RFPs are available to ensure uniformity and fair practice.

Single bidding parameter: Projects bid out by Viability Gap Funding (VGF) schemes have a single bidding parameter. The bidding parameter is the percentage of project costs that would be covered by VGF. Under the VGF, the Central and state governments would provide 60 to 80 per cent of the capital expenditure and up to 50 per cent of the operational costs during the first five years of operation of the project. The winning bid is the proposal that seeks the least percentage of VGF for the project. The use of a single bidding factor rather than a set of composite factors, whose weights can be arbitrarily changed project to project, increases transparency in the PPP process.

3.5.4 Standardised Contracts

Model standardised contracts vary for different sectors and lay down the risks and returns for the project. For instance, the Model Concession Agreement has been set up for the highways, transport, urban, and other sectors so that sponsors and officials are more comfortable in implementing the PPP projects.²

3.5.5 Public Sharing of Information

A database and a portal for various PPP activities have been set up by the Department of Economic Affairs under the Ministry of Finance. This is a public portal of different infrastructure projects being undertaken in India since 1991. The website has a comprehensive year-wise and sector-wise list of the total number of projects by their different procurement methods (traditional versus PPP modes). Under each project, details on the types of PPP models under operation, the host states, and relevant specifics have also been provided.

3.6 Financial Support Framework for PPPs

3.6.1 Viability Gap Funding

The Government of India established Viability Gap Funding (VGF) as a special facility scheme to support the financial viability of PPP projects that are economically justifiable but not viable commercially in the immediate future. Since the inception of the VGF scheme in 2006, a grant assistance of up to 20 per cent of the project cost has been provided by the Central Government. In addition, a further 20 per cent could be provided as a top up grant by the sponsoring Ministry, the state Government or the project authority, depending on the VGF funding request in the winning bid proposal. The scheme was revamped in 2020 by the Ministry of Finance with additional benefits being included within its scope. The details of the revamped VGF are in Box 3.2 below.

The earlier VGF scheme was limited only to projects creating economic infrastructure, such as roads, ports, and energy. However, under the revamped VGF scheme, of the total outlay of Rs 8,100 crore, Rs 6,000 crore has been earmarked for PPP projects in the economic infrastructure segment and the remaining Rs 2,100 crore for social infrastructure segments, like the health, water, and sanitation sectors.

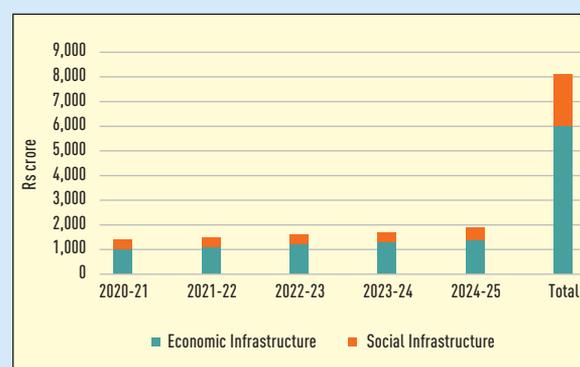
Box 3.2: The Government of India's VGF Scheme

In November 2020, the Cabinet Committee on Economic Affairs approved the continuation and revamping of the scheme for financial support to PPPs in the Infrastructure VGF scheme till 2024-25, with a total outlay of Rs 8,100 crore. Figure 3.8 shows the breakup of the total outlay to the economic and social sector infrastructure. Two sub-schemes have been introduced in this respect:

(1) Under this, private sector projects that cater to the social sectors such as waste water treatment, water supply, solid waste management, health and education will be eligible to get 30 per cent of the TPC as VGF from the Centre; the state Government/Sponsoring Central Ministry/Statutory Entity may provide additional support of up to 30 per cent of the TPC.

(2) In the case of pilot social sector projects in health and education, where there is 50 per cent operational cost recovery, support will be provided with up to 80 per cent of capital expenditure and up to 50 per cent of operation and maintenance cost for the first five years. These projects may get a maximum of 40 per cent of the TPC from the Central Government. In addition, it may provide a maximum of 25 per cent of the operational costs of the project during the first five years of commercial operations. Till date, a total of 64 projects have received 'final approval' under this scheme, with a total project cost of Rs 34,228 crore and a VGF outlay of Rs 5,639 crore. Till the end of the FY 2019-20, a VGF of Rs 4,375 crore has been disbursed.

Figure 3.8 Projected Outlay of the Revamped VGF Scheme



Source: Ministry of Finance, 2020.

²The sample of the Model Concession Agreement is available on the website of the (DEA) at Department of Economic Affairs. https://dea.gov.in/sites/default/files/Document%2011_Model%20Concession%20Agreement%20for%204-laning%20of%20National%20Highways%20_0.pdf.

3.6.2 Setting up of Long-term Finance Companies

In order to provide long-term finance to infrastructure projects either directly or through re-finance, GoI had established the India Infrastructure Finance Company Limited (IIFCL) in 2006 to cater to the financing gap in long-term financing of projects in the public, private, and PPP sectors. The company had a total loan outstanding of Rs 37,478 crore, as of September 2018. The take-out finance accounted for 24 per cent of the portfolio in 2018 while the rest was in the form of direct lending. A majority of the loans went towards the power (47 per cent) and the road (44 per cent) sectors (ICRA, 2019).

In order to increase the access to and focus on infrastructure financing, the Union Budget 2021, has also proposed to set up a new development finance institution called the National Bank for Financing Infrastructure and Development, which will finance infrastructure projects of national importance. Such an agency has become particularly relevant in the post-pandemic world, especially since commercial lenders have little appetite to take on infrastructure risks.

In December 2020, a new bill was tabled in the Parliament seeking to expand the financial scope of IIFCL. It plans to increase the lending potential by raising short-term capital at a lower interest rate and aims to diversify investments vehicles. The goal is to offer financial assistance to projects costing Rs 6-7.5 trillion during the FY2021-FY2024 period.

3.6.3 Easing of the External Commercial Borrowings

In order to encourage foreign investments and for the ease of doing business, RBI liberalised the External Commercial Borrowings (ECB) framework in January 2019. Consequently, sector-specific and ECB limits

have been removed. It is now possible to raise ECB of up to \$750 million per financial year. The list of eligible borrowers has been expanded; all entities that are eligible to receive foreign direct investments can now avail ECB. Another relaxation includes the opening up of ECB for distressed assets.

Box 3.3 An Example of a PPP Project in India

ACME Jaipur Solar Power Plant, Madhya Pradesh, India

The Central Government partnered with the ACME Jaipur Solar Power Plant, Madhya Pradesh, India, in a project for electricity generation in 2018.

The total investment on the project was \$201.9 million.

- The total equity contribution made by the private sponsors of the project was \$56.53 million (28 per cent).
- Total debt financing was \$145.37 million (72 per cent)
 - The project received multilateral bank support as a loan of \$60.5 million from IFC. In addition, the project also got a loan amount of \$84.87 million from L&T Infrastructure Finance Limited.

The Type of PPP Model: Build-Own-Operate (BOO) 'Green field Project'.

In such a collaboration, the private sponsor bears all the risks, builds a new facility, and then owns and operates it at its own risk.

The Government offers support in the form of 'revenue subsidy' to help the private party recover its investment during the project's operational phase, such as availability payments or shadow tolls. This give rise to the PPP form of the project.

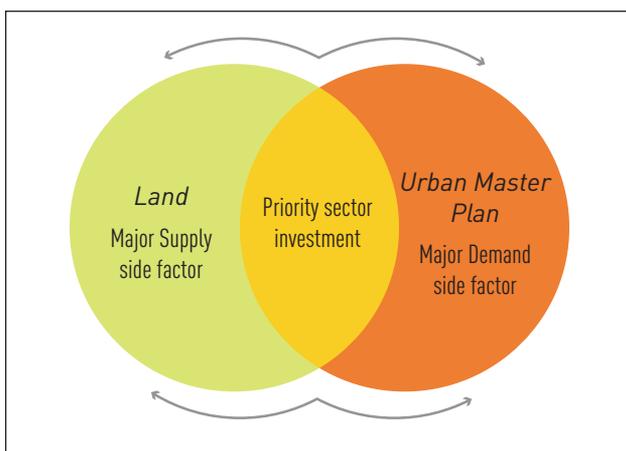
CHAPTER 4

LAND FOR INFRASTRUCTURE

4.1 Background

More than half the global population resides in urban areas, where interactions between land and infrastructure policies facilitate economic opportunities, which affect the quality of life, and patterns of urban development. Some of the major developmental challenges in India today pertain to the generation of economic growth in a socially inclusive, ecologically sustainable, and politically feasible environment. Wahi et al. (2017) highlight how “efficient and equitable acquisition of land by the state for development projects, including infrastructure and industry, lies at the heart of these challenges”. While making investments of this big a magnitude, one needs to ensure the judicious use of all the resources in hand to facilitate optimal profitability for the stakeholders involved. This is where two key factors come into play: an urban master plan, which is a major demand side factor, and the availability of land, a very limited resource, which is a supply side factor. Successful development strategies, therefore, lie at the intersection of a well thought-out urban master plan and the land available. This chapter first discusses the supply side factor, followed by an overview of the urban master plan of Delhi, a major city and the national capital, to help understand how access to land resources for infrastructure is determined while adhering to these regulatory processes.

Figure 4.1 Land for Infrastructure



Source: The NCAER Study Team, 2021.

4.2 Access to Land - A Constraint

The social and economic progress of developing countries is dependent upon “resolving land conflicts, converting customary rights into statutory law, and making compensation mechanisms work in the interests of project affected people. Unresolved conflicts over land tenure significantly augment the financial risk for projects, as well as their overall potential to contribute to local and national development” (Singh, 2020).

Acquisition of Land and the Land Acquisition Act

The Right to Fair Compensation and Transparency in Land Acquisition, Rehabilitation and Resettlement Act (RFCTLARR), 2013 (also known as the Land Acquisition Act, 2013), is an Act that aims to ensure, in consultation with institutions of local self-government and Gram Sabhas established under the Constitution, a humane, participative, informed, and transparent process for land acquisition for industrialisation, development of essential infrastructural facilities, and urbanisation with the least disturbance to the owners of the land and other affected families, and to provide just and fair compensation to the affected families whose land has been acquired or proposed to be acquired or who are affected by such acquisition, and to make adequate provisions for such affected persons for their rehabilitation and resettlement, and for ensuring that the cumulative outcome of compulsory acquisition should be that the affected persons become partners in development, leading to an improvement in their post-acquisition social and economic status, and for matters connected therewith or incidental thereto.

-Ministry of Law and Justice, Gol.

The World Bank’s Ease of Doing Business Index, 2020 reveals that, India ranks 63rd out of 190 countries, and India’s rank in registration of property is even lower at 115th. Although it would be wrong to attribute these ranks entirely to land-related issues, one cannot ignore the fact that a complicated land acquisition and registration process has a potential trickle-down effect on infrastructural development. The two major approaches for obtaining land for infrastructure development are *acquisition* and *purchase*. Most priority sector industries/ investments require large tracts of land which may not be readily available. Public investment involves buying out the properties by the government. When the buyer

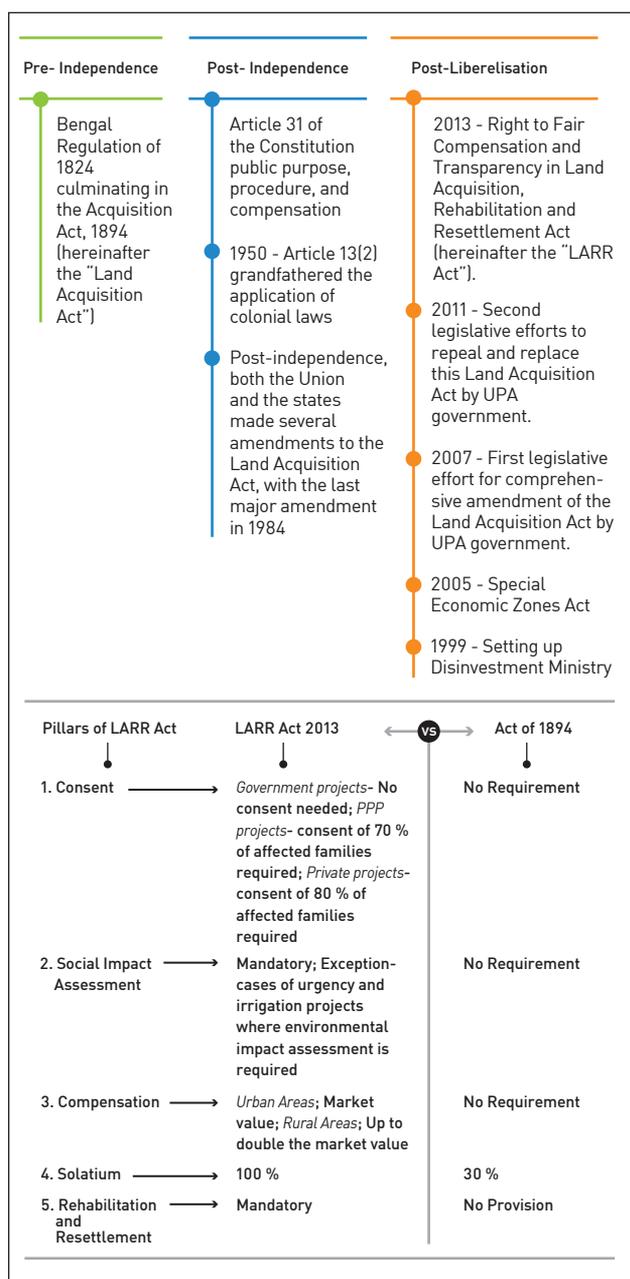
and seller agree, the transaction is essentially termed as a “purchase”. However, when the private owners of property do not agree to sell their land, Indian laws facilitate the “acquisition” of private property in public interest.

4.2.1 Legal Trajectory of Land Acquisition in India

A recent study conducted by the Centre for Policy Research concludes that the political and social conflicts stemming from land acquisition are inherently due to the coercive nature of the acquisition policy (Wahi et al., 2017).

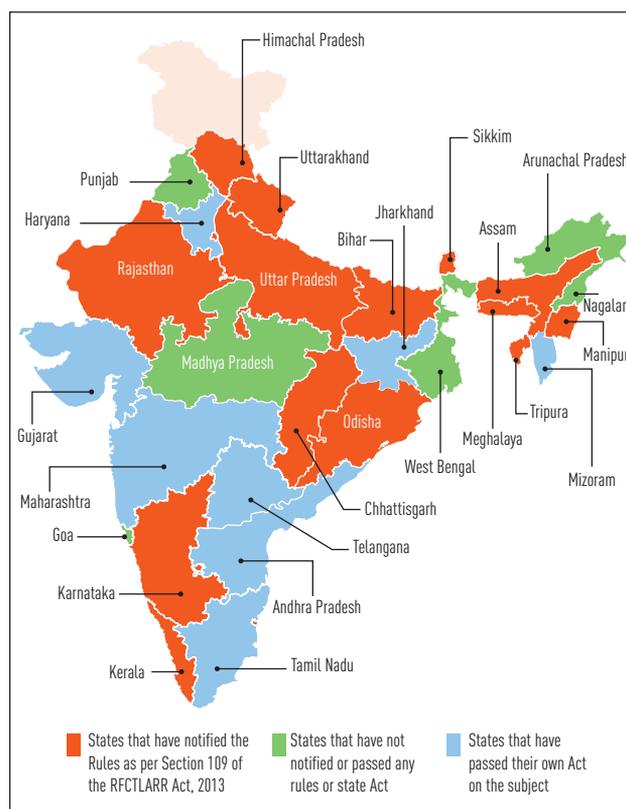
Such coercion leads to a severe imbalance of power between the State and the land owners, resulting in great inequity and hence dissatisfaction among the latter. In order to redress the imbalance of power that was built into the Land Acquisition Act, 1894, amendments were made in the Land Acquisition and Resettlement Act, 2013. The details of the evolution of the relevant regulations/Constitutional amendments leading up to the Land Acquisition and Resettlement Act, 2013, are given in Annexure 4.

