



INDIA'S FIRST COASTAL CORRIDOR VIZAG-CHENNAI INDUSTRIAL CORRIDOR Conceptual Development Plan

FINAL REPORT

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Executive Summary

Introduction

India's economy has expanded at a healthy pace over the past two decades. It is now time to consolidate the gains and tackle the remaining barriers to growth, generate more jobs, raise productivity, and expand economic opportunities for all. While the services sector has anchored India's recent growth, the manufacturing sector must be the engine of future growth and job creation.

The government's "Make in India" initiative is a growth strategy based upon development of economic corridors whereby policy initiatives to spur manufacturing and overall growth are coordinated with transport corridors linking both developed and backward regions. The vision is to create a globally competitive manufacturing sector supported by world class infrastructure, logistics facilities, and a liberal policy regime.

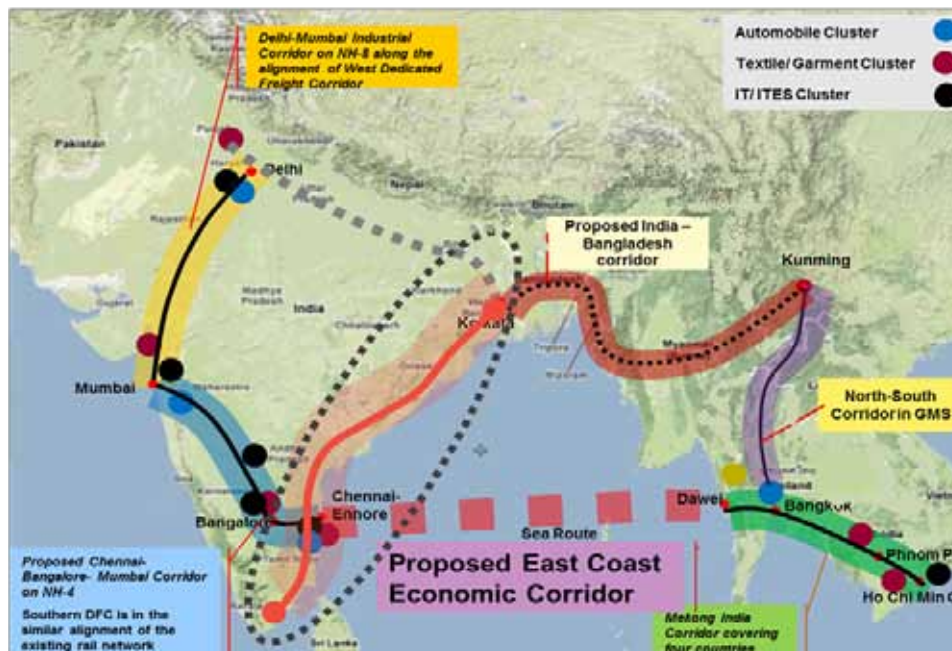
Industrial development is to be built around a set of industries that either exist in the country and account for a growing proportion of national and global economic activities, or represent frontier industries or niche sub-sectors that are expanding but have not yet established a foothold in India. Their development is to be accelerated through the creation of economic zones and manufacturing clusters served by efficient logistics services. The development of these zones and clusters requires the acquisition of land that is of sufficient scale and well-connected to sources of labor and other local inputs. This requires effective zone management to attract enterprises and support their growth, and a regulatory regime that facilitates the establishment of enterprises; allows uninterrupted operations; and facilitates the development of integrated national supply chains—including embedding micro, small, and medium-sized enterprises (MSMEs) and linking them with global production networks for the delivery of inputs and distribution of outputs in domestic and global markets.

Vizag–Chennai Industrial Corridor

The Vizag–Chennai Industrial Corridor (VCIC) is a key part of the planned East Coast Economic Corridor, India's first coastal corridor (see Figure E1).¹ VCIC is aligned with the Golden Quadrilateral and is poised to play a critical role in driving India's new "Act East Policy."

¹ This report excludes the areas that overlap with the Chennai–Bengaluru Industrial Corridor (CBIC). As a result, the discussion is largely focused on the newly created state of Andhra Pradesh.

Figure E1: East Coast Economic Corridor: India's First Coastal Corridor



Source: Study team compilation.

India's "Act East Policy," as recently outlined by Prime Minister Narendra Modi, is a proactive initiative focused on increasing the integration of the Indian economy with the economies of the Association of Southeast Asian Nations (ASEAN). The Act East Policy is based upon the establishment of programs and projects, with defined timelines for the achievement of milestones, that support this integration.

In the traditional framework, an economic corridor has three complementary components: (i) a trade and transport corridor, (ii) production clusters producing goods for both consumption in the surrounding region and for global trade, and (iii) urban centers along the corridor. VCIC's long coastline and strategically located ports provide it with an opportunity to create multiple international gateways to connect India with the vibrant global production networks of Southeast and East Asia that form the bedrock of global manufacturing today. The ports are critical to unlocking the potential of VCIC and should be seen as a source of value-added to domestic and global supply chains.

At the heart of VCIC is a transport corridor that extends north-south over 800 kilometers along the coast connecting a set of economic nodes where industries will be located. The corridor includes National Highway 5, which is part of the Golden Quadrilateral, the Kolkata-Chennai rail route, and seven non-captive operational² ports.

² Kakinada Anchorage Port and Kakinada Deep Water Port are considered as a single port.

While economic growth in Andhra Pradesh has matched the national growth rate over the last decade, the recent division of the state poses significant challenges to growth because it excludes industrial activity (including information technology activities) around Hyderabad. However, the development of the metallurgical, pharmaceutical and petrochemical industries in the north and the continued expansion of industrial activity in the food processing sector and, the industrial development within Sri City in the south will contribute to Andhra Pradesh's industrial base, while growth in traffic through the seaports and increasing power generation capacity will facilitate further economic development. Growth will be buttressed by domestic investment in existing industries and foreign direct investment (FDI) in existing and new industrial activities. Regulatory reforms and institutional changes that (i) improve the investment climate under which firms start and operate their businesses, (ii) enable goods and services to move seamlessly within and beyond the corridor, and (iii) allow for more synchronized industrial and urban planning in and around industrial clusters and zones will result in rising levels of domestic investment and FDI. At the same time, the impacts of domestic investment and FDI will be amplified by the development of the VCIC's major ports and industrial clusters.

Sector- and Node-Based Development

The following sectors and sub-sectors were identified as drivers of industrial development: (i) food processing, (ii) pharmaceuticals, (iii) auto and auto components, (iv) textiles, (v) metallurgy, (vi) chemicals and petrochemicals, and (vii) electronics. Small and medium-sized enterprise (SME) development will also be a key priority within the corridor, with an emphasis on developing supply chains to integrate SMEs. By clustering producers and suppliers in the same location, their regular interactions will be strengthened and domestic suppliers can observe the business models and practices used by global firms and suppliers.

Four geographic nodes will drive the growth of these industries, supported by a network of multi-modal transport to demand centers, urban clusters, and international gateways. These four nodes were selected based on the following criteria: (i) current level of industrial agglomeration, (ii) availability of land for development of new industrial clusters, (iii) proximity to urban centers and seaports, (iv) rail and road connectivity, and (v) availability of power and water. The industries in the sectors and sub-sectors identified above will be located in these four identified nodes and connected through a multimodal transport network to demand centers, urban clusters, and international gateways.

The northern node is centered around Visakhapatnam and is in close proximity to the ports of Visakhapatnam and Gangavaram, and the industrial activities in the immediate hinterland of these ports. The southern node is close to the urban centers of Tirupati and Nellore, the port cluster from north of Chennai to Krishnapatnam, and the industrial zones in their immediate hinterland, most notably Sri City. The two nodes in the central region are primarily green field. One extends from Gannavaram to Kankipadu, with Vijaywada as the major urban cluster. It serves the surrounding industrial clusters and will be served in the future by the port of Machilipatnam. The other node is around the port of Kakinada and the urban centers of Kakinada and Rahjamundry.

The node-based industrialization strategy proposed for VCIC is targeted to achieve regional and global competitiveness. Infrastructure development and urbanization are critical to attain this core objective. While there are pockets of major urban and industrial clusters in the north and south of Andhra Pradesh, the rest of the state, including the two nodes in the central region, faces a challenge. This challenge can be overcome by putting in a place a synchronized infrastructure and urbanization strategy.

The study recommends a two-fold approach: (i) a plan to upgrade and strengthen the spinal routes (north-south alignment) along the corridor to enable connectivity between industries and ports, and strengthen the grid network from the gateways and the nodes to the hinterland; and (ii) a policy of node-centric infrastructure development. Access to and the cost of power and water are other important elements of any strategy to augment VCIC's capacity to support value-added manufacturing.

Industrial development inevitably promotes urbanization, and a certain level of urbanization is necessary to support industrialization. Therefore, a strategy of proactive urbanization is proposed as well as a more pragmatic approach to land assembly for industrial development and regional infrastructure and urban development.

Policy and Regulatory Reforms

The action plan for any successful economic corridor hinges on three elements: (i) infrastructure, (ii) institutions and regulations supporting the ease of doing business, and (iii) planning and management of clusters. Investment in infrastructure is important and can be managed through innovative public-private partnerships. However, the development of institutional capacities and facilitation of trade remain among the greatest challenges.

Two types of regulatory issues need to be addressed to facilitate industrial development in the corridor (i) regulatory issues specific to VCIC that improve the investment climate and facilitate the establishment of enterprises, such as a Single Window system for start-up related approvals and the ongoing operations of existing firms; and (ii) regulatory issues involving more than one state, such as the transit of goods across state borders or through ports. Therefore, trade facilitation and implementation of the Single Window system are critical to reducing the cost of doing business and integrating into global value chains.

To achieve the first objective, each state in the corridor has to undertake critical policy, institutional, and process reforms associated with regulatory compliance. The study team has worked with the Government of Andhra Pradesh to reform and streamline the Single Window system. Under the proposed framework, approvals for setting up new enterprises³ can be obtained within 15 days for green industries and between 45 days and 60 days for other types of industries.

