

# Infrastructure, Institutions and Industrialisation: The Delhi-Mumbai Industrial Corridor and Regional Development in Gujarat and Uttar Pradesh

SHAHANA CHATTARAJ

**ABSTRACT** The Delhi-Mumbai Industrial Corridor (DMIC) is one of several infrastructure megaprojects underway in India, intended to boost industrial modernisation and generate manufacturing employment for India's young, largely unskilled workforce. Field research in DMIC investment sites in Gujarat and Uttar Pradesh shows that its implementation is highly uneven across States and regions. The research, along with the literature, suggests that regional industrial development is likely to depend on the capacity and policies of State governments, and will not be realised through mega-infrastructure projects alone. Gujarat's successful experience with infrastructure-led industrialisation suggests that key are effective institutional systems for industrial policy and planning, internal coordination within the state, and linkages with industry associations, local enterprises and communities. For the DMIC to realise its objectives, it is imperative to develop state capacity at multiple levels, link with local and regional economies, and strengthen systems for planning and coordination.

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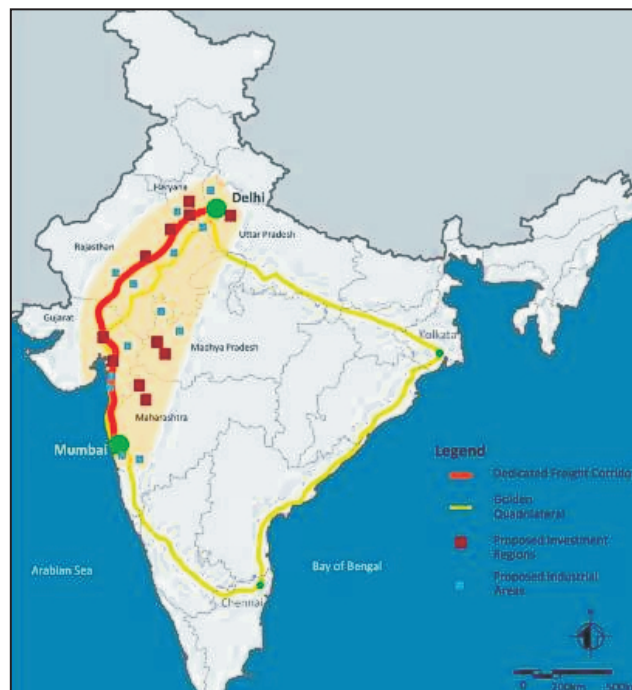
## INTRODUCTION

Experts and policymakers alike recognise that broad-based, sustained manufacturing growth is critical to resolving India’s growing jobs crisis.<sup>1</sup> The Delhi-Mumbai Industrial Corridor (DMIC) project seeks to address three impediments to industrial manufacturing in India: multiple infrastructure deficits; the lack of readily available, serviced land for plants, factories and manufacturing facilities; and unplanned and informal urbanisation de-linked from industrial development. Developed by the Government of India in cooperation with Japan, the DMIC supports the integrated development of industrial mega-regions, townships and new ‘smart’ cities in seven states, and has a projected cost of US\$ 100 billion.<sup>2</sup> Its spine is a high-speed freight line that will link the Delhi National Capital Region with India’s largest container port in Navi, Mumbai.<sup>3</sup> The DMIC is one of five

Development Corridors planned across India—ambitious, complex megaprojects that involve public and private investment and multiple levels of state intervention. The assumption is that planned and coordinated investment in infrastructure, world-class facilities and better connectivity will boost industrial modernisation within and across regions, and generate mass employment for India’s young, urbanising and mostly unskilled work force.<sup>4</sup> Indeed, post-war United States and, more recently China, have shown that national-scale infrastructure and city building is in itself a prolific generator of jobs.