Figure 4.2 Evolution of Land Policies



Source: Adapted from "Reforming Supply of Industrial Land in India: Policy Note".

Figure 4.3 Status of LARR Act 2013



Source: Status of Land Records Digitization in India: NCAER's Land Records and Services Index.

The five pillars on which the Act rests are: “social impact assessment (SIA), people’s consent, compensation, resettlement, and rehabilitation (R&R)”, also “downsizes eminent domain”, i.e, it puts a check on the government from indiscriminately acquiring land for uncertain public purposes. It ensures greater public participation by seeking consent from 70 per cent of the people affected by land acquisition in public-private partnership projects and from 80 per cent people in private projects” (Sonak, 2018).

Basically, the Act addresses all the issues pertinent to land conflicts across the country. Therefore, once the LARR Act was passed, all the states were expected to amend their archaic laws and bring them in line with the progressive principles of the same. However, on the

contrary, many states modified their laws exempting themselves from the LARR Act. In 2015, Central rules were notified to come up with a guiding framework for the RFCTLARR Act. After the 2015 Central notification, 14 State Governments, under Section 109, have notified their own rules of the Central Act, which meant adopting certain provisions of the 2015 Land Ordinance but also enabling themselves to evade the 2013 Act. The states of Goa, Madhya Pradesh, Punjab and West Bengal have not yet notified any rules or State Acts.

4.2.2 Land - A Bottleneck in Infrastructure Development

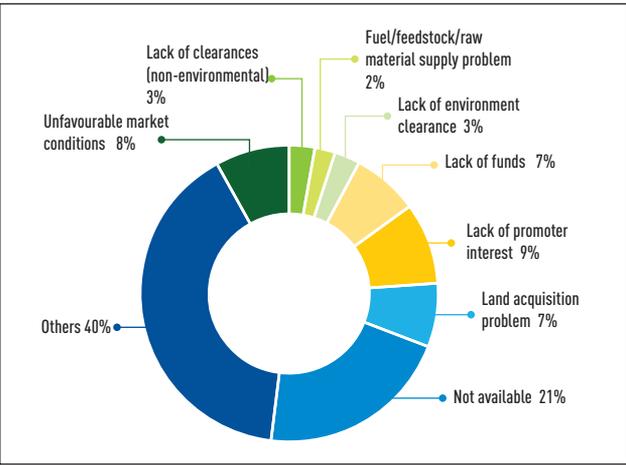
The major focus of India’s development agenda is to facilitate investment in a way that would lead to economic growth, infrastructure development, and social progress. However, many of the investment projects have been abandoned/stalled to date, which could be a red flag pointing towards the poor health of our financial regulatory systems, public sector banks, and the investment community, as a whole. According to an in-depth study conducted by Rights and Resources Initiative (2016), analysts have not paid enough heed to land-related conflicts and their role in stalling investment projects. The cost of these conflicts on the Indian economy and society is significant. The CMIE’s CapEx database reveals that, as on 15 March 2021, that although 55 per cent (Table 4.1). Although 55 per cent of these projects have been completed, 61 per cent of the nation’s money is parked in outstanding projects. Interestingly, the average costs of abandoned/stalled projects have been higher, with 9 per cent of the total number of projects accounting for 18 per cent of the total cost emanating from abandoned or stalled projects.

Table 4.1 Percentage distribution of Number and Cost of Infrastructure Projects as on March 15, 2021

Status	Numbers (%)	Cost (%)
Completed	55	21
Outstanding	36	61
Abandoned/ Stalled	9	18
Total	100	100

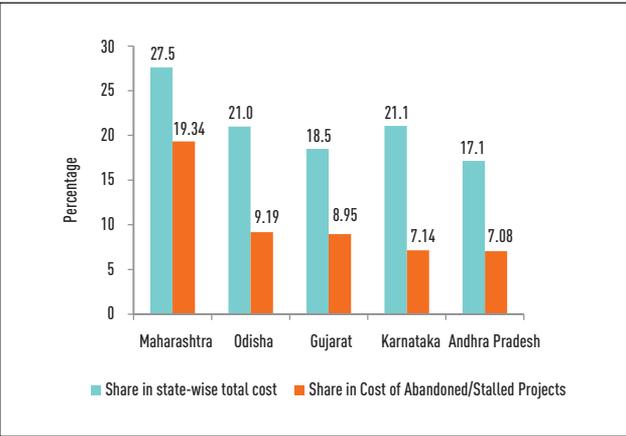
Source: CMIE, CapEx Database.

Figure 4.4 Reasons for projects being Abandoned/ Stalled



Source: CMIE, CapEx Database.

Figure 4.5 Top five states with Abandoned/Stalled Projects



Source: CMIE, CapEx Database.

Leaving aside the “Others” and “Not available” categories, the three major reasons for projects being abandoned/stalled are: “unfavourable market conditions” (8 per cent), “lack of promoter interest” (7 per cent), and “land acquisition problems” (7 per cent) (Figure 4.4). This reiterates the fact that land is a key issue for development. The top five states with abandoned /stalled projects were Maharashtra, Odisha, Gujarat, Karnataka, and Andhra Pradesh (Figure 4.5), with about 51 per cent of the total abandoned projects being in these states. In Maharashtra, more than one-fourth (27.6 per cent) of the total cost of investment projects was spent on abandoned projects. The state alone was responsible for 19.34 per cent of the total incurred by all states on abandoned projects.

4.2.3 Alternative Approaches to Land Acquisition

Overall, it is evident from the above discussion that land as a resource is scarce, with an ever-increasing demand. Chapter 5, in fact highlights the importance of land as one of the 30 key sub pillars, in the construction of an index to arrive at a ranking for prioritising infrastructure investments. Prices offered to sellers by government are often the circle rates and is a state subject in India and district administrations are responsible for fixing the circle rate (for land and other properties) below which transactions cannot be registered. Circle rates vary not only from state to state but also locality to locality (Mishra, 2021). However, one thing that is common to all states is that circle rates are much lower than the actual market rates of land prevailing in the area. Moreover, the red tape and extensive paperwork often delays transactions for infrastructure development and the price of the land in the meanwhile escalates leading to most land acquisition processes to fail. Thus, there is an urgent need to think of alternate pathways to acquire land that would benefit all stakeholders. To this end, the literature highlights some participatory approaches for land acquisition, as suggested by researchers, and delineated in Table 4.2.

Table 4.2 Participatory approaches for land acquisition

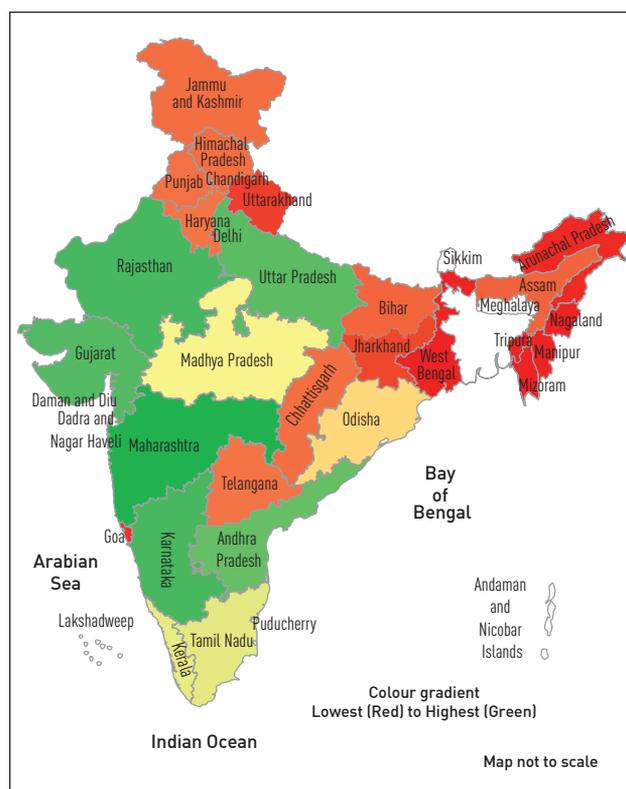
Approach	Benefit over State-driven Compulsory Acquisition
<i>Auction-based land acquisition:</i> The government should hold a land auction in the region where a project has to be established on a contiguous piece of agricultural land. Farmers could be asked to quote a price at which they are willing to sell their land.	A major reason for the under-compensation of owners relative to market values is the huge cost borne by landowners in registering their plots and updating plot characteristics, due to out-of-date government land records. These problems could be easily avoided if compensations were based on bids submitted by them in auctions.
<i>Land pooling:</i> this is a method of assembling small chunks of land owned by various people for planned urban development.	Land pooling/re-adjustment has very little upfront cost, is less prone to conflict and leads to greater creation of social capital. Landowners benefit by the increase in the value of land, enabling them to convert irregular parcels of land into plots of regular sizes and shapes, better infrastructure, etc.
<i>Town planning:</i> This signifies pooling of all the land (typically ranging from 100 to 200 hectares) owned by different people and redistributing it in a properly reconstituted form after extracting the required land for public purposes.	This involves persuading those losing their land in the planning process to become stakeholders in the development of projects.

Source: The NCAER Study Team, 2021.

4.2.4 Industrial Parks - Identification of Land for Infrastructure

Given that farmers and individuals are not very keen to sell their agricultural land for industrial purposes, acquisition of land is getting harder by the day. Hence, many entrepreneurs overseas, or from India find it difficult to identify industrial land of their own choice. Furthermore, they do not have the required knowledge and support to reach out to the concerned authorities for obtaining relevant information about appropriate industrial land/plots. Industrial Parks signify a great solution to this problem. UNIDO's broad definition of an industrial park is "a tract of land developed and subdivided into plots according to a comprehensive plan with or without built-up factories, sometimes with common facilities for the use of a group of industries" (Europe and Central Asia Regional Conference on Industrial Parks, 2012).

Figure 4.6 Industrial Parks in India



Source: Adapted from PIB Delhi, Ministry of Commerce & Industry, 05 February 2020.

However, due to the lack of proper information, many private and Government industrial parks and industrial plots remain vacant. The Department for Promotion of Industry and Internal Trade (DPIIT) has built a centralised system of industrial park information, which is available at the Industrial Information System (IIS), and the details are being updated by the concerned states at

regular intervals. Currently, Maharashtra (447), Karnataka (370), Rajasthan (364), Gujarat (351), Uttar Pradesh (342) and Andhra Pradesh (330) have the highest number of industrial parks in India (Figure 4.6). The states/ union territories in white, viz. Andaman and Nicobar Islands, Dadra and Nagar Haveli, Daman and Diu, Lakshadweep, Meghalaya, Puducherry and Sikkim were those without any industrial parks according to the latest available data.

While the supply-side constraints of the acquisition or purchase of land are yet to be fully addressed, with rapid urbanisation, the demand for land has leapfrogged. Section 4.3 focuses on the Urban Master Plans as a major creator of the demand for land, and discusses the Delhi Master Plan as a case study.

4.3 Urban Master Plan

According to the World Bank, “A master plan is a dynamic long-term planning document that provides a conceptual layout to guide future growth and development. Master planning is about making the connection between buildings, social settings, and their surrounding environments.”

Methodology of Creating a Master Plan

The process of creating a master plan begins with the projection of the population of an urban area and an estimate of an average household size, which together with the income levels of different household categories, determine the demand for residential space. The requirements of industry, office, and retail spaces are based on projections of the economic prospects for the cities; the transport patterns follow from the land use pattern and the space requirement for transportation is typically a residual. The space needs for conservation of natural resources and protection of built heritage are also determined residually.

-Planning for Urban Development in India, ICRIER.

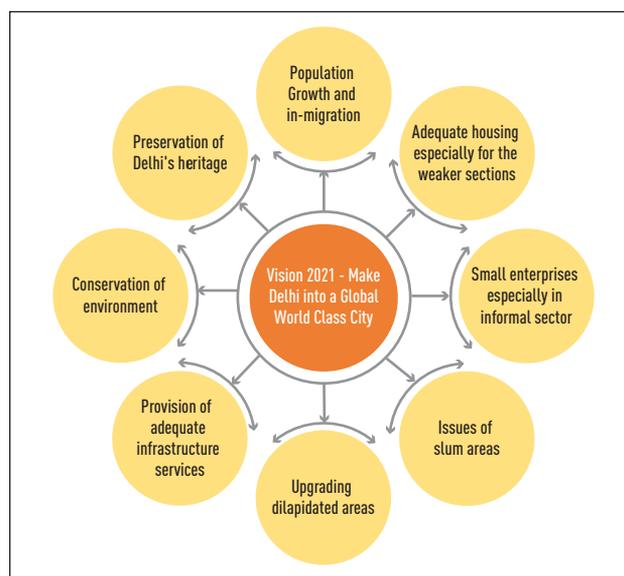
Delhi Master Plan

A Master Plan in India typically covers a time horizon of about 20 years, depicting a roadmap from the present state of the city to its ideal end-state, with spatial details in the terminal year. The umbrella term for all the urban development taking place in Delhi for future is Master Plan Delhi (MPD). The process of planned development of Delhi began with enactment of the Delhi Development Act 1957, which was followed by the promulgation of MPD in 1962 (MPD-62). The MPD-62 entails a scheme of Large-Scale Acquisition and Development of Land as its broad vision. Urban Master Plans are mainly land use plans with a three level hierarchy, i.e, a Master Plan, Zonal Plans, and Layout Plans for specific development schemes within each zone.

4.3.1 Vision of MPD 2021

The vision of MPD 2021 is to make Delhi a “global metropolis and a world-class city”, with its population having access to productive work, better quality of life, and a sustainable environment. This will require planning and appropriate action to overcome the challenges of population growth and increasing immigration into Delhi.

Figure 4.7 Challenges of Vision MPD 2021



Source: Adapted from MPD 2021, Delhi Development Authority.

Adequate housing needs to be provided to all, especially to the weaker sections of the society; issues related to small enterprises need to be addressed, specifically in the unorganised informal sector. Finally, the other necessary measures that need to be undertaken for the purpose include upgrading of old and dilapidated areas of the city; proper rehabilitation of the people living in slums; provision of adequate infrastructural services; conservation of the environment; and preserving Delhi’s heritage and blending it with the modern styles of development. At the same time, there is need to ensure that the steps taken enable sustainable development, public private and community participation, and a spirit of ownership and a sense of belonging among its people.