For inter-state issues, the appropriate institutional framework needs to be adopted to harmonize regulatory standards and compliance processes. The National Industrial Corridor

³ For all categories, the time frame is achievable if units have the land and does not require surface water.

Development Authority proposed by the Department of Industrial Policy and Promotion is envisaged to play a key role in facilitating the institutional mechanisms for addressing these regulatory issues along with ensuring corridor development.

The other critical element involves the planning and management of industrial clusters. Industrial development has evolved from building industrial estates to creating and servicing large-scale economic zones housing single or multi-product clusters. Global investors expect high levels of quality in the planning, design, construction, and management of these developments.

The two emerging models of planning and governance are that of private-sector-led Sri City in Andhra Pradesh, and the Special Investment Region format in Gujarat where a Regional Development Authority has been created and empowered to undertake planning and development, including the use of land pooling. These models need to be complemented by a comprehensive governance framework that supports the management and planning of zones and clusters in VCIC. The challenge is to consolidate the fragmented governance mandates of the federal, state, city, and rural authorities under one zonal or cluster management entity that allows business to operate seamlessly and efficiently. The Government of Andhra Pradesh's Industrial Local Area Authority and the amendments providing Local Authority status to the Andhra Pradesh Industrial Investment Corporation (APIIC) offer a framework that can be further improved upon. The goal is to provide for flexibility in engaging government and private entities to perform specific roles in the planning, development, and management of zones and clusters through the delegation of powers or contractual arrangements as needed.

Conclusion

To summarize, this study identifies the nodes to be taken up for industrial development; industries for future development, including MSMEs; an infrastructure strategy; and a set of priority projects, particularly last-mile connectivity projects, to unlock the near-term potential of the corridor. The study also recommends a set of policies to streamline the regulatory process for setting up and operating businesses efficiently.

The next phase of the study will involve preparation of a comprehensive Regional Perspective Plan, econometric modelling and demand surveys for infrastructure requirements, locational and global benchmarking analysis for selected industries, and the design of policy interventions to improve the regulatory environment in VCIC. Simultaneously, a Master Plan and a Development Plan for selected nodes along the corridor will be prepared.

Introduction

India has undergone rapid structural transformation and achieved strong growth in the past two decades. To preserve these hard-won gains and remove the remaining barriers to growth, it has to continue creating economic opportunities. India also has to broaden access to these opportunities. Indeed, with the proportion of India's workforce that depends on agriculture declining, and given the large numbers of new entrants into its labor force—estimated to be around 12 million per year—one of the most pressing policy challenges is to create more productive and well-paying jobs. Such jobs are vital not only for sustaining high growth, but also for ensuring that growth is inclusive.

While India's services sector has anchored both economic growth and job creation in recent decades, it is now time for India's manufacturing sector to be an engine of growth and jobs. In many ways, India's manufacturing sector has been and continues to be well-poised to play this role. India has an abundant labor supply, especially semi-skilled labor, and has developed the capabilities required for a diversified and dynamic manufacturing sector. This may be seen not only in terms of the sheer range of manufactured products produced in the country, but also in terms of India's manufacturing export basket, which includes relatively sophisticated chemical, pharmaceutical, and auto component products.

Unfortunately, for many years now the manufacturing sector has contributed only around 15% of gross domestic product (GDP) and 12% of employment. By comparison, the manufacturing sectors of the People's Republic of China (PRC), Malaysia, Thailand, and Viet Nam account for nearly 25% or more of GDP. In addition, while manufacturing's employment shares in some of these countries are not too different from India's—for example, a little above 15% in the case of Thailand—the large majority of Indian manufacturing employment is concentrated in small-sized, informal sector enterprises where low productivity, earnings, and wages are the norm.

Recognizing the importance of a more dynamic manufacturing sector, the Government of India has unveiled the National Manufacturing Policy (NMP), which calls for boosting the share of manufacturing to 25% of GDP and employing around 100 million workers (from around 50 million today) by 2022. To achieve these targets, the NMP is spearheading rationalization and simplification of business regulations, including the use of a Single Window clearance mechanism; an “exit policy” that aims to balance firms' needs for adjusting employment levels in response to market conditions with workers' needs for income security; financial and institutional mechanisms for technology development, especially for small and medium-sized enterprises; large-scale infrastructure development; and clustering by means of setting up National Investment and Manufacturing Zones.

A unique opportunity to achieve the goals of the NMP exists via a second initiative of the government: the promotion of economic and industrial corridors. These corridors have the potential to kick start the country's manufacturing sector and provide employment to millions entering the workforce, contributing significantly to the aims of NMP.

Indeed, economic corridors present a unique opportunity for implementing the NMP and ensuring that India's manufacturing sector performs at or close to its potential.

The government's "Make in India" initiative also identifies economic corridors as policy instruments to spur manufacturing and overall economic growth. There are five major economic corridors at various stages of planning and implementation. The oldest and most advanced is the Delhi–Mumbai Industrial Corridor (DMICDC). Others include the Chennai–Bengaluru Industrial Corridor (CBIC); Bengaluru–Mumbai Economic Corridor (BMEC); Amritsar–Kolkata Industrial Corridor (AKIC); and the East Coast Economic Corridor (ECEC), India's first coastal corridor. The Vizag–Chennai Industrial Corridor (VCIC) comprises the first phase of ECEC.

While there are various definitions of an economic corridor, it essentially involves the creation of an efficient multimodal transport network within a defined geography and supported by quality infrastructure; logistics; a policy framework that facilitates doing business (e.g., trade facilitation); and distribution networks that link production centers, urban clusters, and international gateways. Once created, these corridors facilitate growth by easing infrastructure bottlenecks, improving access to markets, stimulating trade and investment, and boosting productivity and efficiency through associated network externalities and agglomeration effects.

Economic corridors promote inclusive growth by expanding economic opportunities in backward regions and providing forward linkages with urban centers and industrial clusters. Strategically located national economic corridors can also boost regional cooperation and linkages with global markets through increased investment and trade by encouraging production fragmentation and linking domestic producers with global production networks.

The East Coast Economic Corridor

The project influence area of ECEC has several centers of economic activity, covering not only the resource-rich, but also the poorest, regions of Andhra Pradesh, Odisha, Tamil Nadu, and West Bengal. Nearly 48.5 million of India's poor live in the four core states along this corridor. Poverty levels vary among the four states that comprise VCIC. In 2012, Andhra Pradesh and Tamil Nadu had poverty levels of 9.2% and 11.3%, respectively, while in Odisha and West Bengal these ratios were 32.6% and 20.0%, respectively.¹ Meanwhile, industrial output and net value-added is most concentrated in Tamil Nadu, which accounts for more than 10% of total Indian industrial output and value-added.²

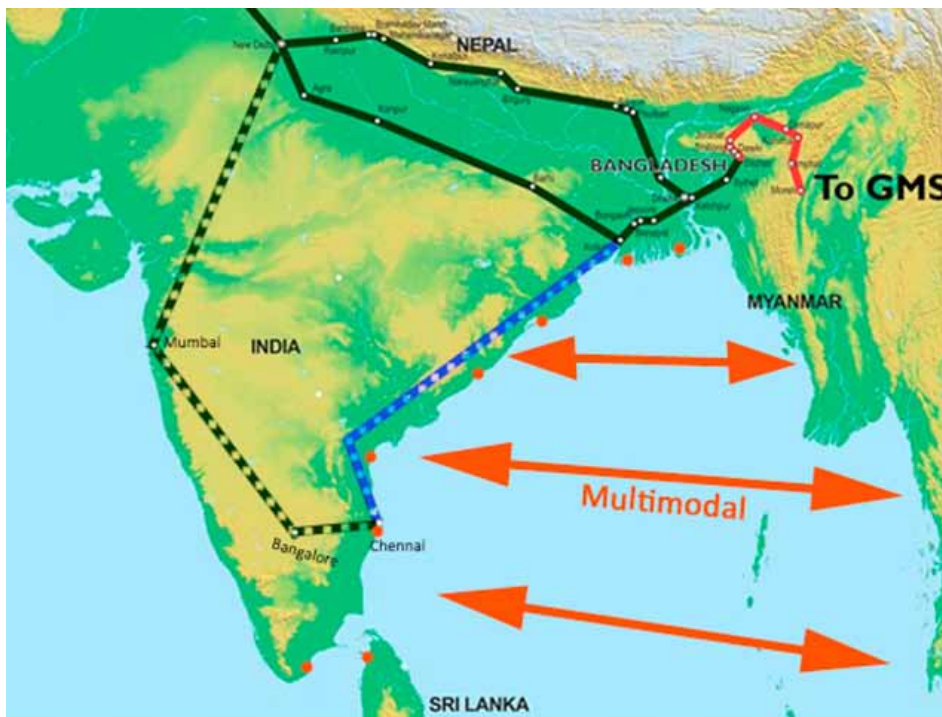
¹ Reserve Bank of India. 2013. *Annual Report 2012*. New Delhi.

² Ministry of Statistics and Program Implementation. 2013. *Annual Survey of Industries 2010–2011*. New Delhi.

Linking the lagging regions with the growing and well-established industrial clusters in Andhra Pradesh and Tamil Nadu will help create job opportunities for the poor. The two states have industrial clusters comprising automobiles, chemicals and petrochemicals, and food processing. Some of these clusters in Tamil Nadu—such as automobiles, automobile components, and niche electronic components—are already linked with the production networks of East Asia. In order to stimulate economic activities in other emerging clusters and distribute growth within the region, efficient multi-modal transport—supported by necessary infrastructure services, efficient logistics, distribution networks, and an institutional framework—is necessary.

The presence of a strong information and communication technology (ICT) industry in Kolkata, Visakhapatnam, Hyderabad, and Chennai can lend support to ECEC's communications network; provide a platform for skills development in other related service sectors; and facilitate implementation of e-governance systems for maintenance, monitoring, and evaluation of corridor development activities.