This brief considers the question of whether DMIC’s infrastructure-led industrialisation strategies are effective. It offers policy recommendations, drawing on field research conducted by the author in DMIC investment regions in Gujarat and Uttar Pradesh as part of a research project for the University of Sheffield/ CEPT.<sup>5</sup>

Diagram 1: DMIC Zone of Influence



Source : Government of India Department of Industrial Policy and Promotion

The field research, in line with the literature, suggests that the developmental benefits of major infrastructure projects vary across regions, and that the interface between institutions, infrastructure and enterprises is critical for regional industrial development. Differences in state capacity in Gujarat and Uttar Pradesh influence the form the DMIC takes in each state, and mediates implementation outcomes.<sup>6</sup> In Gujarat, the state builds on and scales up existing institutional systems for planning and coordination in the DMIC investment. The State government has a coherent policy and implementation framework that integrates infrastructure provision with industrial policy. Relatively effective state structures at central, regional and local levels support ground-level coordination and linkages with local industries, towns and cities. In the Dadri-Greater NOIDA-Ghaziabad investment region in UP, in contrast, the DMIC constitutes a smattering of uncoordinated Central and State government projects, with the State's role primarily as land developer. The state lacks institutional mechanisms for coordination within and outside the state and to link infrastructures with the demands and requirements of local industries and settlements.

Thus, while the DMIC is conceived as a national project, its development outcomes are likely to vary based on the effectiveness of state-level systems for planning and coordination; the state's wider developmental policies and priorities; and its relations with industry, local business associations and communities. In the absence of effective institutional systems and mechanisms for planning, coordination and linking with local

and regional economies, the various DMIC infrastructure projects in themselves are unlikely to result in regional industrialisation. They may spur land speculation and social conflict, channelling public investment and effort into real-estate and white elephant projects with little public value, while failing to provide basic infrastructure for local industries and population centres.

Public investment, land and resources are channelled into mega-infrastructure projects in India and globally. More research is required into which infrastructure investments are likely to have developmental and welfare benefits, the institutional and contextual factors that influence these outcomes, and the intended as well as unintended consequences of infrastructure megaprojects.

## RESEARCH DESIGN AND LITERATURE REVIEW

The academic literature on industrialisation and development (Kohli, 2004; Rodrik, 2004; Sinha, 2005) argues that state capacity – its power to enforce rules and policies, institutional design, professional and technical capabilities—influences how effectively states can realise economic developmental goals. The Sheffield/CEPT research study was designed to test the hypothesis, based on this literature, that differences in state capacity would likely influence the implementation and outcomes of the DMIC. The two states selected, Gujarat and Uttar Pradesh, are at opposite ends of various indices of state effectiveness across India.<sup>7</sup> In terms of economic and industrial policies, Gujarat is amongst the top

performers and Uttar Pradesh is at the lower end.

Media and academic attention thus far has focused on the DMIC's greenfield sites – futuristic-looking 'Smart Cities' yet to materialise,<sup>8</sup> whose potential contribution to core objectives of bolstering manufacturing output and jobs remains debatable (Sampat, 2016). The Sheffield/CEPT research focused instead on existing industrial areas notified as DMIC 'investment regions' in the two states, Gujarat and Uttar Pradesh. The selected sites each have specific locational advantages,<sup>9</sup> and incorporate existing manufacturing hubs and industrial clusters that could potentially benefit from the high-speed freight corridor and planned infrastructure improvements under the DMIC. Field research was undertaken over several months in each site between April-October 2017, and involved field observation and interviews with state officials at different levels, as well as consultants, formal and informal businesses, local leaders, farmers and residents, planners, and academics. The research team reviewed relevant policy and project documents, reports, available studies and data, and media accounts related to the project.

Why might regional differences in state policy and capacity influence the outcomes of a centralised infrastructure project like the DMIC? Policy discussions around projects like the DMIC, and infrastructure and development more broadly, in India, tend to focus on financing, design, models of execution, physical installation and operation of infrastructure facilities. In the US National Research Council's (1987) authoritative definition, however, infrastructure consists

not only of physical public works, "but also the operating procedures, management practices, and development policies that interact together with societal demand and the physical world to facilitate the transport of people and goods, provision of water for drinking and a variety of other uses, safe disposal of society's waste products, provision of energy where it is needed, and transmission of information within and between communities." Interactions between infrastructural systems, firms and households configure the role of infrastructure as a public good and generator of positive externalities with 'multiplier' effects on economic activity and investment.