Population Accommodation and Land Use

It was forecast that by 2021, Delhi’s population would reach 22.5 million. The MPD-2021 aims to keep it below 22 million with a three-pronged strategy:

- i) Encouraging people to shift to suburbs;
- ii) Expanding city limits; and
- iii) Increasing the population-holding capacity of the existing areas by redeveloping them.

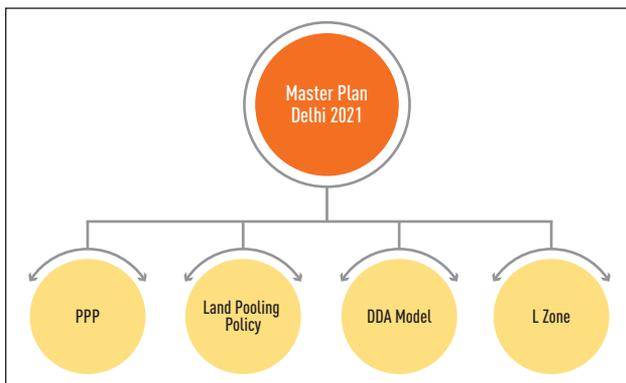
-MPD 2021, Delhi Development Authority.

4.3.2 Key Drivers of MPD 2021

This section highlights the four major focus areas of MPD 2021 (Figure 4.8). Public-Private Partnership is the major driver of MPD 2021. It aims to develop five Smart Cities around Delhi, largely based on the reformed land acquisition policy of the government, also known as a new Land Pooling Policy.

Land Pooling Policy is an integral part of the MPD 2021 that envisages the urban expansion of Delhi in the designated zones of L, M, N, O, and P.

Figure 4.8 Key Drivers of Master Plan Delhi 2021



Source: The NCAER Study Team, 2021.

Delhi Development Authority (DDA) is the urban planning agency of Delhi. It has authorised private planners and the registered societies to participate along with it in developing urban areas in the designated Zones under MPD 2021. The Land Pooling Policy is the core of this urban expansion model.

L Zone is the largest land area approximately of 22,000 hectares in Delhi under the Master Plan 2021, wherein the government aims to develop around 1.5 million homes in order to find a solution to the urban chaos in Delhi.

A unique feature of the MPD 2021 is its changed land policy via the approval of “land pooling” for development. This involves landowners surrendering their land holding into a central pool and becoming stakeholders in the development proposed on their land. Once pooled, the landowner would get 40-60 per cent of the total land that is surrendered as “developable land”. The 40-60 per cent of the land retained by DDA would be utilised to create infrastructure and to monetise it for specific purposes. Two basic types of land pooling announced so far are

- i) For land over 0.2 sq km: 60 per cent of the land would be returned to the landowner;
- ii) For 0.02-0.2 sq km of land: 48 per cent of land would be returned to the landowner.

- Bedi, 2014, Working Paper on Issues related to Land Economics, NCAER.

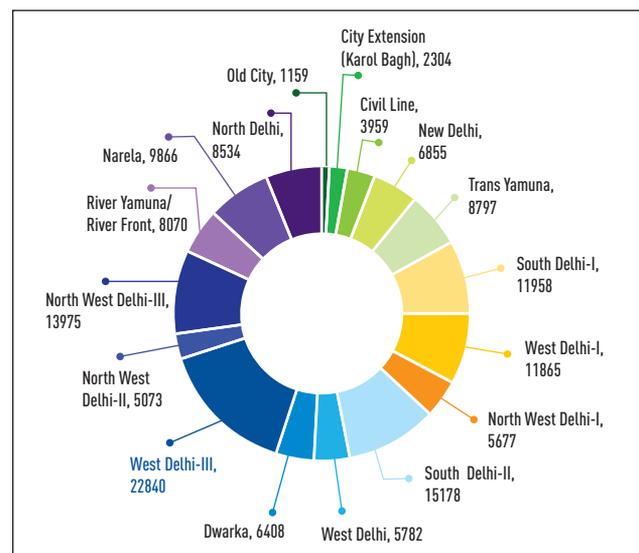
4.3.3 Land Use Plan of MPD 2021

In 2003, the Ministry of Urban Development issued guidelines to prepare the MPD 2021 with the agenda to explore alternate methods of land assembly, private sector participation, and flexible land use and development norms. The Land Use Plan 2021 was prepared on the basis of the following parameters:

- i) The policies enunciated for different urban activities,
- ii) Requirement of additional social and physical infrastructure,
- iii) Transportation and work centres, and
- iv) Already approved Zonal Development Plans and land use modifications.

Zonal Development Plans

Figure 4.9 Zone wise Distribution of Area (in Hectares)



Source: MPD 2021, Delhi Development Authority.

Note: West Delhi III is the L zone.

The NCT of Delhi has been categorised into 15 Zones, starting from A to H and J to P, while eight Zones are in the urban area, one in a Riverbed, and the remaining six are located in rural areas. The Zonal plans provide details about the policies of the Master Plan 2021, and serve as a link between the Layout and Master Plans. The development schemes and layout plans indicating various uses of premises shall conform to the Master Plan/ Zonal Plans. In the absence of a Zonal Plan of any area, the development shall be in accordance with the provisions of the Master Plan. No urban activity is permitted in the proposed Urban Extension without change of land use/modification to the Master Plan, as per the Delhi Development Act, 1957.

Mixed Use Regulations

“To promote non-residential activities in areas meant for housing, the plan envisages a mixed-use policy, which would help Delhi use its lands to an optimum level. However, the mixed-use pattern [will] not be permitted in the Lutyens’ Bungalow Zone, Civil Lines Bungalow Zone, government housing, institutional/ staff housing of public and private agencies, and buildings/precincts listed by the Heritage Conservation Committee.”

-MPD 2021, Delhi Development Authority.

4.3.4 The Focus Areas of Master Plan Delhi (MPD) 2041

The new MPD 2041 also envisages significant investment opportunities. MPD 2041 aims to incentivise new infrastructural features, such as serviced apartments, condominiums, hostels, student housing, worker housing, etc., in order to boost the value and optimal use of real estate in a city where over 4 million people live in unauthorised colonies. The plans will also promote the transfer of development rights-based projects, to bring jobs and homes closer to mass transit systems

and devise comprehensive strategies for improving old and dilapidated areas in the city (Mishra, 2021). MPD 2041 will cover the development of schools, universities, residents’ welfare associations, civil society groups and campaigns, traders’ and market associations, environment experts, industry groups, and professional bodies, among others. The key focus areas under the 2041 Master Plan will involve the provision of high-quality green-blue areas for recreation and leisure, enhancement of Delhi’s preparedness for the impact of climate change, and devising methods to deal with pollution.

4.4 Role of Public–Private Partnership in Acquiring Land for infrastructure

The two major takeaways from the above discussion are as follows: (a) the supply of land is crucial to investment projects, and land is a very limited resource, and (b) the demand for land is ever-increasing due to urban master plans as well as a big push for country-wide infrastructure projects. Given that infrastructure development projects have high fiscal requirements, public sector investments alone may not suffice to fund them in India.

Table 4.3

Structural and Regulatory Barriers to Efficient Private Markets

Barriers	Issues	Examples
Mismatch between demand and supply	Proportion of land that is suitable for industry (fallow land) to total in India is 23%. Land made available for industry by government is outside urban areas. Industrialists prefer urban/peri-urban land.	Adam 2020 highlights that in Ethiopia, the private business sector and the local community have competing interests in peri-urban land, resulting in rapid conversion of farmland into built-up urban property.
	Problem of low availability of land suitable for industry accentuated by increasing population density.	West Bengal, which has a high population density (903 per sq. km, thrice the magnitude of the national average as per the 2001 Census), has only 20 per cent land suitable for industrial use if one considers non-agricultural land.
Regulatory and policy restrictions	India lacks an independent regulatory body that can prescribe a uniform valuation methodology for land. Restrictions such as conversion of land from agricultural to non-agricultural use, land ceiling norms, and high transaction costs in the form of stamp duties pose a challenge to the functioning of an efficient land market.	Andhra Pradesh had promulgated the Agricultural Land Act (conversion for non-agricultural purposes) in 2006 to facilitate the process of enacting a change in the end use for land. Gujarat, on the other hand, has tried to promote the concept of incentive zoning via the Special Investment Region Act.
Dysfunctional pricing regime	In India, there is standardisation with regard to valuation methodology for land. Market prices are distorted for various reasons such as stamp duties, lack of clear land titles, and improper payments involved in land transactions.	Gujarat’s “Jantri Rates” model, unlike conventional techniques, values land according to its end use. The premise is that a parcel of land will be used for a specific purpose, as determined by predefined parameters like zoning suitability.

Barriers	Issues	Examples																																
Weak informational and institutional mechanisms	Currently there is little provision allowing private investors to access ready information on the availability of land that could be utilised for industrial purposes. There is no proper computerisation of records.	<p>The extent and quality of digitization of land records in the states and UTs of India are assessed in the NCAER Land Records and Services Index (N-LRSI 2021). Given here are some insights on the few best performing states.</p> <table border="1"> <thead> <tr> <th></th> <th>2020-21</th> <th>2019-20</th> <th>Difference (points)</th> </tr> </thead> <tbody> <tr> <td>West Bengal</td> <td>57.4</td> <td>40.0</td> <td>17.4</td> </tr> <tr> <td>Tamil Nadu</td> <td>53.1</td> <td>43.2</td> <td>9.9</td> </tr> <tr> <td>Madhya Pradesh</td> <td>52.2</td> <td>51.3</td> <td>0.9</td> </tr> <tr> <td>Odisha</td> <td>48.3</td> <td>41.2</td> <td>7.1</td> </tr> <tr> <td>Andhra Pradesh</td> <td>46.0</td> <td>32.8</td> <td>13.2</td> </tr> <tr> <td>Bihar</td> <td>43.8</td> <td>16.8</td> <td>27.0</td> </tr> <tr> <td>Maharashtra</td> <td>43.2</td> <td>42.1</td> <td>1.1</td> </tr> </tbody> </table>		2020-21	2019-20	Difference (points)	West Bengal	57.4	40.0	17.4	Tamil Nadu	53.1	43.2	9.9	Madhya Pradesh	52.2	51.3	0.9	Odisha	48.3	41.2	7.1	Andhra Pradesh	46.0	32.8	13.2	Bihar	43.8	16.8	27.0	Maharashtra	43.2	42.1	1.1
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	Weak institutional mechanisms exist in the country largely due to the silos and lack of integration between the Government bodies that handle land records.	Gujarat and Haryana have put together committees to decide Government intervention in land acquisition.																																

Source: Gol, 2010; The NCAER Land Records and Services Index, 2021.

Policy recommendations at various points in time (Planning Commission, 2008; Ministry of Finance, 2015; Economic Survey 2018-19) have been made to encourage engagement with the private sector via various forms of PPPs. This has been amply discussed in Chapter 3 as well however, the partnership agreements are not devoid of challenges and issues. Given below are the key recommendations made by Chong and Poole, 2013; Nataraj, 2014; van der Geest and Nunez-Ferrer, 2012; and World Bank, 2006, to enable a smoother implementation of PPPs:

- A clear and stable policy and regulatory framework with strong legal protection for investors;
- An efficient oversight and dispute resolution mechanism;
- An effective public sector capacity to manage and implement PPP contracts;
- Allocation of appropriate PPP arrangement to a particular project; and lastly,
- Adequate risk-sharing between the public and the private sectors.

According to the World Bank Group's PPP Resource Centre, "(PPP)s are a mechanism for government to procure and implement public infrastructure and/or services using the resources and expertise of the private sector. Where governments are facing ageing or lack of infrastructure and require more efficient services, a partnership with the private sector can help foster new solutions and bring finance. PPPs combine the skills and resources of both the public and private sectors through sharing of risks and responsibilities. This enables governments to benefit from the expertise of the private sector, and allows them to focus instead on

policy, planning and regulation by delegating day-to-day operations."

For instance, in response to significant land acquisition problems, particularly in road projects in Indonesia, there is a Land Acquisition Revolving Fund (LARF) that assists the Roads Authority to acquire land that the private partner needs for the PPP. Since ultimately the private partner is responsible for the acquisition of land, the payments by the private partners replenish LARF and ensure that the fund revolves (OECD, 2012).

City development companies established in many provinces of Thailand with the aims "to raise capital for infrastructure development and to promote the transition towards smart city" is another innovative example of PPPs. This is done via collaboration between the private sector, the citizens, and the Government to form the "Pracharath", where everyone has ownership and takes part in the development of the city. The Pracharath Policy aims to promote social enterprises and enable the private sector to work with the Government to help communities and societies. At present, there are three city development companies in Khon Kaen, Phuket and Chiang Mai (UN, 2017).

The availability of adequate land is vital for fast-tracking infrastructure development. Given the limited supply of land, challenges in acquiring the same by both public and private sectors, and the pressing demand for infrastructural development due to rapid urbanization, there is a greater need today for more private sector engagement. However, since there are numerous structural and regulatory barriers to the effective functioning of the private markets, it certainly appears that PPPs are the way forward for ensuring greater private sector participation in infrastructure development in India.

CHAPTER 5

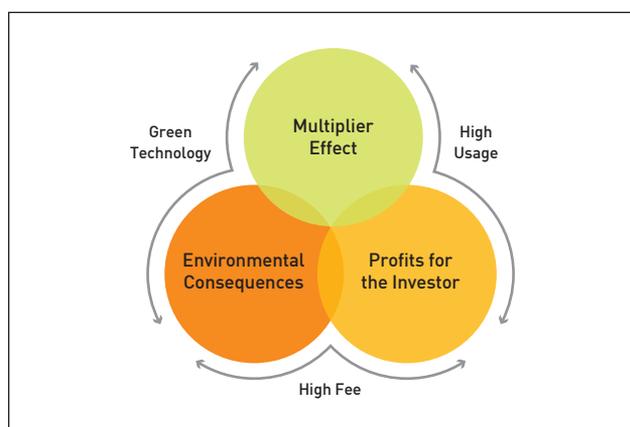
EXISTING METHODOLOGIES AND A NEW FRAMEWORK FOR PRIORITY SECTOR INVESTMENTS

5.1 Introduction

As discussed in Chapter 1, infrastructure encompasses several sectors of the economy and includes investments in physical as well as social and human capital. The estimates for demand for infrastructure in India are enormous and range from US \$150 billion (Global Infrastructure Outlook) to US\$ 350 billion (National Infrastructure Pipeline). While infrastructure projects provide opportunities for both the private and public sector investors, it is difficult to prioritise these sectors for fulfilling the objectives of different stakeholders as well as meeting the allocated budgetary limits. This task becomes even more challenging if the objectives of the two parties do not coalesce with each other.

Figure 5.1

Impossible Trinity: Illustration of the Contrasting Needs from Infrastructure Projects



Source: The NCAER Study Team, 2021.

For instance, consider the illustration in Figure 5.1. There are three factors for consideration in any project - the multiplier effects emerging from the project, profits from the investment, and environmental impacts.