Figure A: Multi-Modal links between ECEC's Gateway Ports and ASEAN Production Networks



ASEAN = Association of Southeast Asian Nations, ECEC = East Coast Economic Corridor
Source: ADB.

ECEC will be the nation's first coastal corridor. It stands out in comparison with other proposed national corridors as it hosts several ports along the east coast that serve not only as international gateways, but more importantly as critical links in supply chains (Figure A). In the latter role, ports are a source of value creation for firms that provide services—ranging from logistics to packaging—to production clusters and distribution centers, and play a significant role in economic development.

While there have been no previous efforts to develop a coastal economic corridor, there are examples of the development of a coastline in support of economic growth and development. These can be divided between examples in which (i) a number of ports were developed along the coastline with each one serving a separate hinterland, but with some overlap allowing for inter-port competition; and (ii) industrial and commercial activity was developed along a coastline between ports.

A good example of the formation of a gateway region is the Rhine–Scheldt Delta in Western Europe, one of the largest logistics clusters with capacity for large cargo consolidation. The ports in the delta make a direct contribution of around 8% of GDP in Belgium and Netherland, in addition to indirect contributions and job creation. The other oft-cited example is the phased development of special economic zones around ports in the PRC since 1980, and their subsequent transformation into economic clusters that paved the way for creation of the world's most important manufacturing cluster in the Pearl River Delta.

The major ports on the east coast of India are Kolkata, Haldia, Paradip, Visakhapatnam, Ennore, and Chennai. These are supported by private ports in Kattupalli, Krishnapatnam, Dhamra, Gangavaram, and Karaikal. Three port clusters are emerging: (i) upper east coast, comprising Kolkata, Haldia, Dhamra, and the proposed Sagar port; (ii) central east coast, comprising Visakhapatnam, Gangavaram, and Kakinada; (iii) lower east coast, comprising Chennai, Tuticorin, Krishnapatnam, Kattupalli, and the planned port at Durgarajpatnam.

The Vizag–Chennai Industrial Corridor

VCIC is a part of ECEC and aligned with the Golden Quadrilateral and therefore poised to play a critical role in India's "Act East Policy". Its long coastline and strategically located ports are expected to help India connect with dynamic Southeast and East Asia, particularly their vibrant global production networks that form the bedrock of global manufacturing today. VCIC is positioned as India's first industrial corridor.

The corridor between Vizag and Chennai will have an influence area across Andhra Pradesh and Tamil Nadu, and already makes a significant contribution to India's GDP and total manufacturing output. The strategy to develop VCIC is part of the plan to achieve accelerated development and regional industry agglomeration in the focus states. Regional industry agglomeration could be achieved by attracting companies in the value chain of other companies already based in the corridor, attracting particular industries that the corridor provides with geographical advantages, or building and maintaining advanced infrastructure to support industries. The advantages to industries operating along the corridor include benefits arising from smooth access to industrial production units, decreased transportation and logistics costs, improved delivery time, and a reduction in inventory costs.

VCIC is thus intended to facilitate development of a well-planned and efficient industrial base served by world-class connectivity infrastructure. The availability of world-class infrastructure along the corridor will bring increased private investment in manufacturing and industrial activity in the two states. Attracting more private companies, particularly second- and third-tier manufacturing companies, will strengthen the global competitiveness of local manufacturers, thus promoting regional development. As VCIC overlaps with the Chennai–Bengaluru Industrial Corridor (CBIC), the report will not examine the areas that are taken up under CBIC.

Additionally, by investing in improved connectivity between the corridor and backward regions in the hinterlands, VCIC will promote inclusive growth well beyond its immediate vicinity. When combined with efforts to integrate micro, small, and medium-sized enterprises (MSMEs) in sectors such as textiles and food processing into modern supply chains, increased connectivity between VCIC and backward regions will expand economic opportunities by providing MSMEs with forward linkages to vibrant urban centers and industrial clusters.

The Framework for India's First Coastal Corridor

The goal of ECEC is to create a more competitive environment for the development of trade and industry in the states along the corridor in order to boost production, create decent jobs, and to reap the benefits of India's population dividend.

In the traditional framework, an economic corridor has three complementary components: (i) a trade and transport corridor (discussed above), (ii) production clusters producing goods for both consumption in the surrounding region and for international trade, and (iii) urban centers. The latter are not only major markets for goods from the production centers and imported through the international gateways, but also a source of labor, technology, knowledge, and innovation (Figure B).

Since the basic infrastructure is available, most of the challenge in developing this corridor is how to facilitate production activities, trade, and transport between clusters of production and consumption, and increase value-added contributions to domestic and international supply chains.

VCIC should be conceived as a market and service area for the principal economic clusters in the corridor. Each cluster comprises an urban center, a port, and one or more production enclaves, each contributing to the activities of the others (Figure C). The physical separation between these three components varies. In some cases they overlap within a metropolitan area, and in others they are physically separate but connected by trunk roads and railway lines.

In order to facilitate the economic development of these clusters, it is important to strengthen the linkages between the port, the urban center, and the production enclave. This includes not only the physical infrastructure connecting them, but also the supply chains used to exchange goods and services, and the information flows needed to coordinate and expedite transactions. Since each component has a separate governance structure, a mechanism for collaboration is required not only to improve the physical infrastructure that connects

Figure B: **Three Components of an Economic Corridor**

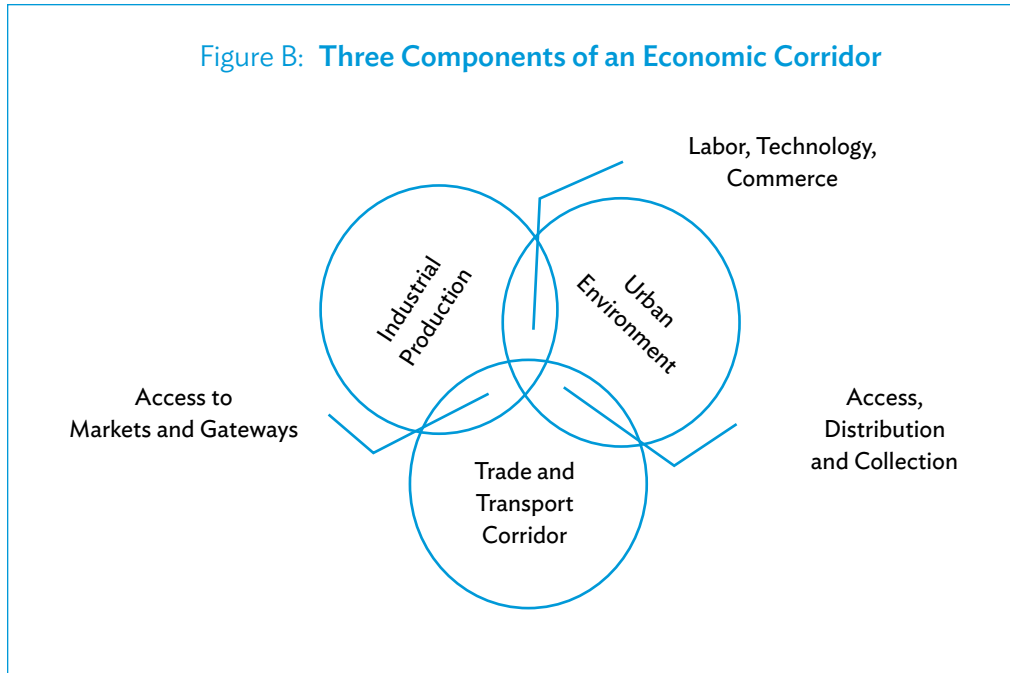
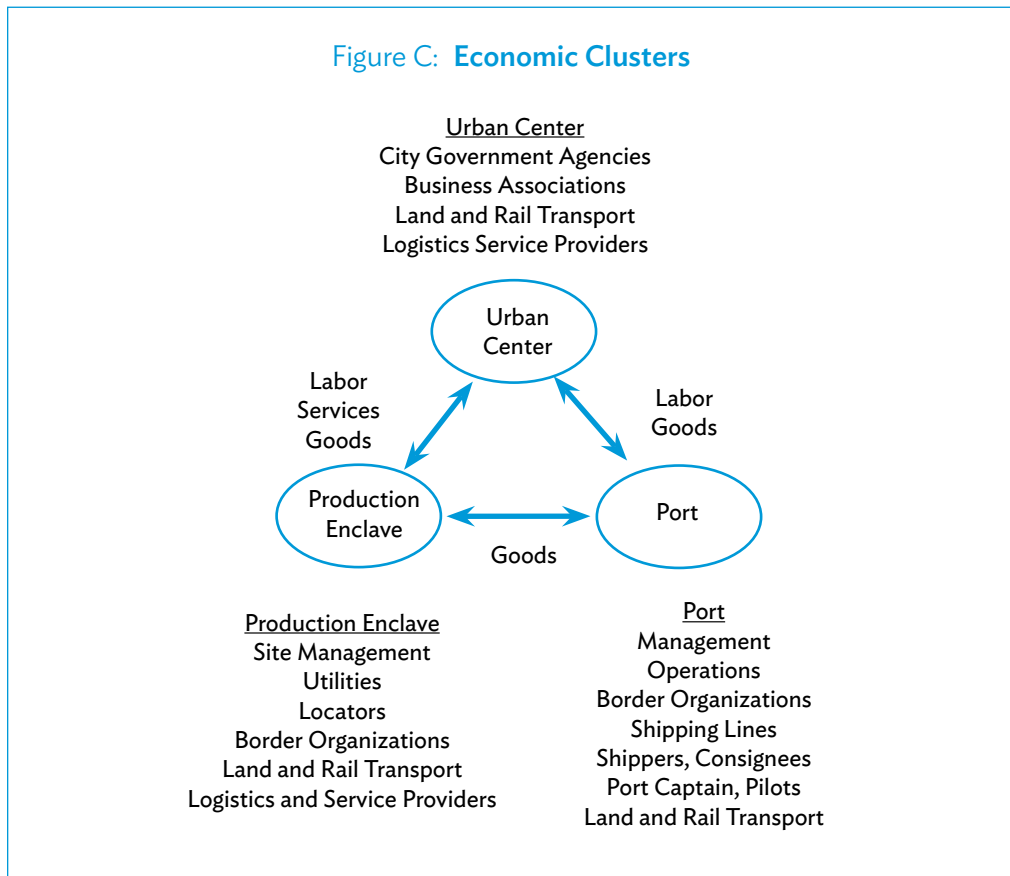


Figure C: **Economic Clusters**



them, but also to integrate the activities in the supply chains that link them and expand the information flows between them.