While it is now commonplace that good infrastructure and transport connectivity is linked to economic development and manufacturing growth (World Bank, 1994), benefits vary significantly across regions. The literature is unclear about which sorts of infrastructure matters when, and where, to outcomes such as output, employment and productivity growth in developing regions (Estache and Garsous, 2012a ; Straub, 2011). Meta-studies examining the growth impact of infrastructure investment indicate that the weaker the institutions, the lower the payoff (Garsous, 2012). There is little evidence that physical infrastructure projects in themselves generate sustained growth or industrial modernisation (Lall and Rastogi, 2007; Estache and Garsous, 2012a). Differences in initial conditions—in terms of existing levels of industrial development and infrastructure stocks, human capital, institutional quality and the functioning of markets—influence the impact of public infrastructure investment. So too does the design, type and



spatial dimension of infrastructure; links between national infrastructure projects and local networks and services; and levels of access and connectivity for households and enterprises (Straub, 2011; Moreno and Lopez-Bazo, 2007). Infrastructure building and services offer potential for generating employment on a significant scale, directly as well as indirectly, but technological choices matter – labour-intensive technologies are likely to create many more jobs for low- and medium-skilled workers. Green technologies such as solar power are far more employment-intensive than coal and gas (Estache and Garsous, 2012b; ILO, 2011).

Mega-infrastructure projects are not merely technical interventions, but concrete instruments of state power and policy with far-reaching distributional implications – they re-allocate land and transform territories, direct investment patterns and shape economic choices and opportunities. While some studies show that infrastructure development helps alleviate poverty and inequality (Calderon and Severn, 2004), evidence from India suggests that it may be associated with increased household and regional inequalities (Bajar and Rajeev, 2016). Global studies show that megaprojects are risky, almost invariably overrun their budgets and timeframes, and that unproductive ‘white elephant’ projects are recurrent (Flyvberg, 2014). Many fail to realise their stated objectives, such as for example Malaysia’s Cyberjaya Technology Corridor<sup>10</sup> and China’s Dong-tan Eco City.<sup>11</sup>

Given the mixed evidence on the industrialisation impacts of infrastructure, and the sizeable risk of failure in megaprojects, it is important to understand the potential

implications of Development Corridor projects, and the factors that might determine their success. While the research project that informs this brief is relatively small-scale, it offers useful insights due to its comparative design and field-research component. More analyses are required to better assess the feasibility, design and potential impact of the DMIC’s components in different sites and regions.

### **THE DELHI-MUMBAI INDUSTRIAL CORRIDOR: A BRIEF PROFILE**

The proposed DMIC Development Corridor covers a 150-km wide stretch of territory on either side of the Indian Railways’ high-speed Western Freight Corridor. It begins near the town of Dadri in Uttar Pradesh, on the outskirts of Delhi, and ends in Mumbai’s new container port. The DMIC megaproject aims to leverage the freight line, connecting cities, towns, districts and regions within its ‘zone of influence’ to each other and to domestic and global markets. The project is based on the assumption that world-class infrastructure and connectivity will stimulate investment, create jobs in the millions, and foster industrial modernisation and planned urbanisation in India.

The DMIC is a complex, multi-sectoral project that spans not only a large territory, but three levels of government, the public sector, and private actors. National-scale and mega-infrastructure components – the dedicated freight railways, national highways and high-speed rail links, ports and airports—are typically national state-enterprises, while state governments are responsible for planning and delivering

regional and local infrastructures and land/urban development. As centralised, concerted projects of state intervention, Development Corridors like the DMIC are correctives to the small-scale, uncoordinated Special Economic Zones (SEZ) and unrealised public-private infrastructure projects that proliferated across India in previous decades, most of which were unsuccessful.