A high degree of usage of the asset may increase profits for the investor and the multiplier effects from the project, but it may lead to adverse environmental outcomes. In order to curb over-use, the public sector can impose a high fee which while reducing the profit margins and ameliorating environmental concerns, could, at the same time, reduce

the multiplier effects. Finally, there can be an emphasis on using expensive technology to reduce carbon emissions from the project. This may sustain usage without adverse environmental consequences but will reduce profit levels for the investor due to high upfront requirements. This impossible trinity illustrates the difficulty in determining the prioritisation of infrastructure projects. While Figure 5.1 contextualises a general dilemma in infrastructure projects, there are several other challenges that are unique to the Indian landscape. One such India-specific case is delineated in Box 5.1.

Box 5.1: Public Sector as Both a Regulator and Operator: Case Study of the Indian Railways

A challenge that is unique to India for infrastructure development and operation arises from the presence of government-owned operators who are difficult to distinguish from regulators. The railways provides an interesting study in this regard.

In the last four years, the Government of India has created conducive conditions for private sector participants to operate trains on key routes. While this effort has led to critical success on some routes, further liberalisation necessitates key consultation with private operators. In the recently held rounds, private operators had raised a request that on the routes on which they ply, no other train may run for at least an hour within a 50km radius of the station (Das, 2021). While the merits of the request are still to be debated, such an arrangement will impact the Indian Railways' operation on these routes. This case also highlights the traffic risk that the private sector remains wary of, but addressing this risk may lower the overall output multiplier of this sector.

In this chapter, we provide overviews of existing methodologies for infrastructure prioritisation. Since the public and private sector participants have varying needs from infrastructure projects, we review the methodologies of the public and private sectors separately. This provides an insight on the need for a unified methodological framework that collectively addresses the needs of all the parties concerned.

The following sections discuss the methodologies used by both the public and private sectors to prioritise infrastructure projects. Section 5.2 reviews the quantitative methods used by the public sector, followed by a qualitative approach, and finally reviews the current World Bank framework which uses a mix of both the quantitative and qualitative methodologies. Section 5.3 reviews the methodologies used by the private sector to prioritise infrastructure projects. Finally, section 5.4 takes a holistic overview of the factors required for prioritising infrastructure investments by both the public and private sectors in order to suggest a new methodology for this purpose.

Here, it may be noted that since this is an Approach Paper, the actual calculations and mapping of infrastructure projects by sectors and geographies is not being done though NCAER is confident of determining these using this new methodology at a later date.

5.2 Review of Methodologies for the Public Sector

5.2.1 Financial and Social Cost-Benefit Analysis

While it is important to undertake a rigorous financial cost-benefit analysis for public sector investments in infrastructure projects, the following two factors indicate that this analysis is not the primary input for the public sector to make decisions on infrastructure investments.

First, several benefits and costs from infrastructure projects are usually intangible in nature. Direct and indirect benefits accrue in an unobservable manner and lead to a differential impact on the population, making it difficult to collate all of them in a single metric. For example, the development of the aviation sector precludes the poorer sections of the society in India. On the other hand, rail travel is time-consuming and may lead to loss of time savings for sections that have higher opportunity costs of time. Indirect benefits that spill over to the economy like welfare impacts and poverty alleviation measures are also difficult to measure. Combining the impact on different sections of the society in a coherent manner is an onerous but important task.

The second issue concerns the measurement of the externalities of a project. For example, even in a project where the cost-benefit analysis is done routinely, accounting for external benefits is rarely done. For example, due to access to electricity (physical infrastructure), the improvement in quality of life (benefits) is hardly a measure for the cost-benefit analysis, or for the construction of roads, the loss of forest or biodiversity (cost) does not feature in the method.

In order to address these issues, the concept of the financial cost-benefit analysis needs to be expanded to include the economic and social costs and benefits for each project. Before determining the social cost-benefit analysis, it is important to estimate the shadow price and the social discount rate, as discussed below.

Shadow Price

The shadow price of an output or input measures all its social costs and benefits. As many fallouts of infrastructure projects are intangible and difficult to compute, social planners use a shadow price to calculate the value of these intangibles in infrastructure projects. Shadow prices particularly differ from market prices when taxes, subsidies, externalities, monopoly, and price and quantity controls distort markets.

For example, organisations in the public sector may be interested in knowing the additional environmental impact on the local fishery industry due to the expansion of a sea port. Understanding this impact is difficult as such counterfactuals are not easily observable. The impact of such an intangible object is known as the shadow price.

While we will not illustrate the computation of shadow price in this chapter, in principal, the shadow price can be calculated by using mathematical tools such as constrained optimisation and linear programming as well as a number of other techniques, including contingent valuation, revealed preferences, and hedonic pricing. Operating these techniques require credible data in sufficient mass. For the purpose of this approach paper, one would require comparable data across several infrastructure projects and several states.

The Shadow Price of Reduced Greenhouse Gas Emissions

Bussolo and O' Connor (2001) provide an estimate of the benefit that the Indian economy will receive from a reduced growth rate of greenhouse gas emissions. Specifically, they use CGE modelling to show that the benefits of environment-friendly policies will offset their costs by more than 10 per cent. Interestingly, the authors find that a nationally uniform policy of carbon emission tax will have varying regional effects, highlighting the heterogeneity of the Indian context.

In another study of the Delhi Metro project, Murthy et al. (2005) estimate the shadow price of particulate matter (PM) at Rs 4777, hydrocarbons (HCs) at Rs 502, and carbon-dioxide (CO₂) at Rs 448. The authors use a hedonic price function and the household's marginal willingness to pay for better air quality to calculate shadow prices. The monetary value of the increase in consumer surplus due to the reduction in air pollution was estimated in this paper by multiplying the reduction in pollutants with its shadow price.

Unless one has representative datasets, using these techniques can provide unreliable and misleading estimates. Thus, we do not recommend these techniques, though we acknowledge that with adequate resources, these techniques can be applied by NCAER.

Social Discount Rate

The social discount rate can be defined as the rate at which one unit of rupee will lose value as the date of its accrual gets delayed further into the future. In principle, this implies that the benefits that one receives from the project in the future will hold less value today. For public sector projects in particular, it is challenging to place a rupee value on the social benefits that arise from a public good, environmental improvements, or safety measures that help save lives.

It is critical to choose the right discount rate to evaluate public sector projects. While doing so, it is important to account for inflation and living costs over time as the stream of benefits will change significantly with these assumptions. It is equally important to account for opportunity costs. Many infrastructure projects exhibit high sunk costs and, hence, for truly evaluating the benefits of infrastructure projects, the opportunity cost of alternative investments must be considered.

The United Kingdom's Green Book (2018) suggests a 3.5 percent social discount rate (in real terms) for government appraisal of costs and benefits over 30 years. This rate decreases to 3 per cent for evaluation beyond 30 years. Projects in the health sector use a lower discount rate of 1.5 per cent for the first 30 years and 1.29 per cent thereafter.

In general, a lower discount rate is used for projects where the costs and benefits accrue decades into the future. For instance, the United States Environmental Protection Agency recommends a discount rate of 2 to 3 per cent for environmental projects. As a rule of thumb, several multilateral development agencies, such as the World Bank and the Asian Development Bank, use a social discount rate ranging from 10 to 12 per cent (see Table 4, pp. 17-18, 20, in Zhuang et al., 2007).

The discount rate used by planning agencies in government also varies from country to country, with a few examples listed in Table 5.1.

Table 5.1

Social Discount Rates in Different Countries

Country	Social Discount Rate (%)
Philippines	10*
India	8^
New Zealand	5^^
United Kingdom	3.5%#
Germany	1.75-4.2%\$

*- Zuniga et al., 2020; ^ Murty et al., 2020; ** Abelson and Dalton, 2018; ^^The Treasury, Government of New Zealand; # The Green Book, HM Treasury, Government of United Kingdom; \$ Schad and John, 2012.

While the social discount rate is more often associated with social value derived from public investment projects, these rates are also used to measure the cost of existing and future regulations on business. The United Kingdom has used the social discount rates in regulatory impact assessments (RIAs) to help improve the quality of regulation and reduce unnecessary burdens on business. While RIAs are not very common among developing countries, in India, the DPIIT's current initiatives to reduce compliance burdens will reduce costs for business and will have a positive impact on future social discount rates.

5.2.2 The Multi-Attribute Utility Theory Framework

The methods described above are quantitative and rely heavily on data availability and rigorous analysis. Also, several assumptions in computing the shadow price and social discount rates are needed, which may appear abstract and can be context-specific. Moreover, many consequences of infrastructure projects are intangible in nature and may become visible only after a lagged time period. In such a context, data-driven processes, though credible, may take away precious time and overlook useful constructs. To provide space to the intangible factors, several subjective decision-making frameworks have been utilised to understand the issue of prioritisation of infrastructure projects. These can be broadly categorised under the multi-attribute utility framework.

One of the common multi-attribute utility theory frameworks is the Delphi Technique developed by Olaf Helmer and Norman Dalkey at the RAND Corporation

Box 5.2: The Goal Achievement Matrix

The table below shows an illustration of the Goals Achievement Matrix. Consider that a scarce resource (land parcel) is to be allocated across different projects - a highway, a residential complex, a commercial complex, and a public garden, listed as rows of the matrix. Different criteria are listed along the columns.

Project\Criteria	Economic (1/3)	Social (1/3)	Environment (1/3)	Final Score
Highway	3	1	1	1.65
Residences	2	3	2	2.33
Commercial Establishments	3	2	1	2.00
Public Garden	1	3	3	2.31

Each entry is the subjective valuation on the impact of the project (row) on the criterion (column). To arrive at the final ranking, weights (given under each criterion) are multiplied with each entry along a row, and each expression is added. So the score for a highway project would be $3*(1/3) + 1*(1/3) + 1*(1/3) = 1.65$, whereas for a public garden, it would be $1*(1/3) + 3*(1/3) + 3*(1/3)$. The weights can vary across criteria (as long as they add up to 1), depending on the importance of the criteria as perceived by the policy-makers.

in the 1950s, now used in a wide range of contexts. The steps of this method can be briefly explained as follows:

1. A questionnaire is sent out to a panel of experts seeking their responses on multiple factors pertaining to the outcomes of the project. The responses reflect the severity or importance of the particular outcome.
2. After analysing the responses, the summary statistics are recirculated to the panel of experts so that they can revise their entries.
3. Steps 1 and 2 are iterated till the panel of experts do not feel the need to revise their entries anymore. In most cases, however, just two iterations are used.

Evaluation, Prioritisation and Selection of Transport Investment Projects in New York City

We provide an application of the MAUT framework in prioritizing transport investment projects in NY City. To meet the transportation requirement for New York City, the urban planners invited project proposals from several departments, such as the Metropolitan Transportation Authority, the Port Authority of New York and New Jersey, New Jersey Transit, and the New York State Department of Transportation, along with multiple city and state development corporations. Berechman and Paaswel (2005) evaluate these project proposals by providing numerical indices on the following four facets of each project: (i) Benefits accruing out of projects including indirect benefits; (ii) Financial and non-financial costs such as temporary disruption and permanent relocation; (iii) Heterogeneity in welfare spillovers across different population groups; and finally, (iv) Environmental consequences. To arrive at an ordering of projects, the authors use a Goal Achievement Matrix method (Hill, 1968) (see Box 5.2).

5.2.3 The Investment Prioritisation Framework

The Investment Prioritisation Framework (IPF) of Marcelo et al. (2016) utilises a multi-dimensional indices approach to prioritise infrastructure investments.

Under this method, two indices are calculated for each project. These are the Financial-Economic Index (FEI), and the Social-Environment Index (SEI). While the former relates to the overall economic gains from a project, the latter reflects the intangible outcomes of the project such as displacement costs and the effects of the project on bio-diversity.

The authors do not combine these two indices into one metric as this would overlook the disparities in the information content present in them. Instead, to evaluate the projects, the authors plot the two scores on a Cartesian plane with FEI on the x-axis and SEI on the y-axis. On this Cartesian plane, a separate budget limit line is superimposed for each axis. The top-right quadrant in Figure 5.2 contains all feasible projects with high FEI and high SEI scores. The bottom-left quadrant consists of the low priority projects.

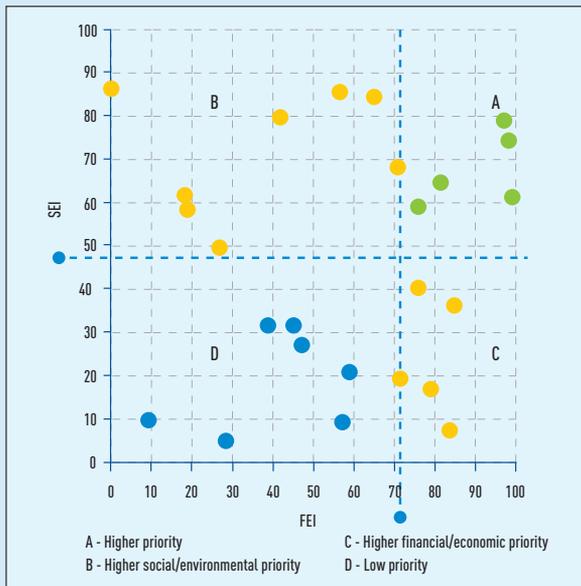
5.3 Review of Methodologies for the Private Sector

In this section, we review some methodologies that private sector investors use to determine investment prioritization. We first introduce the concept of the net present value of a project, which is the fundamental building block for all private sector investment projects. Next we discuss the user cost of capital which takes into account the cost of debt, equity and the impact of tax policies on private sector investment decisions, followed by a discussion on how future risks could potentially make a presently viable project unviable.

Box 5.3: The Investment Prioritisation Framework
Case Study of Vietnam Transport Projects

Figure 5.2

IPF Plane for Vietnam Transport Sector Projects



Source: Marcelo et al., 2006.

The IPF was used in Vietnam to evaluate transport sector projects. Figure 5.2 shows the Cartesian plane with the budget lines superimposed on both the x- and y axes. For FEI, the budget gets exhausted at a score close to 70. Thus, all projects to the right of 70 on the FEI axis can be developed using the budget. However, that may include some projects with a low SEI (Quadrant C). To address the social environment consideration, the authors also impose a budget line on the SEI axis, which gets exhausted at a score close to 50, which means that all projects with a score of above 50 for the SEI can be developed within the given budget. The intersection of the two budget lines provides the Quadrant A where projects are feasible and have high SEI as well as FEI scores.

5.3.1 Net Present Value Analysis for Private Sector Investments

Private sector participants are primarily motivated by profits from a project. As the revenue and costs of infrastructure projects flow over a long period of time, the potential investor calculates the net present value of the revenue stream (NPV) as the aggregate profits discounted during each period, as follows:

$$NPV = R_1 - C_1 + \frac{R_2 - C_2}{1+i} + \frac{R_3 - C_3}{(1+i)^2} + \dots + \frac{R_T - C_T}{(1+i)^{T-1}} = \sum_t \frac{R_t - C_t}{(1+i)^{t-1}}$$

where, R_t and C_t are the revenue and costs from the project at time t , respectively, and i is the discount rate for the investor. T is the duration of the project. The concept of the net present value is utilised by investors in several frameworks to understand how much capital to deploy or whether to invest in the project at all or not.