(i) **Strengthening Linkages**

Linkages can be strengthened through the establishment of

- inland container depots near the urban center and/or production enclave that are connected to the port by rail;
- distribution centers for goods imported to and exported from the immediate hinterlands;
- information systems for facilitating transactions associated with moving goods through a port and monitoring the status or shipments;
- zone management systems to facilitate the establishment of businesses, provide information on procedures related to business operations, and deliver services to these businesses;
- e-governance platforms providing similar services; and
- port community organizations for improving coordination between border agencies, port authorities, shippers, shipping lines, and logistics service providers.

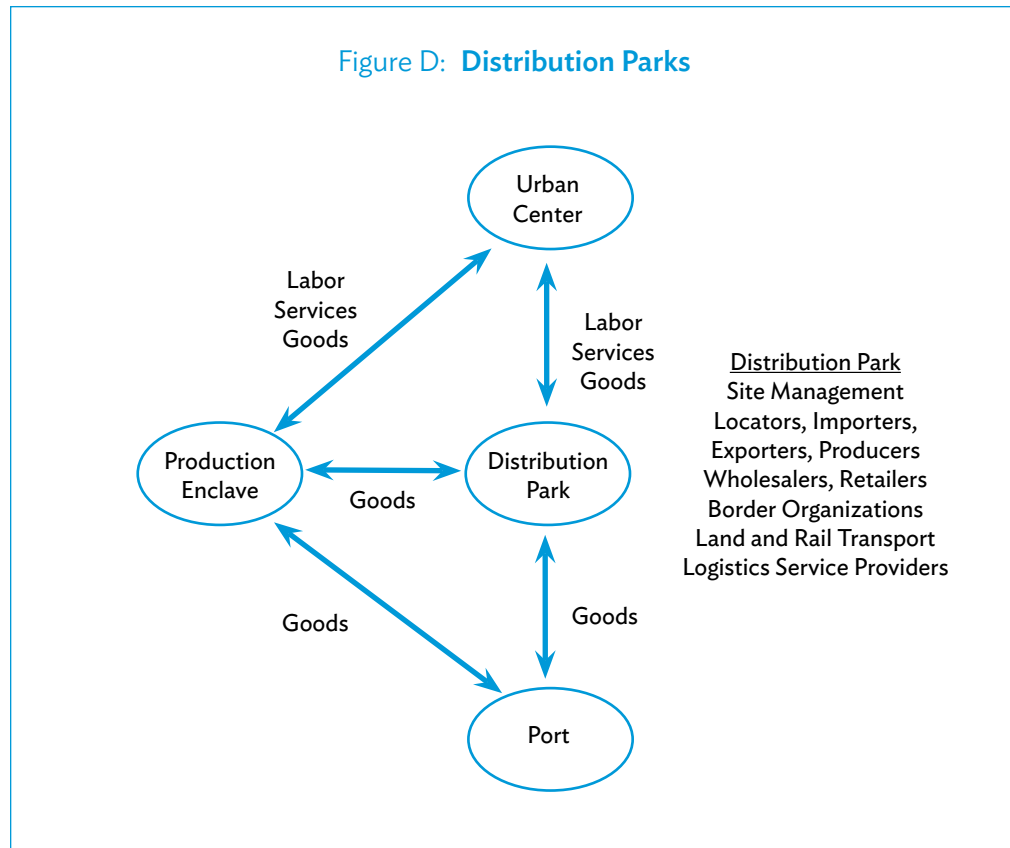
So far, the focus has been on the linkages connecting the three components in an economic cluster. In addition, there are linkages that connect the different economic clusters in the VCIC, allowing them to share services and access each other's markets. As a result, they can specialize and achieve economies of scale by obtaining goods and services from suppliers throughout the corridor and delivering their outputs to other clusters. This would be in addition to the international trade in goods through the port (and airport) in each cluster.

(ii) **Improving Distribution**

International trade is primarily east–west in orientation, in contrast to the north–south axis of VCIC. Goods from both Europe and East and Southeast Asia are delivered to VCIC ports primarily through feeder services from Singapore and Colombo. The goods, a majority of which are containerized, are then distributed throughout the port's adjacent hinterlands. Some containers are delivered direct to the consignee while others are delivered to storage facilities where they are de-stuffed and their contents subsequently distributed.

Globally, the efficiency of distribution networks has improved dramatically with the introduction of modern logistics, the primary component of which has been the distribution center. These have replaced the traditional *godowns* (warehouse) with larger warehouses that provide automated inventory management systems, including vendor-managed inventory, and efficient cargo transfer capabilities, including cross-docking. Distribution centers are typically located near one of three places: the point of production, the final market, or a modal interchange. For the typical cluster, they would be within the production enclave at the periphery of the urban center or in the area behind the port.

While many factories produce against fixed orders and do not hold stock, most producers of consumer goods, especially fast-moving consumer goods, stock an inventory that is



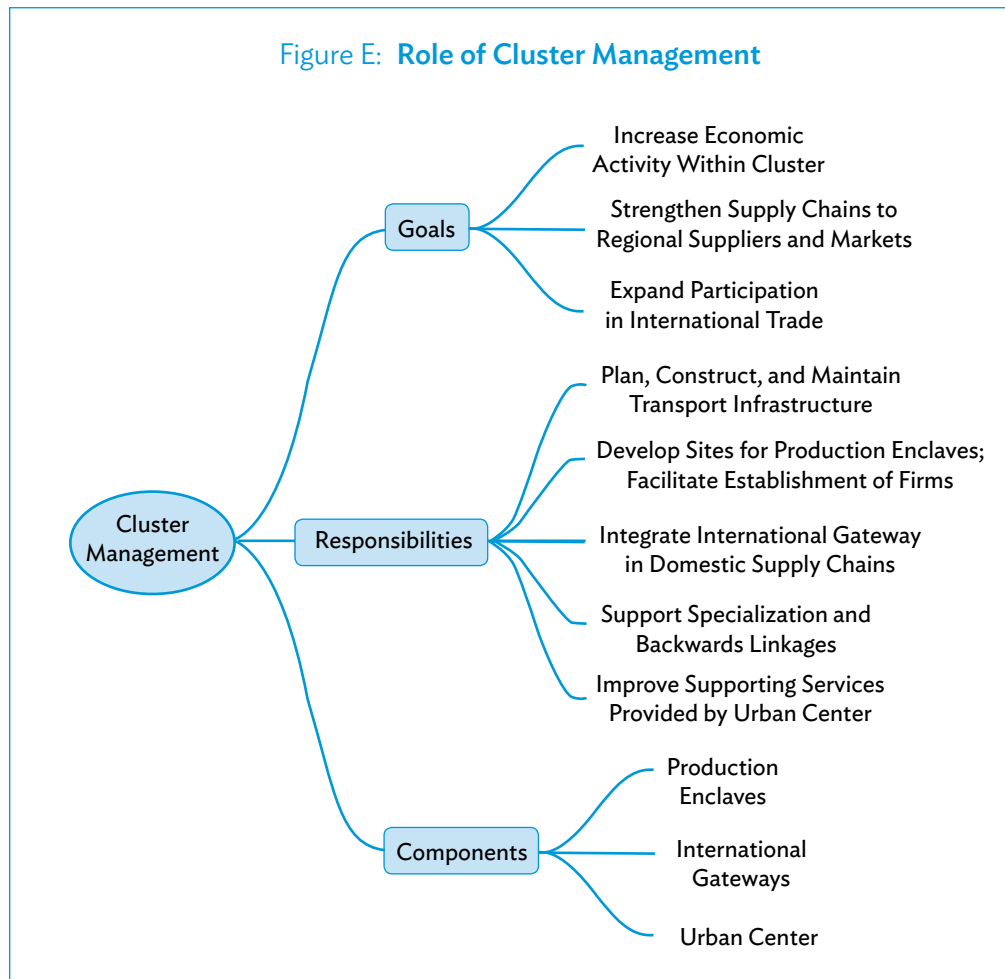
maintained near the factory or final market. Distributors and large retailers place orders for restocking inventory. This inventory is located at a site that can receive large shipments from suppliers, which can be delivered via smaller shipments to various buyers and stores.

Urban ports have played a limited role in distribution because of their limited backup area, although some regional *entrepôt* (e.g., Singapore and Rotterdam) developed distriparks near their ports specifically for this purpose. Newer ports, most notably those in the Middle East, have been designed to include large areas for warehousing and distribution activities.

Large distribution centers are usually located far from urban centers, while smaller warehouses are established on the periphery. In order to better serve growing demand in urban markets, distribution parks have been established on the periphery of urban centers at a reasonable cost and with good access to trunk roads and the urban road network. While production enclaves have been developed with separate areas for logistics services, most distribution centers are extensions of production facilities (Figure D).