In contrast to China, India undertook little infrastructure investment in the post-liberalisation period (Lall and Rastogi, 2007). Infrastructure deficits have been linked to the country's metropolitan-centred, service-driven economy, which generated high rates of growth but little formal employment. Manufacturing expansion in India was arguably restricted by insufficient and poor quality infrastructure within and outside major urban centres, difficulties in acquiring land, and high transport costs.

To address problems on multiple fronts in a coordinated fashion, the DMIC provides a framework for the planned development of industrial 'mega-regions.'<sup>12</sup> Eight such 'investment regions' are planned in the ongoing first phase of the DMIC, in poorer agricultural states such as Madhya Pradesh as well more industrialised ones like Gujarat. Within these 'nodes', the DMIC supports infrastructure provision at the regional scale—transport, power, logistics, waste treatment, water; the integration of existing industrial clusters and population centres; and building new 'Smart cities', industrial zones and technology parks. DMIC nodes are centred on existing cities and manufacturing hubs as well as greenfield sites, aiming to distribute urban and industrial growth within and across regions.

## THE ROLE OF STATE GOVERNMENT CAPACITY

The DMIC is, notionally, a centralised, national-scale project. However, state governments are the key actors, responsible for designing, planning and implementing interventions within their territories, integrating and connecting cities and regions. Its implementation, therefore, is likely to be uneven across States and regions, dependent on the coordination and planning capacity of sub-national state institutions. These factors, combined with the wider landscape of State-level policies related to industry, land, education, regional and local governance, are likely to shape its developmental outcomes.

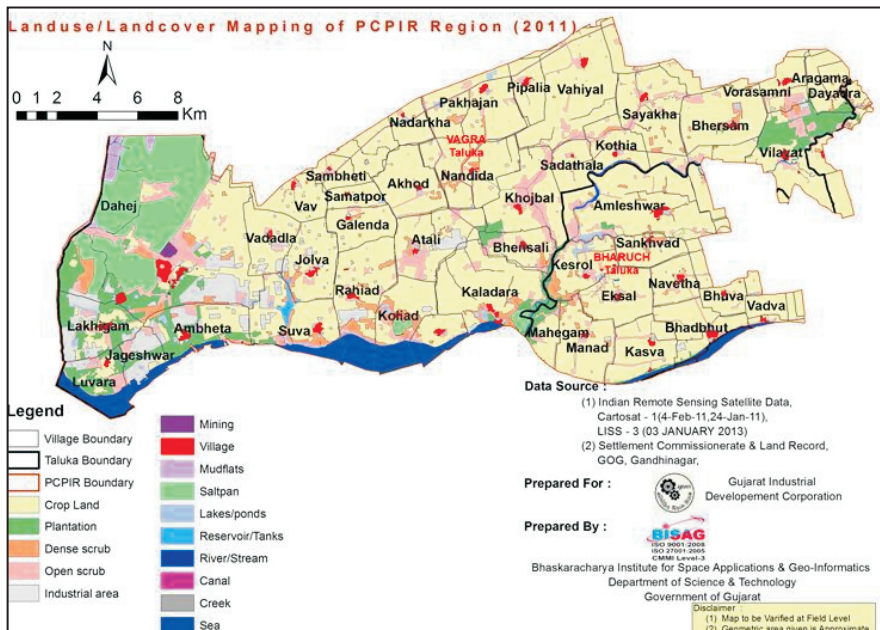
While the DMIC framework ensures some consistency and commonality in overall goals and modalities of financing, execution and management of component projects, State Governments conceive and plan projects and will be responsible for matching them to local and regional demands, requirements, skills and potential. They undertake regional coordination and administration, land acquisition and development, and provision trunk and local infrastructures, including transport, power, water and waste treatment, to new and existing industries and settlements within DMIC nodes. The DMIC itself – in terms of a centralised structure that coordinates central and state-level investment, projects and activities—has little institutional or material presence in either site. State, rather than Central government institutions, design and implement industrial policy as well as related development policies such as those for education and workforce development. These policies are as much likely

to influence investment, economic activity and employment outcomes as infrastructure.<sup>13</sup>