¹These assumptions are: $f(\cdot)$ is continuous and differentiable everywhere. Further, we will assume that $f'(\cdot)$ is downward sloping.

The Role of PPP Law in Encouraging Private Sector Investments

Albalade et al (2018) review the PPP laws of 35 states in the USA and construct an index of PPP law effectiveness using a list of 13 factors or provisions of the laws. The authors show that an improvement of one-tenth in their index improves the proportion of projects in the PPP mode by 0.5-0.6. Further, not each of these variables affect the outcome uniformly. For instance, provisions in the PPP law that disallow private sector participation in roads and highways have a negative effect on the number of PPP projects. On the other hand, provisions in PPP laws that exempt PPP projects from a state's procurement laws and grant exemption of private sector participants from property taxes have a positive impact on PPP investments. The last instance illustrates an example of the "impossible trinity", discussed previously - tax breaks may invite private sector participants but the public sector will face a revenue shortfall.

5.3.2 User Cost of Capital

The objective of an investor is to maximise the NPV. This fact can be used to estimate the amount of capital that one must invest in a project and how this capital varies with different cost factors. Consider the following simplification of $C_t = rK + \delta K$ where K is the amount of capital, r is the cost of finance, which depends on the debt-equity ratio of the project, as well as the interest and inflation rates, and δ is the depreciation rate on capital. Assume also that $R_t = f(K)$, or that the revenue from the project is a function of the capital invested. Now, under some mathematical assumptions,¹ The private sector investor will continue to invest till the marginal revenue from one more unit of capital is the same as the marginal addition to cost; that is,

$$f'(K) = r + \delta$$

The right-hand side of the above equation is the user cost of capital. Given the assumption that marginal revenue falls as capital invested increases, a higher cost of finance and higher depreciation rate imply that a smaller amount of capital will be invested. This approach can be further extended to incorporate corporate tax rates, τ , and GST, g . In addition, the user cost of capital is also influenced by tax policy in the form of tax allowances, A (in the form of depreciation provisions and tax holidays). Now, the optimal amount of capital is provided by

$$f'(K) = \frac{(1+g)(r+\delta)(1-A)}{1-\tau}$$

Thus, a higher corporate tax rate or GST implies lower investments, while more generous tax allowances spur greater investments. All the variables in the above

equation are also important factors in private sector investment decisions in a particular geography or an administrative region.

5.3.3 Investment Risk Approach

The investment risk approach is a mathematically intensive exercise where one evaluates the range of values of different variables, which may lead to the costs of the project becoming higher than revenue; that is, for the infrastructure project to become unviable. For example, in the case of many costs, loan repayment is borne in US\$ but the revenue accrues in INR. Thus, fluctuations in exchange rate between US\$ and INR can influence the profit stream.

Under this method, one first identifies the variables that capture the revenues and costs of the project. Then one builds a mathematical function which maps the different variables into the present discounted value of the project. These variables may be subject to uncertainty owing to the overall national and global economic factors. Thus, in a permutation of different variables, one may find the net present discounted value to decline below the minimum acceptable range. The following equations provide an illustration of this approach:

Let $X = (x_1, x_2, \dots, x_n)$ be the set of variables which can influence the revenue and costs of the project. Using this, we calculate the net present discounted value as:

$$NPV(X) = \sum_t \frac{R(X) - C(X)}{(1 + i)^t}$$

With the above formulation, NPV is a function which depends on the realisation of values of X . Now, if for some realisations of these factors, $NPV(X) < 0$, then the project is unviable.

The investment risk approach measures the probability that $NPV(X) < 0$. If the probability is high, then it implies that for a large number of realisations of vector $X = (x_1, x_2, \dots, x_n)$ the project may yield negative returns and may thus be abandoned.

5.4 The Proposed Framework

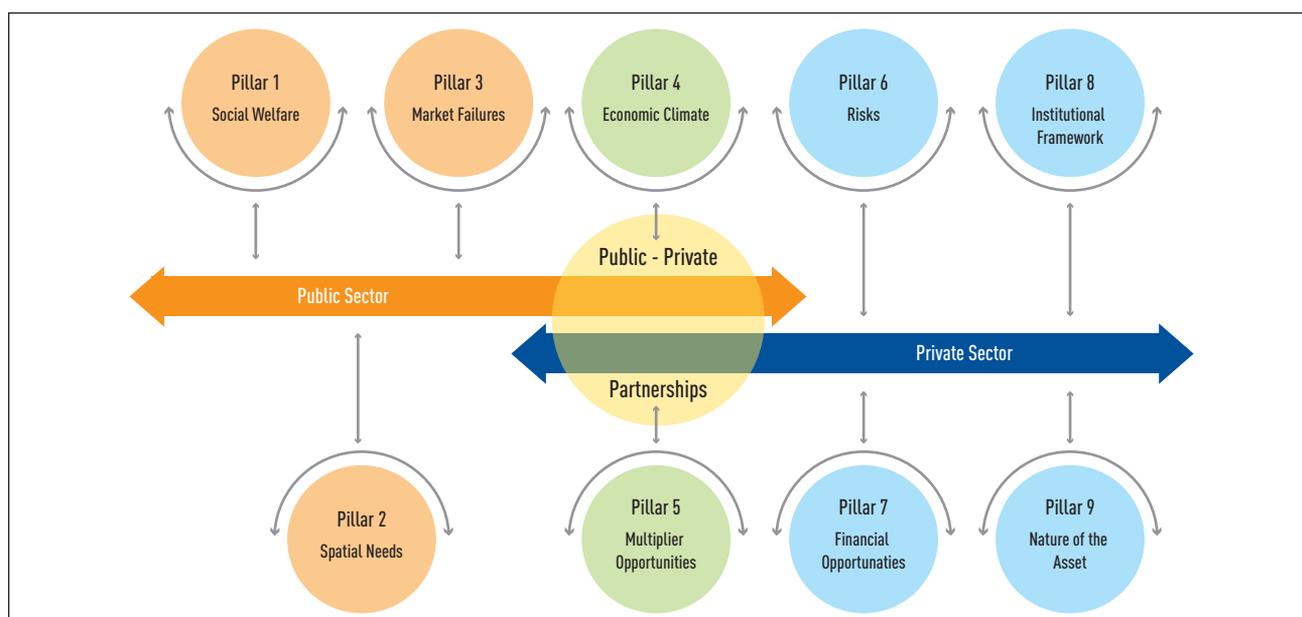
5.4.1 The Nine Pillars

As described above, both the private and public sectors are driven by different objectives for an infrastructure project. While there is some common ground, several times the objectives may run counter to each other. However, both the participants are equally important and any framework should, therefore, account for the needs of both.

In this section, we propose a new framework for infrastructure prioritisation, which takes into account the different objective functions of the public and private sectors. Apart from considering the individual drivers for investment decisions by the private and public sector players, we also consider the factors that enable better public-private partnerships.

The proposed new methodology to prioritise infrastructure investments stands on 9 pillars, 30 sub-pillars, and 70 indicators. Figure 5.3 provides an illustration of our

Figure 5.3 The Nine Pillars of N-IIPI



Source: The NCAER Study Team, 2021.

approach. Appendix A has the full description of the nine pillars with details of the sub-indicators and data sources for the same for the public sector, the private sector, and for PPPs.

The Public Sector Pillars

The factors that impact investment decisions in the public sector fall under three broad pillars. These pillars satisfy the social welfare, spatial needs, and market failures criteria for greater public sector investment. Social welfare refers to the distribution of benefits among different sections of the society. Investments by the public sector may target infrastructure development for certain sections of the society which are more disadvantaged. Hence, we include this pillar as a public sector consideration. Similarly, policy-makers may be driven by the need for addressing geographical or regional disparities through infrastructure development, which compels the inclusion of spatial development. Finally, markets may not be adequate to meet the development objectives. Such a situation leads to market failures, which the public sector can address through regulation.

The Private Sector Pillars

In order to address private sector considerations, we include four pillars. Two of these, viz., risks and financial opportunities, pertain to the magnitude and stability of the flow of revenue for costly investments in the private sector. The institutional framework pillar captures the legal environment for business operations in the country. Without an enabling environment, where contractual costs are small and regulations are not arbitrary, the private sector will encounter operational challenges. Finally, the traits of the asset, that is, specifically, the extent of competition and elasticity of consumers, play an important role in private sector consideration.

Public-Private Partnerships

Apart from the pillars which pertain individually to the public and private sectors, there are several areas of common ground between the two participants. For example, a sound economic environment is conducive for private sector investments. Further, high economic activity also generates effects beyond the direct users of the infrastructure assets. Thus, we include some indicators which are beneficial for both stakeholders for their prioritisation of projects. These pillars are the economic climate and the multiplier effects of the projects.

Under the economic climate, we consider the trends in the indicators of major economic activities and the macro-economic outlook, which provide an understanding of the usage of the asset. For the multiplier effects, we explore the ancillary industry opportunities that an infrastructure asset gives rise to during and after construction. Box 5.4 illustrates one such case of ancillary opportunities and output multipliers arising from infrastructure projects.

Box 5.4: Multiplier Effect of Airports

For airports, ancillary opportunities provide a substantial fraction of revenue as well. A key ancillary opportunity for the airport sector is the Maintenance, Repair, and Overhaul (MRO) facilities that can be developed within the airport. Airlines usually enter into contracts with airports to use MRO facilities. The following table outlines the ancillary units at the Hyderabad and Cochin airports.

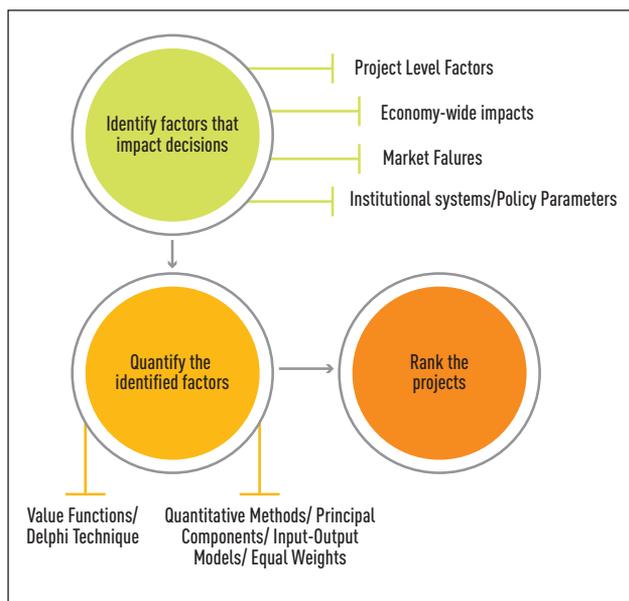
Airports	MRO	Other Units
Hyderabad	The GMR Aero Technic facilities, which cater to all types of MRO needs spread over 40 acres and extendable by 20 acres	Training Institute: GMR School of Business and Aviation
Cochin	Operated by the Cochin International Airport Limited, which provides limited MRO facilities to narrow body aircrafts	CIAL Exhibition Center spread over 2.5 hectares

5.4.2 Constructing the Infrastructure Investment Priority Index

The new index for prioritising infrastructure investments is called the NCAER-Infrastructure Investments Priority Index, or N-IIPI. This new framework will be used to construct an index in multiple states. First, for each sector in a given region we will construct sub-index scores. These sectoral indices can then be aggregated across regions to arrive at the final index.

The methodology used in N-SIPI (and discussed in Chapter 2) was a good platform to build N-IIPI, a complementary index. While N-SIPI ranks a states' overall competitiveness to attract investment, N-IIPI ranks the investment projects itself, across geographies, across regions and across different modes of participation (by the public sector, the private sector, and through PPPs).

Figure 5.4 Flowchart for Constructing N-IIPI



Source: The NCAER Study Team, 2021.

The N-IIPI methodology will first identify the factors that impact investment decisions separately for the public sector and the private sector as discussed in Section 1.4 of Chapter 1 and Section 5.4.1 in this chapter. The next step would be to quantify the identified factors using a mix of qualitative and quantitative techniques. The final step would be to rank these projects to help prioritise infrastructure investment decisions (Figure 5.4).

5.4.3 Methodology for the Composite Score to Prioritise Infrastructure Investments

The NCAER's Infrastructure Investment Priority Index (N-IIPI) has been constructed under nine broad pillars that incorporate the following measures: P1-Social Welfare, P2-Spatial Needs, P3-Market Failures, P4-Economic Climate, P5-Multiplier Effects, P6-Risks, P7-Financial Opportunities, P8-Institutional Framework, and P9-Nature of the Asset. Figure 5.5 illustrates the 9 pillars and the 30 sub-pillars in detail.

Under each of the nine pillars are a number of sub-pillars and indicators. The sub-pillars under each of the pillars P1 to P9 will be aggregated using some weighted average. There will be two separate sub-Indices for the public sector and the private sector, respectively. To do this, the common pillars, that is, the economic climate (P4) and the multiplier effects (P5), will be part of the separate sub-Index.

The sub-Index for the public sector will have five pillars, P1 to P5, incorporating indicators for social welfare, spatial needs, market failures, economic climate, and the multiplier effects. The sub-Index for the private sector will have six pillars, P4 to P9, incorporating economic climate, the multiplier effects, risks, financial opportunities, the institutional framework, and the nature of the asset.