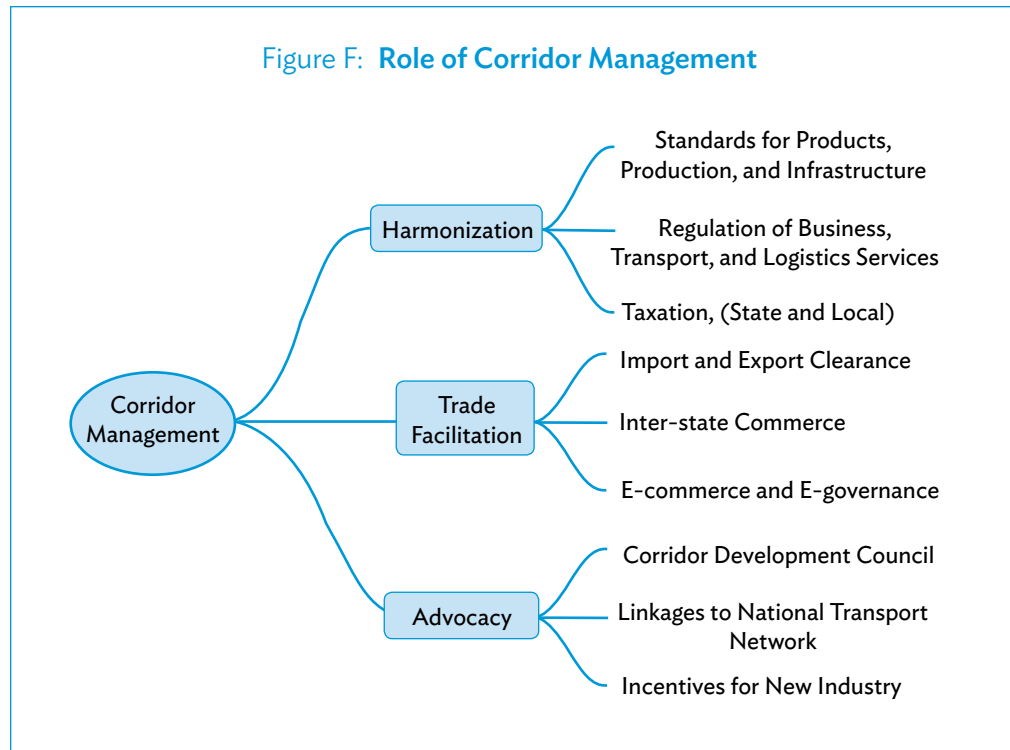
Development of VCIC

The development of VCIC into an integrated market with efficient supply chains connecting regional suppliers, producers, and markets begins with strengthening the economic clusters



(Figure E). The current trunk roads and rail network are sufficient to support this development, however, capacity will have to be increased as economic activity grows. More important, the linkages between cluster components need to be strengthened to allow reliable delivery of goods and services. The gateway seaports need to improve their container handling facilities. The flow of goods through ports needs to be more efficient and better integrated. A port should function not as an impediment to trade but rather as a part of the supply chains serving international trade.

Activity in the production enclaves needs to be increased. This may involve the expansion of industrial zones, the simplification of regulations related to doing business, and improvements in supporting services provided by the management of these zones. The urban center supports production activities in a variety of ways, for example, by providing housing, education, and other services for the persons working in the industrial enclaves. It also supports the delivery of goods produced through the development of urban freight distribution networks.



Collaboration at the regional level is required to address a number of challenges facing VCIC, including the need for harmonization, trade facilitation, and advocacy (Figure F). Harmonization and trade facilitation are needed to improve access for primary economic clusters to markets throughout the corridor. Trade facilitation applies to both international and inter-state trade. Advocacy involves attracting new industry to the region and ensuring that each cluster has a reasonable level of access to the national transport network.

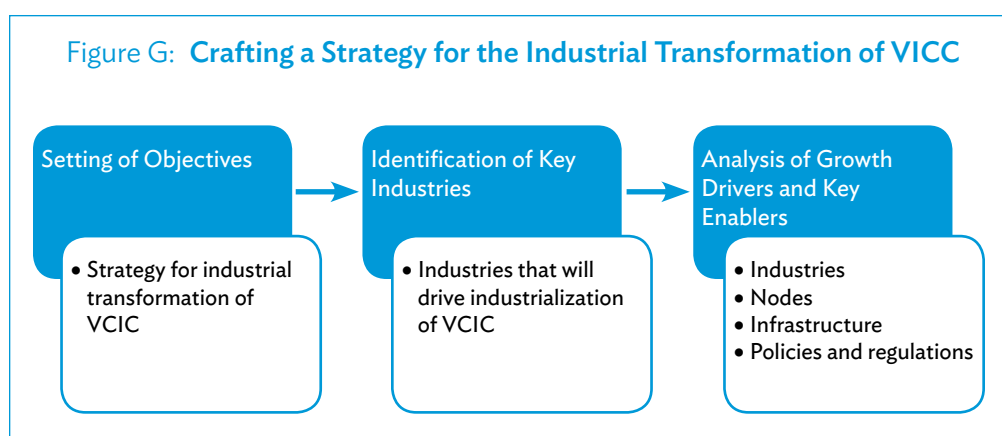
A uniform set of standards is necessary to minimize reputational risk from substandard products, while avoiding competition based on the level of regulation. This is especially important for the food processing and pharmaceutical industries. Harmonization of business regulations and logistics services should be combined with simplification of these regulations in order to encourage competition. Harmonization of taxes is a continuing problem because of the diversity of state and local tax rates. These affect not only the location of businesses, but also the structure of the supply chains, and lead to inefficiencies.

The need for collaboration among various government entities within a corridor can be addressed through the formation of a development council. The council can attract new industry to the corridor by providing incentives at both the regional and local level. It can also solicit support for the development of linkages between the economic clusters and the national transport network.

Study Approach and Summary of Findings

The overall objective of this exercise is to craft a strategy for industrial transformation of the Vizag–Chennai Industrial Corridor (VCIC). The approach employed was to first identify the industries that will drive growth in VCIC and the nodes in which they will be strategically located, taking into account land availability. Of course, another key driver is infrastructure. As VCIC is a coastal corridor, ports play a significant role in the infrastructure strategy, as well as other industrialization enablers such as power and water supply. While their availability is a necessary condition for building a corridor, other critical elements include institutional frameworks, policies, and regulations that create a favorable investment climate, and the ease of doing business for investors, both domestic and foreign (Figure G).

In this section, we briefly summarize the study’s approach and conclusions with respect to the (i) selection of industries, (ii) selection of economic nodes, (iii) infrastructure strategy, and (iv) policies and regulations that improve the ease of doing business.



Industrial Transformation in VCIC

VCIC, will be one of the key drivers for economic growth in both southern India and the country as a whole. VCIC has the advantages of a long coastline, the presence of key ports and urban agglomerations, and a workforce that will help it achieve the following industrial transformation objectives:

- Increase the manufacturing sector’s contribution to state and national output.** The manufacturing sector’s share of the gross domestic product (GDP) of the two states comprising VCIC—Andhra Pradesh and Tamil Nadu—is 10% and 17%, respectively. In the case of Andhra Pradesh, this share is less than India’s average of 15%. In countries like the People’s Republic of China (PRC) and Thailand, the manufacturing sector’s contribution is more than 30%, suggesting that there is enormous potential for the manufacturing sector in both VCIC and in India as a whole. Improving the manufacturing sector’s contribution to state-level GDP will be critical.

- **Level regional industrialization.** VCIC’s success will be dependent on addressing the issues of skewed industrialization within the region as evidenced by strong manufacturing sector performances in key districts like Visakhapatnam and East Godavari. Visakhapatnam’s manufacturing sector comprises 22% of the district’s GDP, and in East Godavari this share is 13%. Many districts in VCIC have manufacturing sector’s that contribute less than 10% to district-level GDP. Additionally, improved connectivity between VCIC and hinterland regions (especially backward ones) and programs that spur dynamism among hinterland MSMEs will expand economic opportunities for the latter, thereby contributing to the leveling of regional industrialization within VCIC states.
- **Improve labor productivity.** Many industries in VCIC are engaged in labor-intensive activities in the formal sector where the small scales of operation and lack of technology result in low-levels of productivity and wages. The focus needs to be on deploying more capital to boost productivity and creating more jobs in the formal sector. There also needs to be an effort to assist MSMEs, especially in employment-intensive sectors, upgrade and link up with modern supply chains and/or vibrant demand centers.
- **Enhance regional and global competitiveness.** Industries in VCIC should seek to link with global value chains to drive export growth and competitiveness.

Industries That Will Drive the Industrial Transformation of VCIC

To achieve the industrial transformation of VCIC, it is necessary to identify the right set of industries for promotion. These include industries that

- are projected to attain high growth rates driven by domestic and/or export demand;
- offer competitive and comparative advantages at both the state and country levels;
- create employment opportunities and drive wages higher; and
- are new and/or expanding, and can be attracted to the corridor (sunrise industries).

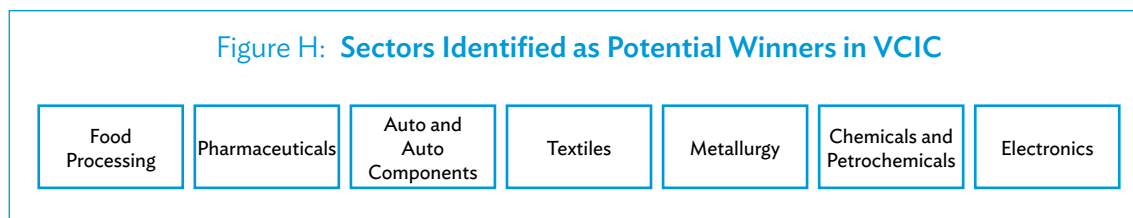
A two-step analysis was undertaken to identify industries for promotion:

- **Step 1:** Generate a shortlist of industries that will drive industrial transformation.
- **Step 2:** Identify industries that will drive the growth of certain sectors.