Given the central role that State governments play in shaping and implementing the DMIC, their goals, policies and capacity shapes the form the DMIC takes in each region and mediates its implementation and outcomes. For example, State capacity in Gujarat, an Indian variation

of the ‘East Asian’ development state known for its successful industrialisation (Sinha, 2005; Hirway and Shah, 2014), is significantly stronger than in Uttar Pradesh. Planning and delivering serviced land and infrastructure, furthermore, has been a central element of industrial policy in the ‘Gujarat model’ of industrialisation from the 1960s. Field research<sup>14</sup> discovered striking differences in the two DMIC investment regions under study:

Fig. 2: Bharuch-Dahej Petroleum, Chemicals and Petrochemicals Investment Region (PCPIR), Gujarat



Source: Patel, A., Singh, V., Kansara, B., Kalubarme, M. and Panchal, B. (2016) Monitoring Land Use and Infrastructure Changes in Industrial Complex Using Geo-Informatics Technology in Gujarat State, India. *International Journal of Geosciences*, 7

Figure 3: Dadri-Greater NOIDA- Ghaziabad Investment Region, Uttar Pradesh



Source: www.dmicdc.com



While it is too early to discuss the DMIC’s impacts, the study provides an opportunity to examine critical but understudied links between infrastructure, institutions and industrial modernisation on the ground. Equally

important is that it offers an opportunity to distil lessons for state planners and policymakers, to undertake course corrections and more effectively utilise public resources. (See Table 1 for the key field research findings.)

**Table 1: DMIC Sites in Gujarat and UP: Summary of Findings**

<b>PCPIR, GUJARAT</b>	<b>DADRI - GREATER NOIDA - GHAZIABAD, UP</b>
<i>Planned and Coordinated Regional Development and infrastructure modernisation</i>	<i>Uncoordinated projects, and spatially and economically polarised development patterns</i>
<p><b>Policy Coherence</b></p> <p>Consistency in State goals, laws and regulations, industrial and related policies, investment and spatial planning. Coherent institutional framework for state coordination.</p>	<p>Lack of coherence and consistency between stated development goals, policies, plans and state projects.</p>
<p><b>Infrastructure and Industrial Development Planning</b></p> <p>Effective, professionalised State Industrial Development Corporation, with successful record integrating infrastructure and industrial policy.</p> <p>Policies and mechanisms in place to connect and integrate existing industrial estates and manufacturing centres, develop new ones.</p>	<p>While some success in the past, UP State Industrial Development Agencies focus on land/ real-estate development without clear strategies for industrial/ manufacturing growth.</p> <p>Lack of coordination between Central and State DMIC projects. Gaps in planning and delivery of trunk and basic infrastructure and services in the region.</p>
<p><b>Regional and Local Coordination</b></p> <p>State capacity in district and local government and administration, including municipal governments and panchayats ensures better coordination and linkages with existing settlements.</p> <p>State better equipped to cater to urban expansion and in-situ urbanisation in rural areas. Municipal and planning authorities</p>	<p>Fragmented state institutions with limited capacity. While district increasingly urban/industrial, little change in capacity, function and services of state administration. Little connection between Freight Railway, various DMIC projects and surrounding settlements in region.</p> <p>Municipal and local governments lack</p>