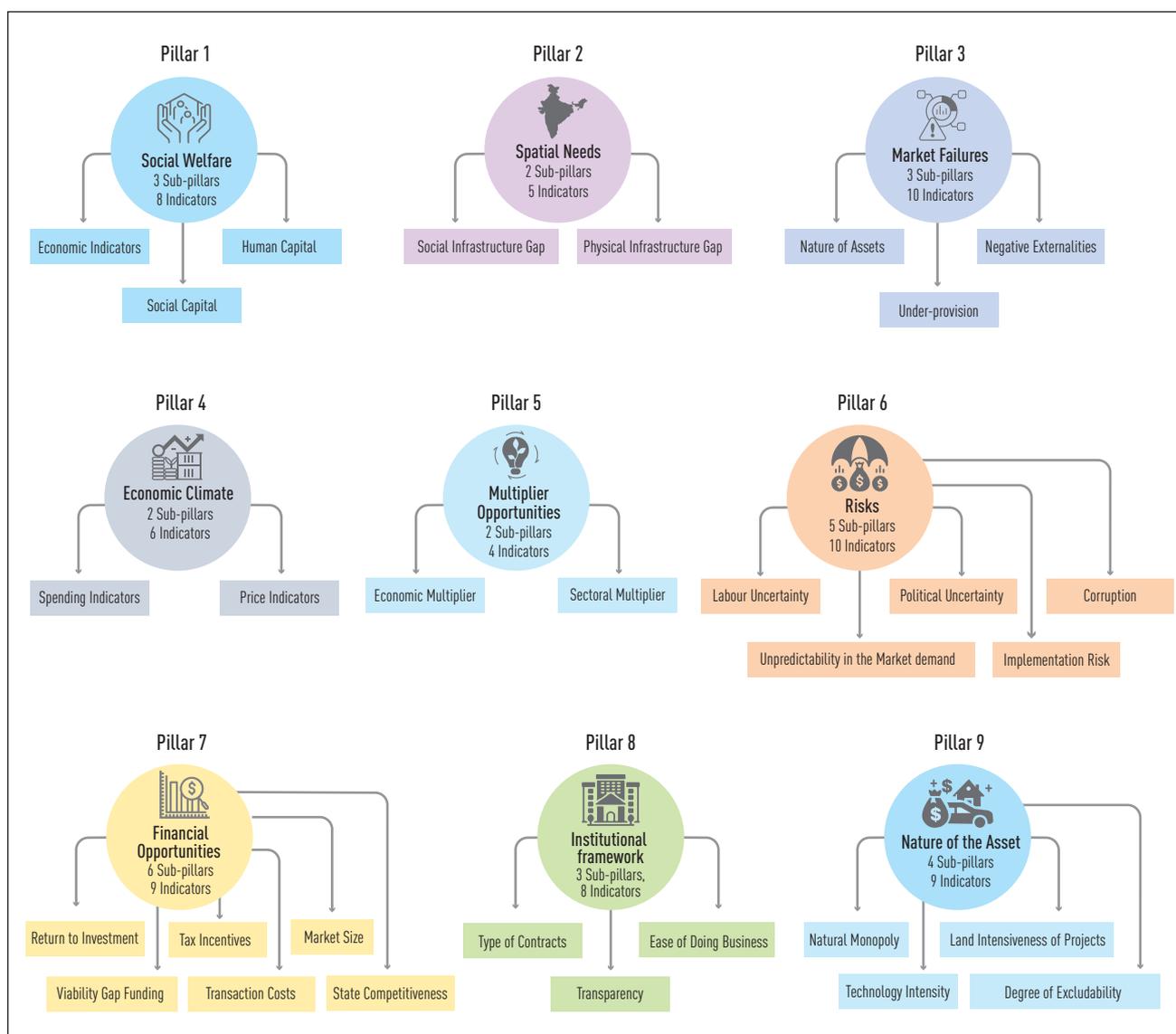
Each sub-pillar will have a number of indicators. There are 70 indicators in all. The indicators of each sub-pillar will be first normalised and then aggregated using equal weights for each indicator. This step will provide the score for each of the nine pillars.

The weighted geometric mean is used to aggregate the scores across the sub-pillars as it reduces the level of substitutability between the broad pillars (five for the public sector and six for the private sector). The weights will be decided after consultation with experts. At the same time, this methodology ensures that a 1 per cent decline in one pillar, say, social welfare, has the same impact on the overall sub-Index as a 1 percent decline in, say, the economic climate pillar. Thus, as a basis for comparisons for the two implementers, this method helps smoothen the intrinsic differences across the pillars better than the simple average.

Sectoral Indices: It is important to note that different sectoral indices will be made for each major sector and for each implementer (Public, Private, PPP). For instance, separate sectoral indices will be made for the transport sector (roads, highways, railways, airports, ports), energy sector (solar, wind, and non-renewable energy), the water and sanitation sector (irrigation, sewage management, waste management, water treatment plants), and social infrastructure (health and education).

The sectoral sub-indices will be aggregated into the composite sub-index for each implementer. To construct our intermediate and final indices, we will adopt the Multi-Attribute Utility Framework, which was described in Section 5.2.2 of this chapter. The techniques to standardise the data and the suggested weighting system for the construction of N-IIPI, as conceptualised in this paper, will be detailed after an in-depth review of the literature, and discussions with policy-makers and private sector participants in the infrastructure space.

Figure 5.5 The 30 Sub-Pillars of N-IIPI



Source: The NCAER Study Team, 2021.

5.5 An Illustration of the Index Construction

To apply our methodology, we require a list of infrastructure projects to be implemented. If different projects lie in non-overlapping regions, we require regional characteristics as well. In this section, we will provide an illustration of how the N-IIPI will be constructed. Since the exercise being performed here is for illustration only, we assume region as a given.

Consider a policy maker who has to rank three infrastructure projects on the basis of prioritization. These projects are construction of an airport, development of a highway and establishing a network of hospitals and medical facilities in a given state. As per

our methodology, these three projects will be evaluated on 9 pillars, 30 sub-pillars and 70 indicators. The 70 indicators could be both quantitative (cardinal) and qualitative (ordinal). For the purpose of this illustration, we are aggregating at the sub-pillar level, using only ordinal scoring.

5.5.1 Scoring the sub-pillars

In this exercise, we will provide hypothetical scores between 1 and 3 to the projects under each sub-pillar. A score of 3 (1) indicates that for the given sub-pillar that project is the most (least) desirable. Table B1 in Appendix B provides scores to different projects under eight sub-pillars of three pillars-Social Welfare, Spatial

Needs, Market Failures. The scores are subjective but they follow a rationale. For example, if hospitals have a higher positive externality then they receive a higher score compared to airports or highways. Thus, the scores are ordinal in nature as they order each project on the basis of the sub-pillars.

5.5.2 Normalizing the Score

Once each project is provided a score under each sub-pillar, the final score for a pillar is derived by using the average of the scores in the sub-pillars. Thus, the score of highway sector under social welfare pillar is 1.67 (2+2+1/3) whereas for hospitals it is 2.33 (1+3+3/3) (Table B2 in Appendix B). Since these scores are ordinal in nature, we can scale them up or down to get different magnitudes. As long as the ordering across project remains the same, the informative content regarding which project is more important will also not change. This poses a problem of which scale to use. To address that, we use a min-max formula which translates the scores for each project in each pillar to a scale between 0 and 1. This formula is given by the following formula

$$Score_i^{Hi} = \frac{y_i^{Hi} - \min(y_i^{Hi}, y_i^A, y_i^{Ho})}{\max(y_i^{Hi}, y_i^A, y_i^{Ho}) - \min(y_i^{Hi}, y_i^A, y_i^{Ho})}$$

where, y_i^{Hi} is the average of scores in the indicators of each sub-pillar in pillar i for highway project. Table B3 in Appendix B provides the normalized scores for each sub-pillar in the public sector pillar across all projects.

5.5.3 Weighing Scheme

The objective of our study is to order these projects for different agents of infrastructure development. These agents/stakeholders are the public sector, the private sector and the PPP sector. However, to arrive at a composite ranking of the projects for each agent, we require a weighing scheme that is used to aggregate the scores across pillars. In Phase-2 of the project, we will obtain these weights from an independent panel of experts. For the current illustrative exercise, we will construct aggregate scores with two weighing schemes.

Weighing Scheme-1

Table B4a in Appendix B provides a weighing scheme that will be used for each agent. Under this scheme, different agents are assumed to have mutually exclusive objectives across pillars. For example, for Public sector agents, weights are assigned to only three pillars—Social Welfare, Spatial Needs, Market Failures—while all other pillars get zero weights. Similarly, this weighing scheme assumes that private sector investors are only driven by

Risks, Financial Opportunities, Institutional Framework and Nature of the Asset for a particular project.

Weighing Scheme-2

The above weighing scheme is restrictive. First, it assumes that different agents have non-overlapping objectives from an infrastructure projects. This may appear problematic since public sector may also be wary of the underlying risks of the project. Second, within each agent, this weighing scheme distributes weights equally not accounting for heterogeneity in the objective function.

To address that, we propose weighing scheme-2 in Table B4b in Appendix B. In this weighing schemes, the weights are distributed across more pillars and are non-uniform. Hence, the objectives are overlapping and heterogeneous across stakeholders.

5.5.4 Final Index

The final index of infrastructure projects for different stakeholders is derived by taking the weighted average of the normalized scores in Table B3 in Appendix B. Specifically, the public sector index for, say, highway projects is given by:

$$\sum_i w_i^{Public} \cdot Score_i^{Highway}$$

where, w_i^{Public} is the weight on pillar i assigned for public sector (as per Tables B4a and B4b in Appendix B) and $Score_i^{Highway}$ is the normalized score on pillar i assigned to highway projects (as per Table B3 in Appendix B).

Since we have considered two weighing schemes, our final index will be contingent on the weights. Table 5.2a and Table 5.2b provide the final weighted index using weighing scheme-1 and weighing scheme-2, respectively.

Table 5.2a Index of Sectors (Weighing Scheme-1)

	Public	PPP	Private
Highway	0	0.5	0.25
Airport	0.25	0.75	0.62
Hospital	1	0.5	0.60

Table 5.2b Index of Sectors (Weighing Scheme-2)

	Public	PPP	Private
Highway	0.20	0.25	0.30
Airport	0.43	0.56	0.55
Hospital	0.80	0.69	0.59

Comparing the scores down the column would indicate which project a particular agent could prioritize. For example, in Table 5.2a, with a restrictive weighing scheme and mutually exclusive objectives, we find that the public sector would prioritize hospitals whereas the private sector would develop airports. In Table 5.2b, however, with a distributed weighing scheme, we find a conflict in distribution of tasks as all agents find hospitals as their priority.

The N-IIPI methodology conceptualized in this Approach Paper and illustrated above will be used to compute a score for a large number of infrastructure projects in India. It is envisaged that Phase 2 of this project will rank infrastructure projects in India across regions, states and sectors using the 9 pillars, 30 sub-pillars and 70 indicators discussed above and given in more detail in Appendix A .

APPENDIX A

This Appendix describes the different pillars separately for the public and private sectors and also for PPPs. It provides details of the indicators used to measure each pillar and sources of the data that can be exploited to obtain this information.

The weights and sub-weights will be decided after consultation with experts.

Table A.1 Description of Pillars

	Pillars	Sub-pillars	Indicators	Source
Implementer: Public Sector				
P1	Social Welfare (+)	Economic Indicators	a. Poverty Rate	NSSO data
			b. Per capita Income	World Bank
		Social Capital	a. Hospital/Healthcare centre data	Medical Council of India
			b. Safety/Crime rate data	National Crime Records Bureau (NCRB)
			c. Health Indicators-Life expectancy, Infant mortality rate	WHO, World Bank
		Human Capital	a. Literacy Rate	World Bank
			b. Secondary Level Education	MoHRD
			c. Higher/Technical education trends	Statistics of Higher and Technical Education, MoHRD
		P2	Spatial Needs (+)	Social Infrastructure Gap
b. Aspirational Districts	NITI Aayog			
Physical Infrastructure Gap	a. Inter connectivity-roadways, Railways, Waterways and Airways coverage			Annual Survey of Industries
	b. Power generation and distribution data			
	c. Inputs, Availability of Natural Resources			Indian Bureau of Mines; Ministry of New and Renewable Energy, Government of India
P3	Market Failure (-)	Nature of Assets	a. Excludability and Technological Intensity	Review-based analysis/ subjective perception
			b. Natural Monopoly-Fixed Cost, Variable Cost, Tariff	Websites of the respective regulator
			c. Elasticity Measure	Secondary data study
		Under-provision	a. Social Infrastructure Expenditure-Health, Education, Low-cost housing, Food Security	Union and State Budgets
			b. Physical Infrastructure Expenditure-Tourism, Road, Power, Railways	Union and State Budgets
		Negative Externalities	a. Pollution	Central Pollution Control Board (CPCB)
			b. Forest cover	Forest survey of India
			c. Abatement cost	Secondary Data Study/Review based analysis
			d. Displacement	Detailed Project Report
			e. Effect on Biodiversity	Forest survey of India

	Pillars	Sub-pillars	Indicators	Source
Implementer: Public Private Partnerships				
P4	Economic Climate (+)	Macro-economic stability	a. Overall GSDP growth	MoSPI
		Price Indicators	b. Sectoral GSDP growth	Reserve Bank of India; CRISIL
c. Fiscal deficit				
a. Exchange rates				
b. Interest rates				
c. Inflation				
P5	Multiplier Opportunities (+)	Economic multiplier	a. Employment multiplier	
			b. Output multiplier	
		Sectoral multiplier	c. Ancillary industry	
			d. PPP projects	
Implementer: Private sector				
P6	Risks (-)	Political Uncertainty	a. Politically motivated violence	Association of Democratic reforms, Election Watch, Lok Sabha and State Assemblies; South Asia Terrorism Portal
			b. Mass civil protest	
			c. Instability of/within political regime	
		Labour Uncertainty	Man days lost annually due to strikes	Press Information Bureau (PIB)
		Implementation Risk	a. Cancelled projects	CMIE Stalled Project Database
			b. Distressed projects	
c. Stalled projects				
Corruption	a. Measures of bribery by citizens	India Corruption Report, 2019 by Local Circles;		
	b. Cases of pending investigation from previous year cases in total cases of investigation	National Crime Records Bureau (NCRB)		
Unpredictability in Market demand	Congestion due to under-provision	Subjective assessment/ Qualitative information		
P7	Financial Opportunities (+)	State Competitive-ness	Ranking of the State in the investment potential	The NCAER State Investment Potential Index
		Return to Investment	a. RoI measure	Project reports/ Industry averages
			b. Lock-in-period	
		Transaction Costs	a. Number of approvals/clearances needed	Qualitative and Stakeholder Interaction
			b. Time taken from proposal to project initiation	
		Tax Incentives	Measures of tax benefits received	Administrative data
Viability Gap Funding	Amount of VGF allowed	Department of Economic Affairs; PIB		
Market size	a. Number of competitors/ Market share	Project reports		
	b. Number of users			

	Pillars	Sub-Pillars	Indicators	Source
P8	Institutional Framework (+)	Ease of Doing Business	a. India ranking	World Bank Ease of doing business; DPIIT Scores
			b. State rankings	
		Transparency	a. Fast-tracking of project clearances	Stakeholder Interaction and desk based research
			b. Independent audit system	
			c. Transparency in data	
			d. Contracts and validations	
			e. Transparency in bidding process	
Types of contracts	a. Ownership rights by sectors	Infrastructure India Government data-base		
	b. Proportion of different PPP models in states			
P9	Nature of the Assets (+/-)	Technology intensiveness	a. Sector-specific intensiveness	Review based analysis/ subjective perception
		Degree of Excludability	a. Excludability	Review based analysis/ subjective perception; Proportion of projects with annuity streams /AERA/NHI
			b. Ability to charge user-fees	
		Natural Monopoly	a. Essential services cost	Variable cost, Fixed cost
			b. Cost of infrastructure	
		Land Intensiveness of project	a. No. of urban master plans in a State	Data on land availability : State Industrial Development Corporations; Directorates; Ministry of Micro, Small and Medium Enterprises; Ministry of Commerce and Industries; Municipal websites, Project reports
			b. Registered Land	
			c. No. of industrial parks available	
d. Cost of the land				

Note: Signs below the pillar names (+/-) indicate whether the pillar impacts the index positively or negatively.

APPENDIX B

Following tables illustrate the scoring for N-IIPI as presented in Section 5.5.