Market analysis was undertaken for 78 industries, as per the National Industries Classification (NIC). These were grouped into 25 distinct sectors that could potentially be attracted to VCIC. The parametric assessment comprised two stages: (i) “what is” analysis to identify existing strengths in particular sectors, and (ii) “what could be” analysis to identify underdeveloped sectors with potential for growth. The analyses were undertaken at the state, country, and global levels using parameters such as trends in foreign direct investment (FDI), other investment, exports, output, dynamic revealed comparative advantage, and relative trade advantage, among others. Using the “what is” and “what could be” analyses, a list of sectors was identified as potential winners for the proposed VCIC (Figure H).

The sectors included in Figure H comprise 34 sub-sectors (as per 3-digit NIC codes), which were further analyzed to identify the top sub-sectors from three different aspects:

Figure H: Sectors Identified as Potential Winners in VCIC



- export-driven, with potential for increasing VCIC exports;
- domestic-demand-driven, with potential for expansion in domestic markets; and
- employment-intensive, with potential for providing more jobs.

Each of the sub-sectors was tested for relevance (i) on a global scale, (ii) in the Indian context, and (iii) in the context of Andhra Pradesh (95% of VCIC falls within the state), as presented in Appendix A.

Analysis of Sectors and Key Enablers for Industrial Development

The study team has undertaken detailed industry analysis of the shortlisted sectors, including

- global, country, and state level scenarios of investment and growth;
- industry structures (e.g., segments driving output, employment, productivity, and growth);
- benchmarking against sector performances in key Indian states;
- infrastructure and supply chain issues in key industrial clusters in Andhra Pradesh;
- assessment of MSMEs, including the employment-intensive textiles and food processing sectors;
- approaches to leveraging established supply chains (including global production networks) for SME growth and development; and
- policy and institutional enablers.

The above analysis led to the identification of (i) structural issues within Andhra Pradesh in each sector, (ii) key segments that are driving growth and productivity in other states, and (iii) success factors that will impact investment decisions and possible locations for the shortlisted industries. This analysis helped in identifying four districts to serve as industrial nodes within VCIC: Visakhapatnam, East Godavari, Krishna, and Chittoor. Together, the four districts contribute around 55% of the state's manufacturing output. Visakhapatnam and East Godavari are also key contributors to the state's manufacturing employment. Visakhapatnam has the highest level of value-added at INR10 *lakh* (100,000) per employee, compared with INR3 *lakh* per employee in Chittoor and East Godavari, on account of greater investment in the chemicals and petrochemicals sector. Across all four districts, over 60% of total employment is in the unorganized sector, with the food processing and textiles industries being the major employers.

The study team interacted with select stakeholders operating in the node areas to understand their concerns about industrial infrastructure development. The team also benchmarked the industrial infrastructure of successful industrial parks and clusters elsewhere in Asia, including the Hsinchu Science Park in Taipei, China; TEDA Industrial Park in Tianjin in the PRC; and Suzhou Industrial Park in the PRC.

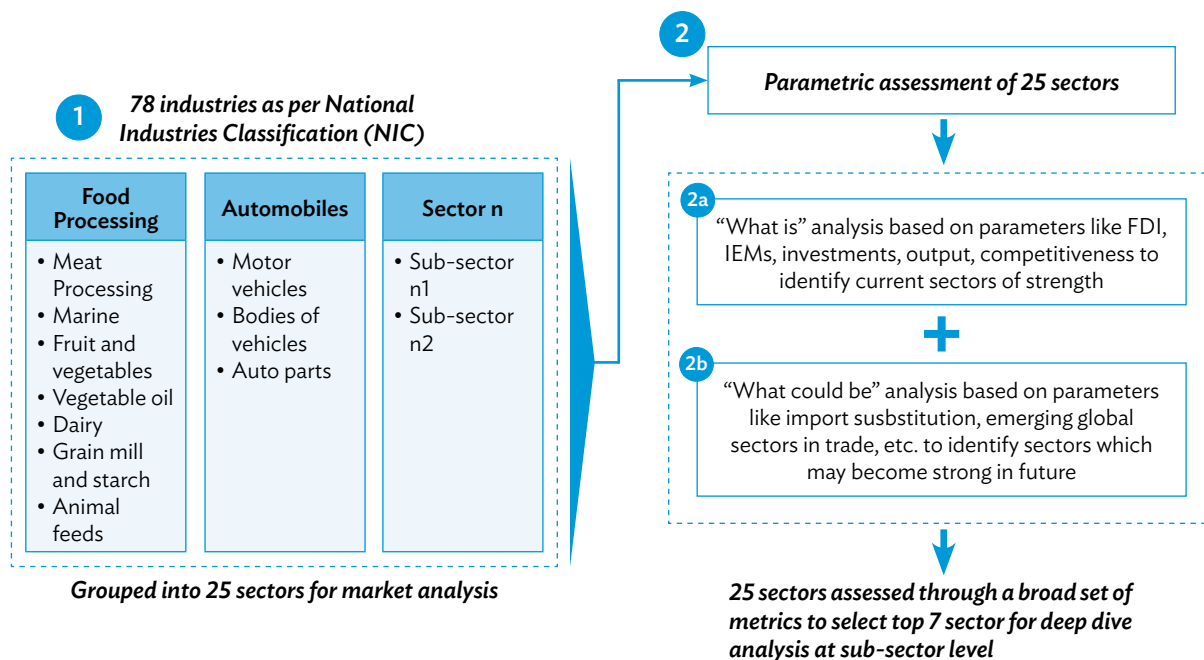
Connectivity infrastructure, logistics facilities, urban connectivity, and skilled manpower availability emerge as the key success factors from benchmarking globally successful industrial hubs.

Regulations and their implementation mechanisms are critical for realizing the full economic potential of any industrial corridor. Key recommendations for the VCIC include

- defining a Single Window system, and augmenting the roles and capacities of the relevant nodal agency(s), to provide a uniform regulatory compliance experience to current and potential investors;
- introducing information technology (IT)-enabled systems with user dashboards for the relevant committees to monitor agency clearances;
- creating integrated check-posts at borders with the participation of relevant state enforcement agencies; and
- rationalizing value-added taxes and entry tax structures across participating states, including goods- and area-based tax exemptions;

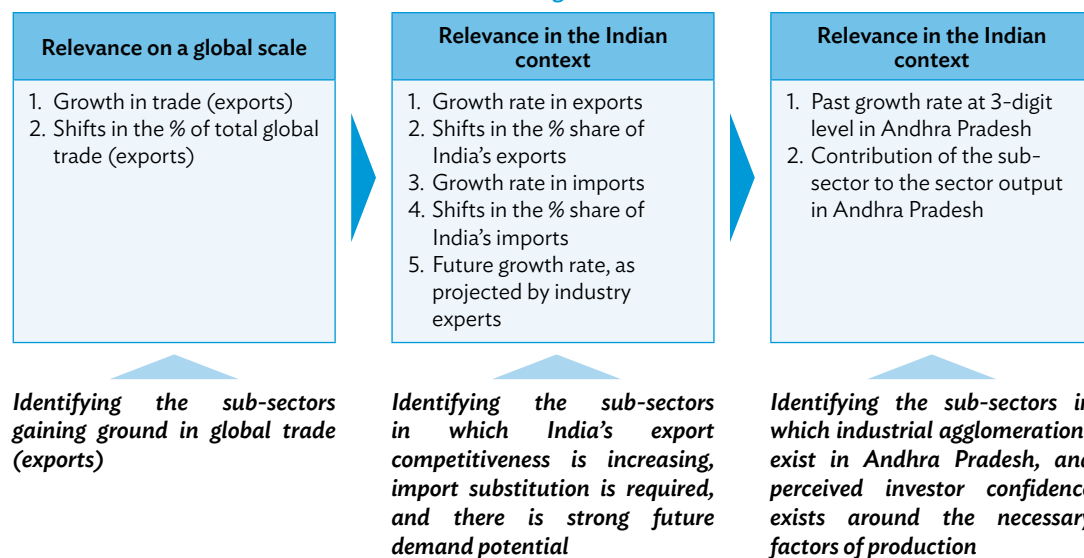
Finally, the Corridor Management Authority proposed by the Department of Industrial Policy Promotion needs to play a facilitating role in addressing many of the inter-state issues listed above.

Appendix A: Methodology for Selection of Sectors and Sub-Sectors



Food Processing, Pharmaceuticals, Auto and Auto Components, Textiles, Metallurgy, Chemicals and Petrochemicals, Electronics

Framework for shortlisting of sub-sectors for VCIC



Sub-sectors short listed for VCIC

VCIC Industrial Nodes

Approach for node identification

One of the objectives of the study was to identify suitable nodes for industrial development within the corridor area. The study team has carried out (i) identification of the land parcels available with the government and in private industrial parks, and (ii) analysis of potential nodes for development using “must have” and “good to have” criteria. The prioritization of industrial nodes for the master plan will take place under Phase 2.

Based on the discussions undertaken with state government officials, 119 locations in government industrial park and special economic zones (SEZs) and private industrial parks and SEZs were identified as having vacant land. (All locations were in Andhra Pradesh as districts in Tamil Nadu did not feature any vacant land.) The locations also included vacant government revenue lands available for consideration. The focus of VCIC’s industrial transformation has been on enabling existing industrial agglomerations. Hence, all locations that were shortlisted for node development have been analyzed for the presence of industrial units in close proximity to the shortlisted land parcels. In addition, instead of identifying a single contiguous land parcel, attempts have been made to identify a cluster of land parcels in close proximity to create nodes of substantial size. Detailed analysis based on the framework in Figure I was undertaken to identify potential zones for development.