<p>apply established and relatively effective system of urban and regional development planning.</p> <p>Established links between state and industry and business associations. Local businesses and farmers are organised and better placed to negotiate and make demands on state for infrastructure and services.<sup>15</sup></p>	<p>capacity. Panchayat bodies divested of power in 'notified' industrial/ investment regions.</p> <p>Informal urbanisation and manufacturing activity outside planned enclaves. Responsibility for governance, basic infrastructure and services is unclear.</p> <p>Limited organisation and associational activity amongst local businesses and farmers. Fewer institutional mechanisms for interaction with state.</p>
<p><b>Support for Local Industries and Jobs</b></p> <p>Industrial policies favour capital-intensive, mega-industries and large-scale investment. Availability of 'formal' jobs limited, particularly for less-educated local populations. Rules linking land subsidies to employment requirements scaled back.</p> <p>Large migrant share in professional and low-wage jobs in large industries.</p> <p>Policies and mechanisms in place to support more employment-intensive MSMEs. Land and infrastructure provision for MSMEs remains core function of State Industrial Development Corporation.</p> <p>Functional 'District Industries Commissions' provide capital investment subsidies and technical assistance to local industries/MSME and start-ups.</p>	<p>'Supply-side' rather than demand-responsive development planning. DMIC projects such as Bio-tech Parks geared towards high-skilled workers/ advanced services. Enclave developments and gulf between planned 'modern' cities and investment zones and existing settlements.</p> <p>Workforce largely unskilled and informally employed. Large migrant share in professional and low-wage manufacturing jobs.</p> <p>Existing manufacturing enterprises mostly MSMEs. Few working mechanisms to support and integrate existing industrial areas and manufacturing clusters, planned and unplanned.</p>

## POLICY RECOMMENDATIONS AND LESSONS FROM THE GUJARAT MODEL

The research shows that effective state policies and institutions are critical to realising the developmental objectives of complex infrastructure mega-projects such as the Delhi-Mumbai Industrial Corridor. The Gujarat case, for example, suggests that some of the fundamentals in infrastructure-led regional industrialisation are developing state

capacity at multiple levels, strengthening systems of internal coordination and planning, and strengthening linkages with industry associations, local enterprises and communities.

Compared to Gujarat, many states in India lack effective institutional systems for urban and regional development planning and delivering connecting and trunk infrastructure networks. As a result, the

multiplier effects of large-scale infrastructure investments are dampened, and access to basic public goods and services is likely to remain limited and unequal. State policymakers and planners should carefully consider the effects of various types of public infrastructure on manufacturing output, productivity and employment growth, as well as their locational and spatial dimensions and potential spillover effects, whether positive or negative.

Complex megaprojects like the DMIC require sophisticated systems for analysis, planning, management, and coordination within the state. The process for planning, development and justification of projects, particularly those involving public investment, should be made more transparent and clearly linked to economic and social objectives, and incorporate a robust and independent system for the analyses of the true costs and benefits. South Korea, for example, has an independent public body that conducts high-quality feasibility studies, and sponsors independent research and evaluation studies.<sup>16</sup> These aspects are neglected in the existing DMIC framework, and should be incorporated at both Central and State levels.

The focus in most states under the DMIC is on greenfield urban and industrial enclaves for hi-technology services and advanced manufacturing. In its current form, projects are replicated across states and investment regions, rather than matched to regional and local demands, skills and potential. There is a risk that the DMIC devolves into a collection of big-ticket physical infrastructure and real-estate projects with merely a tenuous relationship to goals of manufacturing development and jobs growth. The danger is


that rather than boosting employment-intensive manufacturing and broad-based regional industrialisation, these could further polarise formal and informal economic activities and spaces.

The promise of large-scale employment generation is a major driver of the DMIC. Infrastructure investment creates jobs both directly and indirectly, but the critical issue of jobs—particularly for low- and medium-skilled workers—is insufficiently addressed in DMIC project development and planning. The bias, in India, should be towards labour-intensive technologies, and the potential for job creation should be seriously analysed and weighed when evaluating projects. (Estache and Garsous, 2012b)<sup>17</sup> Labour-intensive technologies do not imply retrograde choices – solar power, biofuels, waste recycling and management are employment intensive and sustainable. In much of the corridor area, these are a better fit with local skills and resources, demands and constraints.