Table: B.1 Scores for Different Projects under the Public Sector Pillar

	Pillar 1: Social Welfare			Pillar 2: Spatial Needs		Pillar 3: Market Failures		
	Economic Indicators	Social Capital	Human Capital	Social Infrastructure Gap	Physical Infrastructure Gap	Nature of the Asset	Negative Externalities	Under-Provision
Highway	2	2	1	1	1	2	2	1
Airport	3	1	2	1	2	1	1	3
Hospital	1	3	3	3	3	3	3	2

Table: B.2 Average Scores for the Nine Pillars

	P1	P2	P3	P4	P5	P6	P7	P8	P9
	Social Welfare	Spatial Needs	Market Failures	Economic Climate	Multiplier Opportunities	Risks	Financial Opportunity	Institutional Framework	Nature of the Asset
Highway	1.67	1	1.67	3	1	2.2	1.83	1.67	1.75
Airport	2.00	1.5	1.67	2	2.5	1.6	2.17	2.00	2.25
Hospital	2.33	3	2.67	1	2.5	2.2	2.00	2.33	2

Table: B.3 Normalised Scores of Pillars

	P1	P2	P3	P4	P5	P6	P7	P8	P9
	Social Welfare	Spatial Needs	Market Failures	Economic Climate	Multiplier Opportunities	Risks	Financial Opportunity	Institutional Framework	Nature of the Asset
Highway	0	0	0	1	0	1	0	1	0
Airport	0.5	0.25	0	0.5	1	0.5	1	0.5	1
Hospital	1	1	1	0	1	0	1	0	1

Table: B.4a Weighing Scheme-1

	P1	P2	P3	P4	P5	P6	P7	P8	P9
	Social Welfare	Spatial Needs	Market Failures	Economic Climate	Multiplier Opportunities	Risks	Financial Opportunity	Institutional Framework	Nature of the Asset
Public	0.33	0.33	0.33	0	0	0	0	0	0
Private	0	0	0	0	0	0.25	0.25	0.25	0.25
PPP	0	0	0	0.5	0.5	0	0	0	0

Table: B.4b Weighing Scheme-2

	P1	P2	P3	P4	P5	P6	P7	P8	P9
	Social Welfare	Spatial Needs	Market Failures	Economic Climate	Multiplier Opportunities	Risks	Financial Opportunity	Institutional Framework	Nature of the Asset
Public	0.2	0.2	0.2	0.15	0.15	0.05	0	0	0.05
Private	0	0	0.1	0.1	0	0.2	0.2	0.2	0.2
PPP	0.05	0.05	0.1	0.15	0.15	0.1	0.1	0.2	0.1

ANNEXURE 1

Budgetary Initiatives to Attract Infrastructure Investment

UNION BUDGET 2020-21

Tax exemption for notified Sovereign Wealth Funds (SWFs)

The Government introduced an income tax exemption for investments by Sovereign Wealth Funds and Pension Funds, to fund its infrastructural development plans. This includes investments made in all types of InvITS, debt or shares of companies engaged in specific infrastructure activities, and units of Category 1 and Category 2 Alternate Investment Funds (AIF), which have invested 100 per cent of their funds in companies engaged in specific infrastructure activities. These investments must be made after 1 April 2020, and must be held for three years.

The launch of new government-sponsored Infrastructure Investment Trusts

Investments made in Real Estate Investment Trusts (REITs) and Infrastructure Investment Trusts (InvITS) have been made more attractive, while their capital-raising avenues have been deepened. The trusts can now raise debt capital at competitive rates, while dividend payments to REITs and InvITs have been exempt from tax deducted at source (TDS). Debt financing of InvITs and REITs by foreign portfolio investors (FPIs) will be enabled by making suitable amendments in the relevant legislations. So far, FPI regulations allow them to invest in non-convertible debentures (NCDs) issued only by a corporate entity. Since InvITs and REITs are trusts, FPIs could not subscribe to debt instruments issued by them a couple of years ago, despite the fact that the Securities and Exchange Board of India (SEBI) allowed InvITs and REITs to start issuing NCDs.

UNION BUDGET 2021-22

The new Development Finance Institution (DFI)

The Government announced that a professionally-managed DFI would be set up to provide, enable, and catalyse infrastructure financing. The government proposed to set aside Rs 20,000 crore to capitalise this institution and aimed to have a lending portfolio of at least Rs 5 lakh crore in three years. Subsequently, on March 16, 2021, the Union Cabinet approved a detailed proposal for setting up the DFI.

The National Infrastructure Monetisation Pipeline

The Government proposed to monetise potential brown field infrastructure assets. Some of the assets that would be monetised include:

- **Roads:** The National Highways Authority of India (NHAI) and Power Grid Corporation of India Limited (PGCIL) have sponsored one InvIT each, which will attract international and domestic institutional investors.
- **Railways:** The Dedicated Freight Corridor assets will be monetised for operations and maintenance, after commissioning.
- **Airports:** These will be monetised for operations and management concessions.
- **Other Organisations:** Among these are the oil and gas pipelines of Gas Authority of India Limited (GAIL), warehousing assets of Central Public Sector Enterprises (CPSEs) such as the Central Warehousing Corporation (CWC) and National Agricultural Cooperative Marketing Federation of India Limited (NAFED); and sports stadiums.
- **Land with the Ministries/Departments and PSUs:** These landholdings will be monetised either by direct sale or through concessions. A SPV is slated to be set up to carry out this activity.

Other Salient Points in Budget 2021-22

PPPs: The government is particularly interested in PPPs in the social and economic infrastructure sectors including Health, Education, Waste Water, Solid Waste Management and Water Supply, and is revamping the infrastructure Viability Gap Funding (VGF) scheme to make investments more attractive.

Insurance: The limit for FDI in the insurance sector has been increased from 49 per cent to 74 per cent.

Zero Coupon Bonds: Provision has been made for funding of infrastructure by tax-efficient Zero Coupon Bonds for notified infrastructure debt funds.

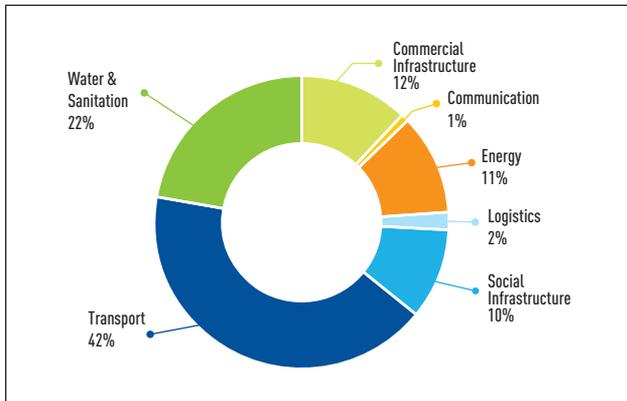
GIFT City: Some tax incentives are being provided for relocating to the International Financial Services Centre in Gujarat International Finance Tec (GIFT) City. These include tax holidays for capital gains for aircraft leasing companies; tax exemption for aircraft lease rentals paid to foreign lessors; tax incentives for relocating foreign funds in the Indian Financial System Code (IFSC); and tax exemption to the investment division of foreign banks located in IFSC.