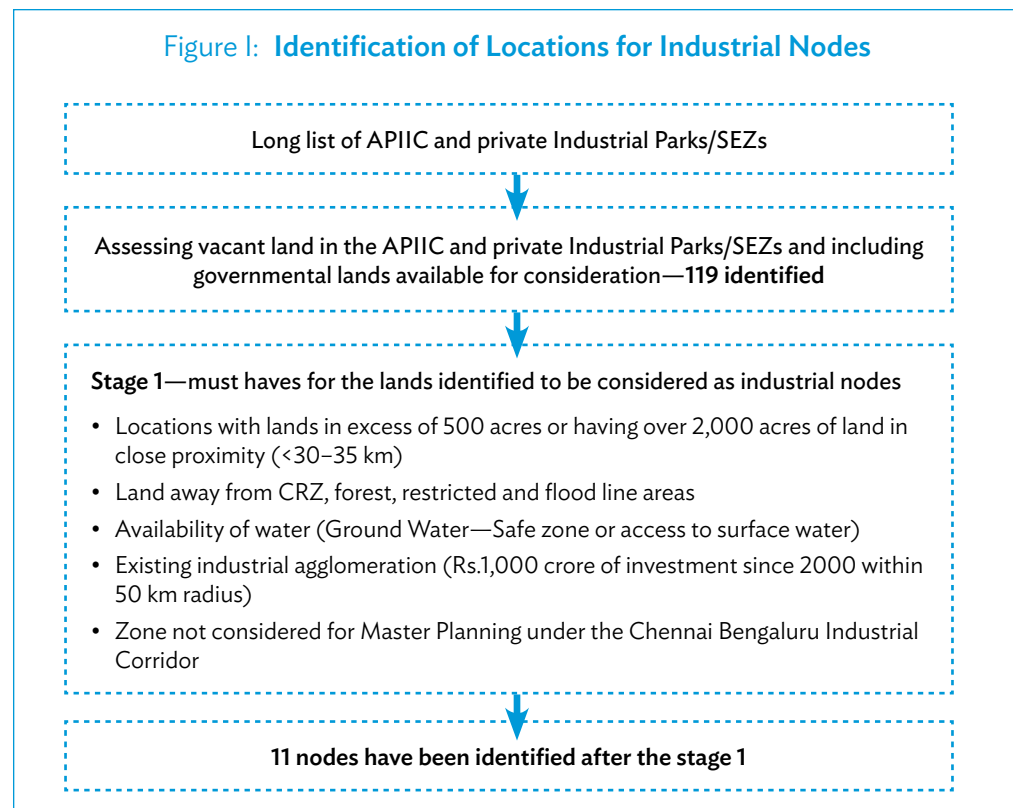


Table A: Potential Clusters in VICC

Cluster in Andhra Pradesh	Area or Region
Atchutapuram	Visakhapatnam
Nakkapalli	Visakhapatnam
Bheemunipatnam	Visakhapatnam
Pydi Bhimavaram	Srikakulam
Kakinada	East Godavari
Kankipadu	Krishna
Gannavaram	Krishna
Jaggayyapeta	Krishna
Kopparthy	Kadapa
Yerpedu–Srikalahasti	Chittoor
Sri City	Chittoor

Zones that are being considered under other corridor projects, such as the Chennai–Bengaluru Industrial Corridor, were not considered under this project to eliminate duplication of developmental efforts. Based on the above analysis, 11 potential clusters were identified (Table A).

The potential zones listed above were further analyzed on a set of important (good-to-have) factors:

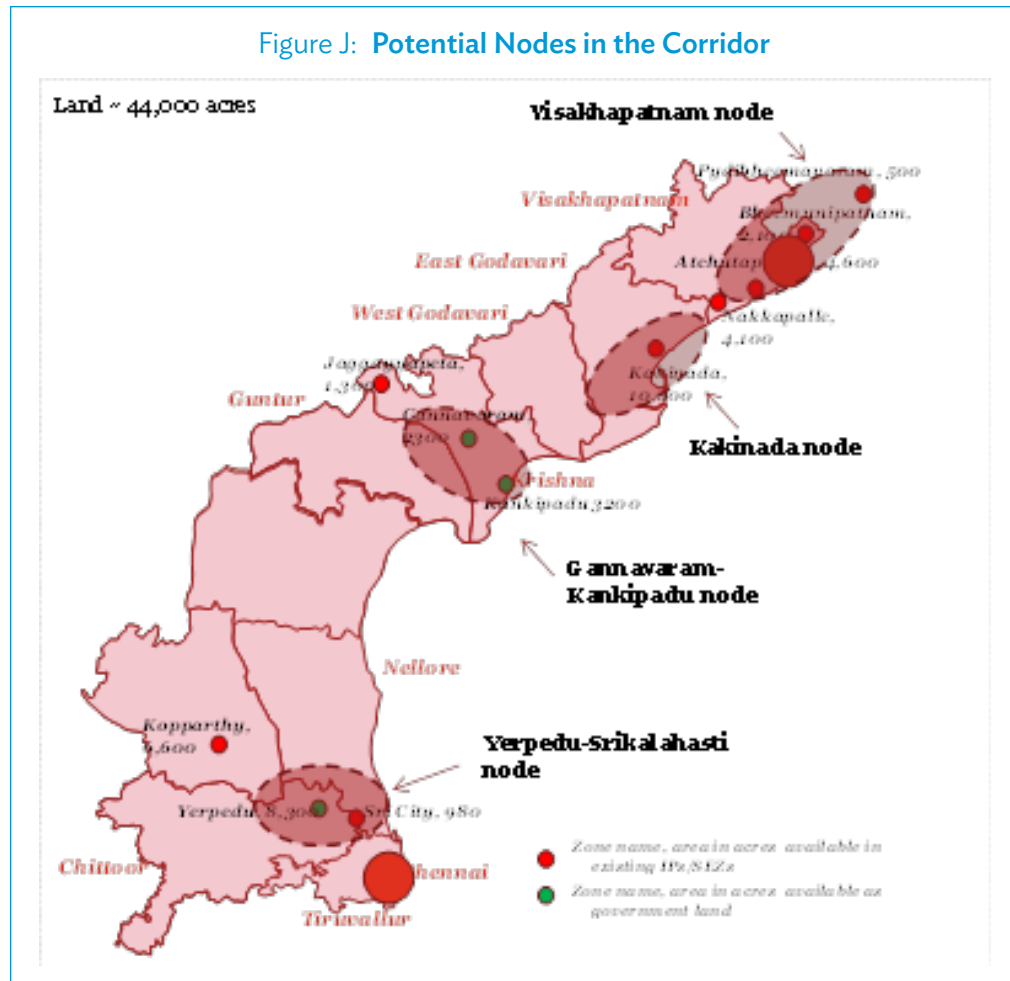
- proximity to existing or planned ports of less than 50 kilometers (km) for industries such as metallurgy, chemicals and petrochemicals, and textiles;
- proximity to raw materials (<25 km) for industries such as food processing; and
- proximity to a city (<50 km) for industries such as automobiles, pharmaceuticals, medical equipment, electronics, and aerospace.

Each location was further analyzed on the existing availability of connectivity infrastructure, skilled manpower, and logistics infrastructure. As part of the Concept Development Plan, discussions were conducted with government officials from Andhra Pradesh to understand their views on the shortlist of potential nodes. Based on the analysis and these discussions, locations were identified for node development (Table B and Figure J).

Table B: Locations for Node Development in VICC

Node	Land of Parcels	District	Area (acres)
1	Pydibheemavaram, Bheemunipatnam, Atchutapuram, Nakkapalle	Visakhapatnam	11,300
2	Kakinada	East Godavari	10,000
3	Kankipadu Gannavaram	Krishna	5,500
4	Yerpedu, Srikalahasti	Chittoor	9,280

Figure J: Potential Nodes in the Corridor



Enabling Competitive Manufacturing through Infrastructure Development

The node-based industrialization strategy proposed for VCIC is targeted to achieve regional and global competitiveness. Infrastructure development is one of the most important levers needed to attain this core objective. As the corridor will be primarily oriented toward manufacturing, the focus of infrastructure development can be categorized as follows:

- **Multi-modal transport infrastructure to enable competitive supply chains.** Nodes of manufacturing do not function in isolation, but as part of a supply chain, aligning with domestic or global value networks. Inbound and outbound logistics from the industrial nodes will need to consider capacity and service provision at key infrastructure gateways like ports and airports, as well as the network connectivity between the nodes, gateways, and hinterland consumption centers.
- **Other infrastructure to enable competitive value-added.** Industry and node selection has implicitly factored in resource-linked advantages (e.g., land availability

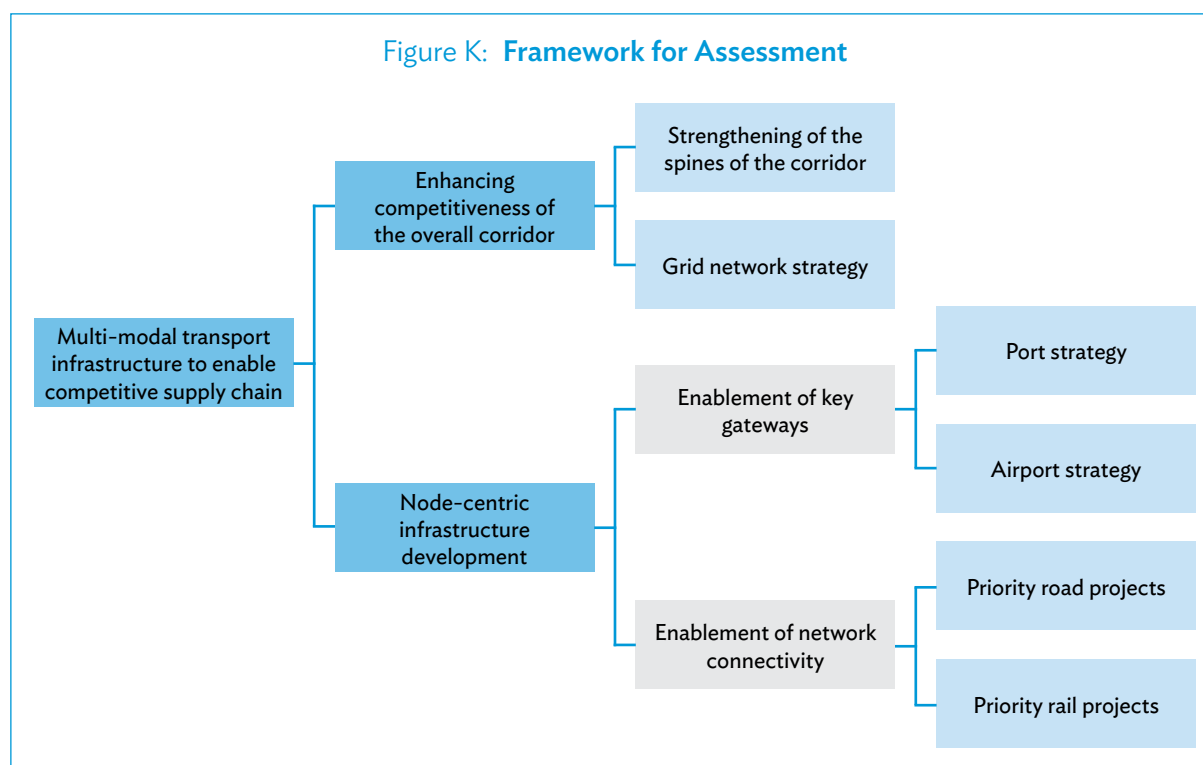
and skilled manpower). These advantages will need to be complemented by other input factors that enable competitive value-added such as access to and the cost of power and water.