Given the well-documented risks associated with megaprojects like the DMIC (Flyvberg, 2014), other successful models of infrastructure-supported industrialisation should be considered within and outside the corridor. State industrial policies in Gujarat in the pre-liberalisation era were relatively successful in fostering industrialisation. In contrast to most other Indian states, Gujarat industrial policy in the 1960s–80s centred on provisioning serviced land and infrastructure for local manufacturing enterprises, particularly small and medium enterprises (SMEs).<sup>18</sup> Industrial estates and clusters were small, regionally distributed and mostly developed around towns and cities with an existing industrial base. The state provided good infrastructure, and built road networks

to improve connectivity. Local offices of the State industrial development agencies had links with industry associations and were responsive to local demands and requirements, but also monitored activities to ensure production. Older, pre-DMIC iterations of the ‘Gujarat model’ of industrial development planning offer a viable, cost-effective pathway for promoting employment-intensive, diversified and distributed manufacturing growth.

MSMEs form the backbone of the economy in much of India, and account for the bulk of

manufacturing employment in both DMIC sites in this analysis. Strong emphasis should be placed on developing regional and local basic infrastructure, road and communication networks and connectivity to support labour mobility, facilitate ‘backward and forward’ linkages for existing settlements, industrial clusters and enterprises and reduce their transaction and production costs. Effective policies and strategies to modernise existing small and medium enterprises, upgrade their infrastructure, technology and connectivity are lacking within the DMIC, and should be put in place. 

#### ABOUT THE AUTHOR

**Shahana Chattaraj** is a Visiting Fellow at the Centre for Policy Research, New Delhi. She holds a PhD in Public Affairs from Princeton University and a Master’s degree in urban planning and international development from MIT.

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## ENDNOTES

1. State of India Working Report 2018, Centre for Sustainable Employment, Azim Premji University
2. <http://dipp.nic.in/japan-plus/delhi-mumbai-industrial-corridor-dmic>
3. [http://dfccil.gov.in/dfccil\\_app/Home](http://dfccil.gov.in/dfccil_app/Home)
4. McKinsey Global Institute, 2012. The World at Work, <https://www.mckinsey.com/featured-insights/employment-and-growth/the-world-at-work>
5. This brief contains a summary of research findings/ analyses, along with lessons distilled from the research and policy recommendations. Detailed research articles and working papers are currently in preparation, and will be shared on request.
6. These include the National University of Singapore's Asia Competitiveness Institute (ACI), Ease of Doing Business rankings ( [https://www.worldscientific.com/doi/pdf/10.1142/9789813226852\\_fmatter](https://www.worldscientific.com/doi/pdf/10.1142/9789813226852_fmatter)), to the National Institute of Public Finance and Policy study of Governance Performance across Indian States.
7. <http://www.dmicdc.com/newsdetail.aspx?mpgid=40&pgidtrail=41&Eventsid=49>
8. Case selection is intended to focus on variations in State-level planning and coordination systems, rather than differences in initial levels of industrial and infrastructure development or geographic advantages.
9. <http://www.ideas.org.my/ideas-cautions-new-government-to-learn-lessons-from-cyberjaya/>
10. <https://www.chinadialogue.net/culture/7934-Why-eco-cities-fail/en>
11. The minimum area of DMIC 'Investment Regions' is 200 sqkm as per the DMIC planning framework. [www.dmicdc.com](http://www.dmicdc.com)
12. These policies are likely to be particularly important when 'world-class' infrastructure and facilities become more widely available in India as a result of DMIC-type projects.
13. There are conflicts over land acquisition and planning/zoning within the PCPIR region. Industrial pollution is a serious problem in the region, and the Gujarat state's record on environmental protection is lax. Social protection and welfare for workers is limited, and jobs in both MSMEs and large industries are informalised. These issues are outside the scope of this brief, but are discussed elsewhere (see Hirway and Mahadevia, 2004; Hirway and Shah, 2014)
14. <https://www.mckinsey.com/industries/capital-projects-and-infrastructure/our-insights/megaprojects-the-good-the-bad-and-the-better>
15. Not just numbers, but the quality of jobs matter, as do social protections and environmental sustainability, neglected in Gujarat's industrial model. These topics are outside the scope of this paper, but discussed in Hirway and Mahadevia, 2004.
16. State industrial policies shifted post-liberalisation to prioritise capital-intensive corporatised industrial development concentrated in 'growth corridors' and mega-investment regions (Hirway and Shah, 2014).



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