ANNEXURE 2

State-wise and Sector-wise Distribution of NIP Projects

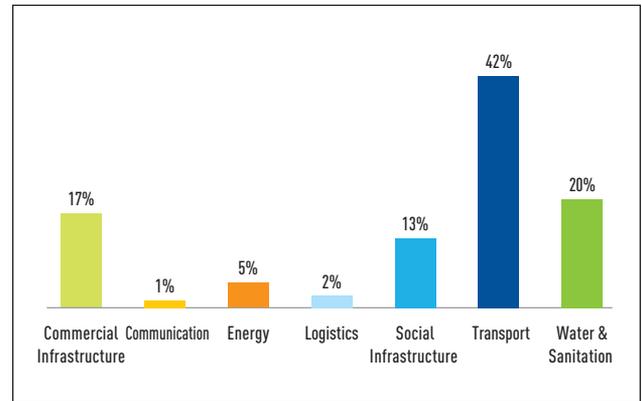
Andhra Pradesh

Total Cost: Rs. 11.8 Lakh Crores



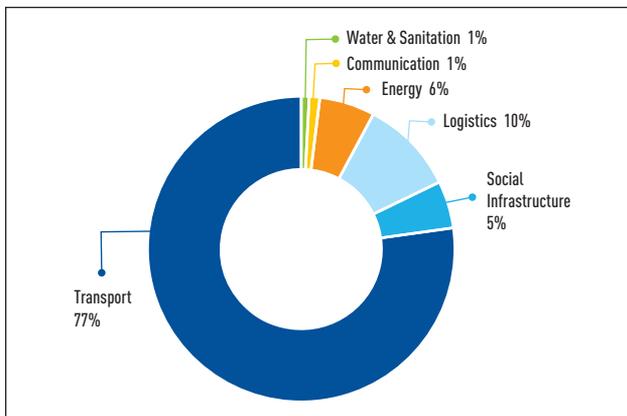
Percent of Total Number of Projects

Total Number of Projects :576

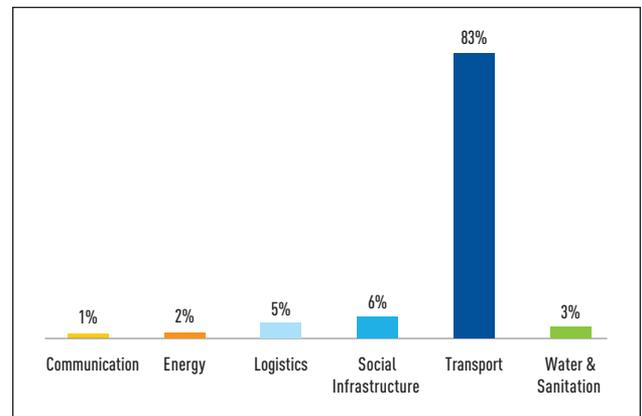


Assam

Total Cost: Rs. 1.5 Lakh Crores

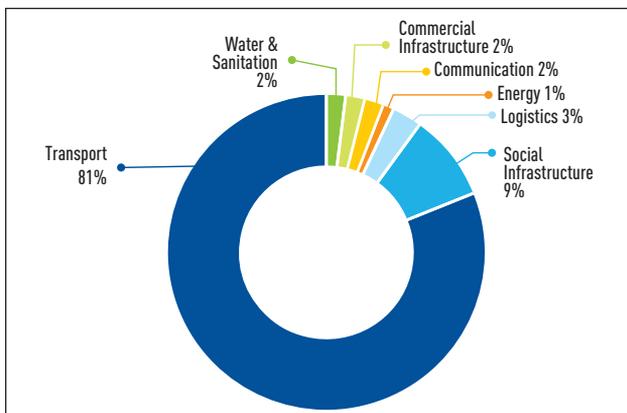


Total Number of Projects: 176

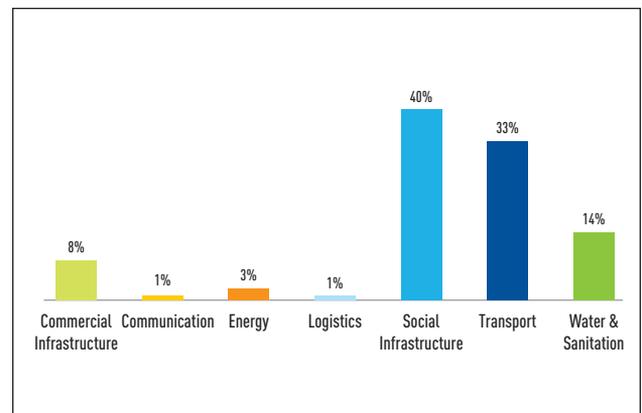


Delhi

Total Cost: Rs. 4.2 Lakh Crores

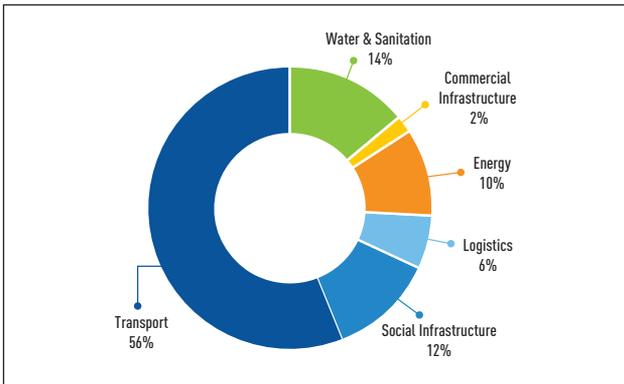


Total Number of Projects :120

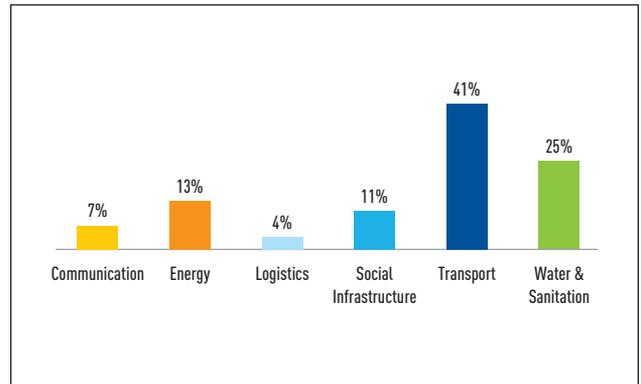


Gujarat

Total Cost: Rs. 5.62 Lakh Crores

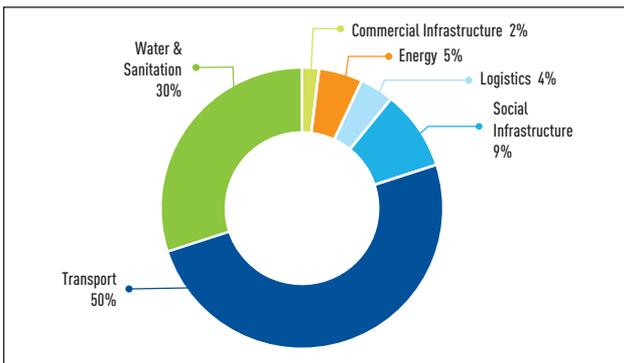


Total Number of Projects: 423

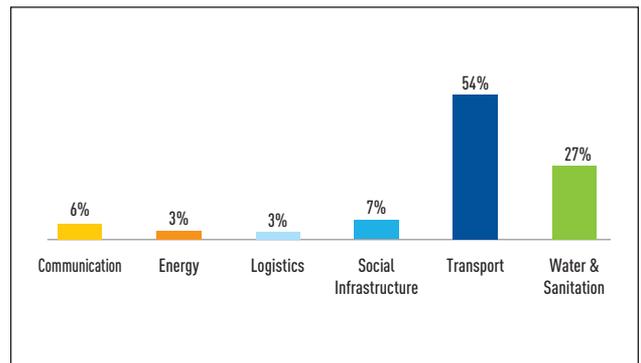


Karnataka

Total Cost: Rs. 6.2 Lakh Crores

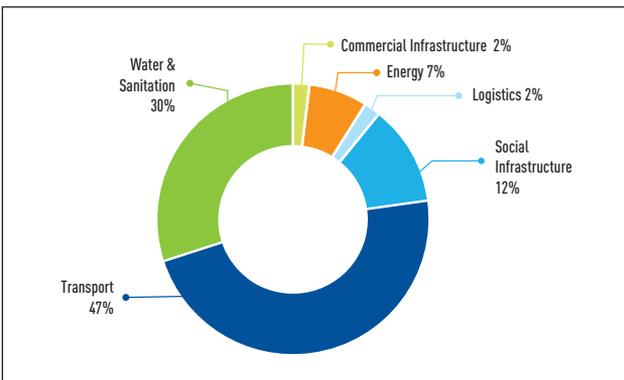


Total Number of Projects: 577

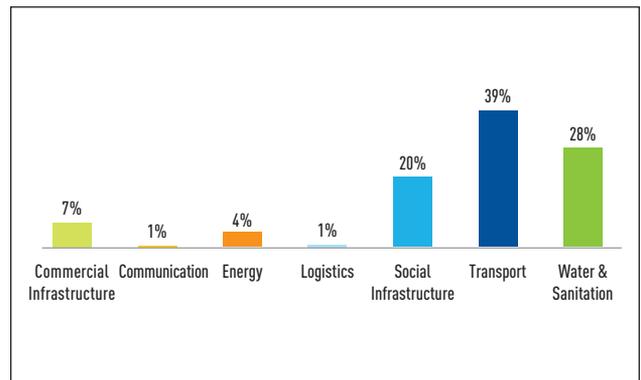


Madhya Pradesh

Total Cost: Rs. 7.9 Lakh Crores

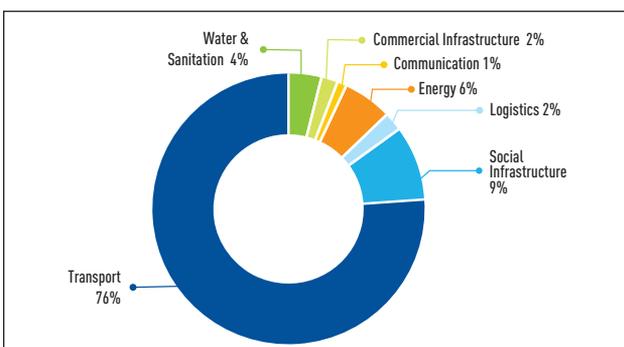


Total Number of Projects: 772

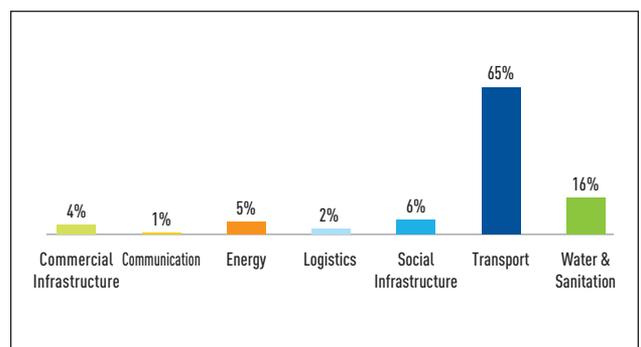


Maharashtra

Total Cost: Rs. 13.9 Lakh Crores

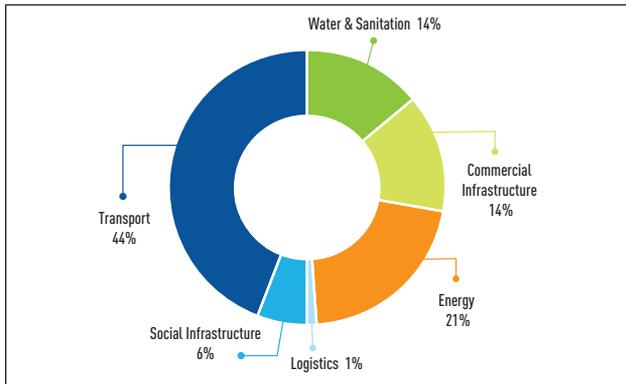


Total Number of Projects :577

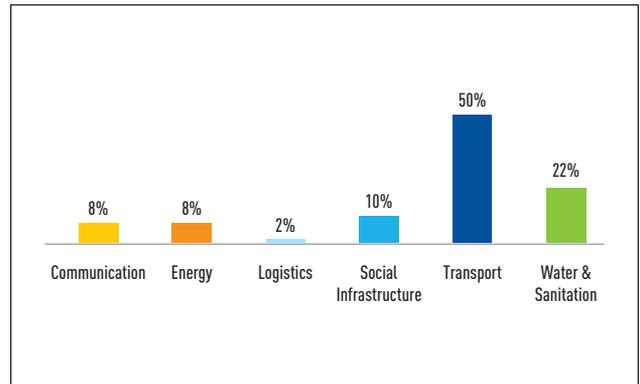


Tamil Nadu

Total Cost: Rs. 10.9 Lakh Crores

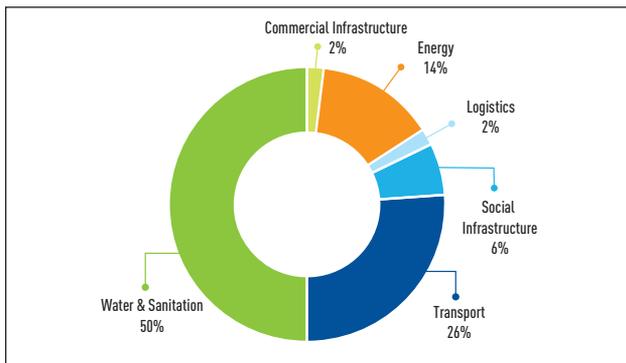


Total Number of Projects :448

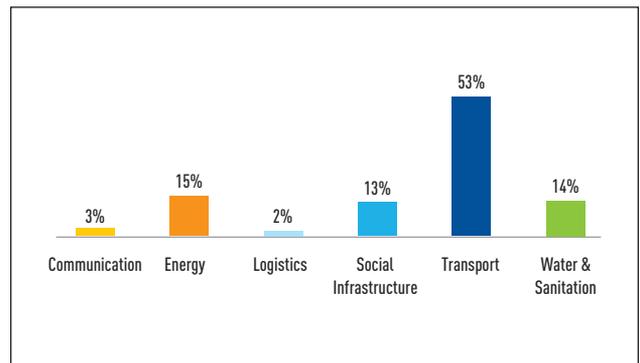


Telangana

Total Cost: Rs. 6.4 Lakh Crores

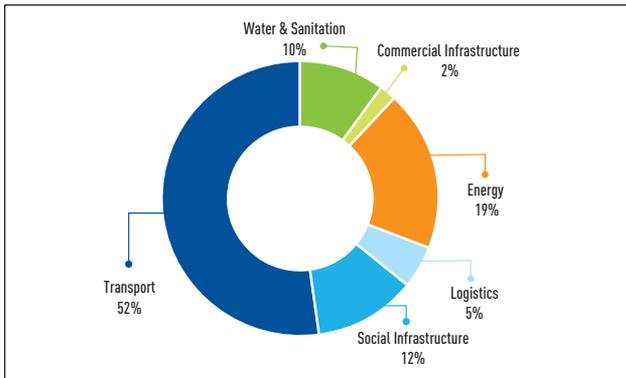


Total Number of Projects: 303

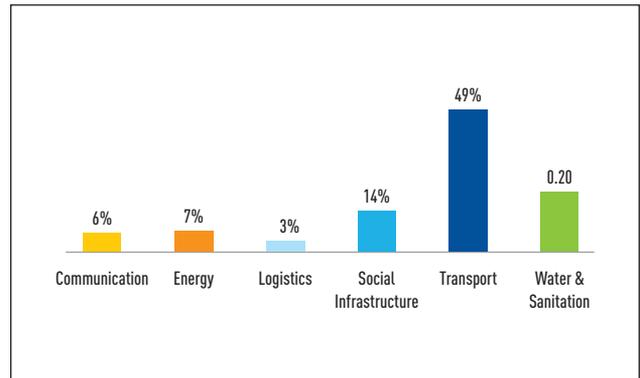


Uttar Pradesh

Total Cost: Rs. 8.24 Lakh Crores

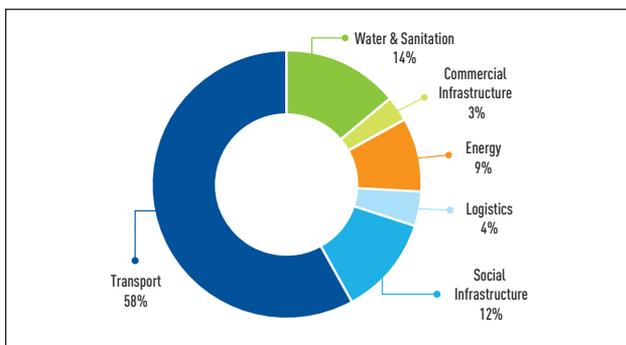


Total Number of Projects: 616

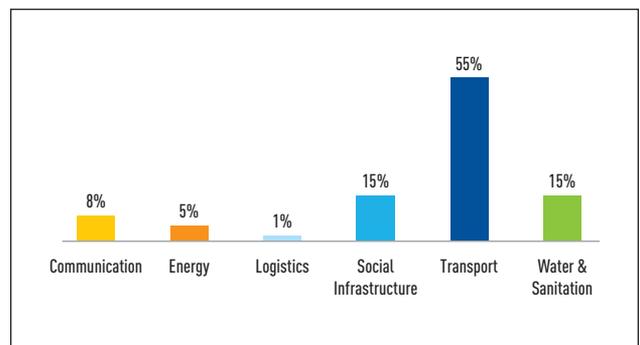


West Bengal

Total Cost: Rs. 6 Lakh Crores

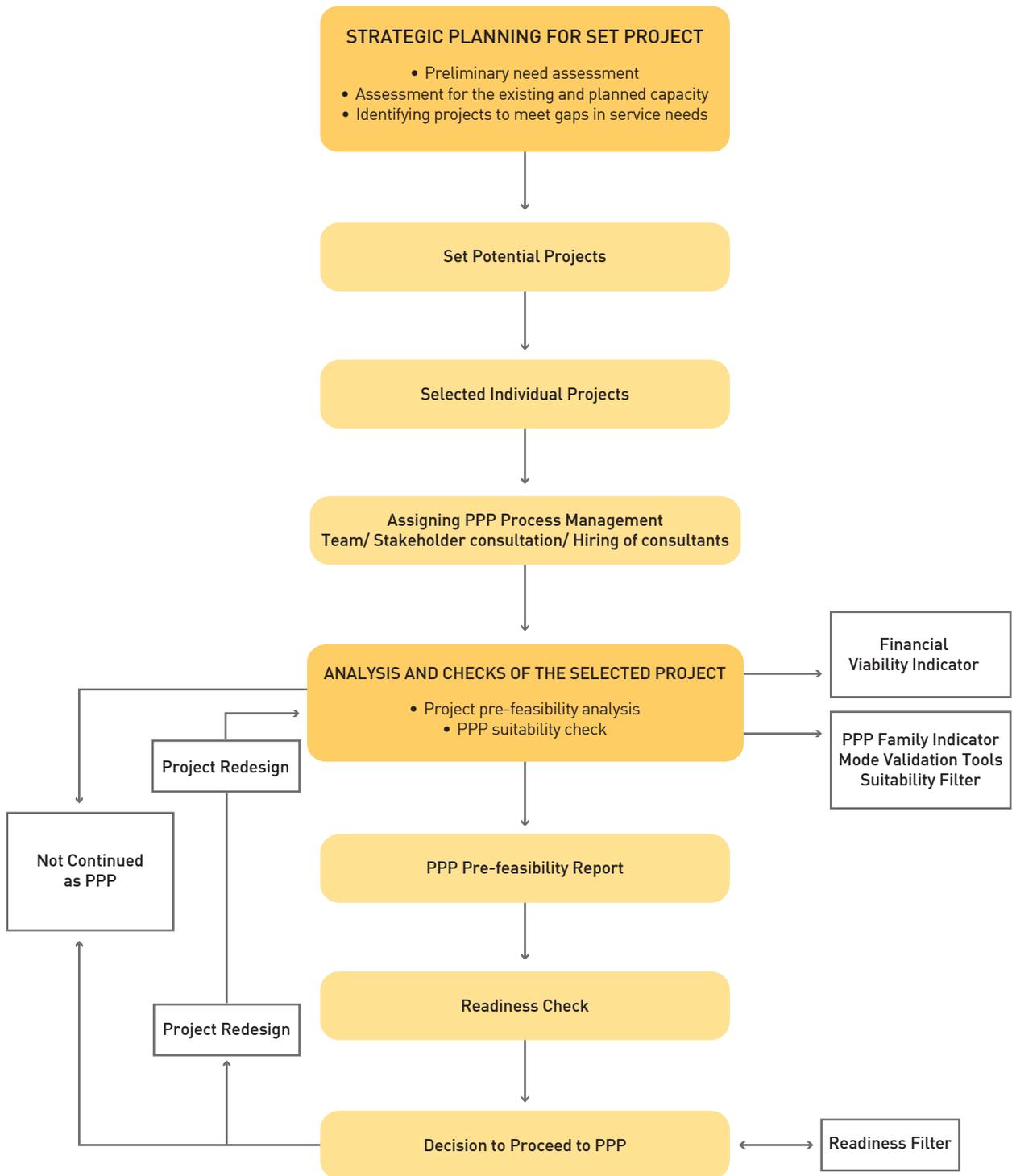


Total Number of Projects :623



ANNEXURE 3

The Procurement Process of PPP



Source: Public Private Partnership Framework for Infrastructure Sector, Global Compact Network India.

ANNEXURE 4

Evolution of Land Laws in India

“The Bengal Regulation which was originally enacted for I of 1824 culminated in the Acquisition Act, 1894 (hereinafter the “Land Acquisition Act”). After independence, the coverage of the act extended to the entire country except for the state of Jammu and Kashmir as princely states had their own land acquisition laws.

In 1950 when India became a republic, Article 13(2) formed the base for the application of colonial laws, including the Land Acquisition Act, as long as they were not incongruous with the fundamental rights of the people. Article 31 of the Constitution enshrined the requirements of public purpose, procedure, and compensation that condition the exercise of the state’s eminent domain power into constitutional protections. However, Article 31 led to political and legal conflicts, and had to undergo numerous amendments, before it was abolished as a fundamental right by the Constitution (Forty Fourth Amendment) Act, 1978. Article 300A ensured that “no person shall be deprived of his or her property without the authority of a valid law”, thereby doing away with the requirements of public purpose and compensation from the text of the Constitution. Therefore, post-independence, a lot of amendments were

made to the Land Acquisition Act by both the Union and the states, with the last major amendment in 1984.

Following the liberalisation of foreign investment laws in 1991, and the inflow of foreign capital, there has been an increase in land acquisition by the state. In 1999, a Disinvestment Ministry was set up and given the role of privatisation of state owned industries. This was followed by the enactment of the Special Economic Zones Act, 2005, which enabled the acquisition of land by the government for private industry. This used to take place in the past but in an ad hoc fashion, and became official government policy after 2005. Along with the increasing land acquisitions since the late 1990s, the frequency and severity of land related conflicts increased. This translated into “massive public outrage and civil society movements” which led to legislative efforts towards a comprehensive amendment of the Land Acquisition Act. The first one took place in 2007. This was followed by attempts since 2011 to repeal and replace this Act by what eventually became the Right to Fair Compensation and Transparency in Land Acquisition, Rehabilitation and Resettlement Act, 2013 (here in after the “LARR Act”).”

Source: Gol, 2010.

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