Approach for Infrastructure Development

In this phase of the study, the focus has been on assessing the current state of infrastructure, both in terms of quantity and quality across categories, and identifying critical capacity gaps and other issues. This assessment was then compared with a supply-side assessment of key initiatives at various stages of execution in the pipeline. The initiatives were assessed for their strategic importance for VCIC, as well as for their readiness for implementation. Using this sequential assessment, a near-term roadmap was developed and the approach adapted to the specific context of different infrastructure categories.

Multi-Modal Transport Infrastructure to Enable Competitive Supply Chains

The availability and quality of the core transport infrastructure is the most important foundation on which competitive supply chains can be designed for various industries. The framework for assessing the enabling transport infrastructure is divided into two parts as illustrated in Figure K.



1. Infrastructure to enhance the overall competitiveness of the VCIC corridor

VCIC is a coastal corridor, designed around National Highway 5 (NH5) and the Chennai–Kolkata trunk railway line, which together form the spines of the corridor. The corridor is also surrounded by several other strategic National Highway routes and other trunk rail routes, which are largely linear in nature and lacking in cross-connectivity.

A two-fold strategy to enhance spinal and grid connectivity is proposed to enhance the overall competitiveness of the corridor:

- a) **Strengthen existing spinal routes.** Existing spinal routes should be upgraded with state-of-the-art connectivity to enable ports and industries in the region to become integrated within the overall East Coast Economic Corridor network. Some of the projects that are considered for this purpose include the 6-laning of the entire stretch of NH5, a parallel expressway close to the coastline, and a dedicated freight corridor (DFC) on the Chennai–Kolkata route.
- b) **Strengthen the grid network.** The grid network should provide cross-connectivity between important linearly aligned National Highway and trunk rail routes to reduce the overall time, cost, and distance of evacuation of cargo from gateways and nodes to the hinterlands. For this purpose, a select set of road and rail links are proposed to fill the existing gaps in cross-connectivity. Since several projects in the grid network will pass through regions of Andhra Pradesh that are relatively under-developed at present, these projects will also serve to economically integrate such regions.

2. Node-centric transport infrastructure development

As part of the industrialization strategy, four nodes have been selected along the corridor for anchoring VCIC's industrial strategy. As candidates for hosting manufacturing-oriented industries, they will need to be connected to sources of raw materials and key consumption centers, both domestic and international. This will spawn a need for efficient transport linkages along two dimensions.

- a) **Enablement of key gateways proximal to nodes.** Capacity and quality of service at gateways like ports and airports are important factors that affect cost of logistics for cargo. For the purpose of this study, each node in the current set has been mapped to a set of proximal gateway port clusters and airports as follows:
 - An assessment of the current capacities, throughput, and operational performances of these gateways was conducted, both in absolute and comparative terms, through secondary and focused primary interactions.
 - The assessment was supplemented by analysis of supply projections, bandwidth available for capacity expansion, and future development plans, as well as an assessment of technical constraints in project execution. This was tested against a range of demand scenarios, based on benchmarks and independent estimates.
 - The assessment was complemented by current and expected network and usage trends from shipping lines and airlines in terms of route development, and developments in competing gateway clusters, and their implications for capacity development.

- The assessment helped evaluate the sufficiency of port and airport capacity in the short-to medium-term. It also helped identify key strategic and operational enablers and measures of performance for supporting the development objectives of VCIC.
- b) **Enablement of network connectivity centered on nodes and node-linked gateways.** Having defined the nodes and gateways, it is important to enable the network of connectivity anchored around the two points of the supply chain, through both road and rail, for supply chain competitiveness. It is also important to consider hinterland source and distribution centers for domestic movement, as well as other neighboring gateways. For the purpose of defining the network centered on nodes, five different categories of road and rail connectivity were considered:
- **Node-VCIC gateway connectivity.** This entails connecting nodes to identified port and airport gateways, through last-mile road and rail connectivity.
 - **Node-hinterland connectivity.** This entails strengthening middle-mile connectivity between nodes and selected hinterland source and distribution centers, within and outside VCIC to enable domestic movement.
 - **Hinterland-VCIC gateway connectivity.** Several sources of industrial production located outside the VCIC region may generate demand for cargo throughput at VCIC ports. Facilitation of throughput via VCIC gateways that is driven by better connectivity can bestow scale advantages to the corridor by facilitating greater cargo agglomeration and reducing unit costs of logistics infrastructure and services. The hinterland connectivity projects that pass through backward districts of Andhra Pradesh would also serve as spines along which the economic development could spread to neighboring regions.
 - **Node-ex-VCIC gateway connectivity.** Similarly, VCIC nodes may also find it convenient to be connected to other gateway nodes outside the VCIC region. This is especially true for airports, as the region is located near three of the top six international airports in the country.
 - **Intra-node connectivity.** Finally, analysis of the micro-environment of each node provided visibility into localized issues in connectivity within the node. Certain road connectivity projects are proposed in this category.

A detailed list of pipeline projects under consideration by various executive agencies for roads and railways at both the country and state levels was collected, followed by interactions with these agencies to understand the status of projects. The list was supplemented by fresh project ideas that are currently at the conceptualization stage but deemed necessary to achieve certain targeted benefits relevant for VCIC.

The list of projects was then analyzed along the five node-centric connectivity categories defined above, as well as against the corridor-level projects proposed for spinal and grid connectivity. The list was then consolidated to remove redundant projects.

The list was prioritized along one dimension for various levels of strategic importance for the corridor (critical, need-to-have, and good-to-have) and projects were assessed based on their ability to fulfill each of the five needs of network connectivity as defined above. The state of readiness of these projects was defined on a scale of 1 to 5: (1) conceptualization, (2) feasibility being studied, (3) feasibility assessed, (4) procurement, and (5) implementation.

Based on the matrix of level of urgency and level of preparedness, projects for immediate-, medium-, and long-term execution were identified. The region has a history of inland waterways, and potential for coastal shipping. The cost-benefit of these, and their integration with road and rail networks, would be done at the Perspective Planning stage, when a comprehensive Transport Network plan is developed.

Other Infrastructure to Enable Competitive Value-Added

Access to and the cost of power are important elements for augmenting the ability for value-added manufacturing. Several industries proposed for VCIC's industrialization strategy—including pharmaceuticals, automobiles, textiles and apparels, and electronics—have a high dependence on either or both of these two enablers.

For the purpose of this study, a current-state assessment of supply and demand was conducted, including the differential trends in industrial and other segments. The needs of the VCIC region were then assessed against pipeline initiatives and key conclusions were drawn.

- (i) **Power strategy.** In the current scenario, access to power was determined to be more important than industrial tariffs because the alternatives to grid-based supply are prohibitively expensive for industries. Therefore, the study focused on current and future trends in demand and supply for generation and transmission of power for the VCIC region through various supply mixes at the country, regional, and state levels. Analysis of future generation capacity was benchmarked against the demand forecasted by the 18th Electricity Power Survey and gaps were identified.

The list of generation and transmission projects in the pipeline was analyzed and a degree of strategic importance (low, medium, or high) and a state of readiness was assessed. In this manner, a set of projects for immediate-, medium-, and long-term execution was identified.

- (ii) **Water strategy.** The industrial water scenario in the districts of the corridor was profiled in terms of groundwater and surface water availability and demand. Water demand in VCIC was projected for the next 10 years based on available data and industrial water demand in the corridor districts nearest to the nodes was estimated. Nodes requiring industrial water supply projects were identified, too. Trends in the recycling of water and water use efficiency were compared against international benchmarks. Commercial, regulatory, and institutional interventions were also studied for recommending strategic interventions.

Infrastructure to Enable Competitive Supply Chains: Conclusions and Recommendations

Corridor-Level Intervention: Strengthening Spinal and Grid Network Connectivity

Strengthening the Road Spine and Grid

The design of a strong spine is critical from the perspective of the overall competitiveness of VCIC as it is part of the larger East Coast Corridor from Chennai to Kolkata that is anchored

around the entire stretch of NH5. The road is strategically linked at both ends to other industrial corridors and regional multi-modal connectivity networks. Effective integration into such multi-modal networks will demand a strong backbone.

- **Critical: 6-laning of NH5.** The stretch from Visakhapatnam to Chennai is currently 4-laned. As part of Phase V of the National Highways Development Programme (NHDP), the entire stretch is proposed for 6-laning.
- **Critical: Strengthening parallel access segments of NH214, NH214A, and State Highway (SH) 103.** Upgrading of these parallel access segments into 2- and 4-lane connectivity is recommended.
- **Critical: New NH and SH projects.** Prominent national highways surrounding the corridor (e.g., NH5 and NH7) are aligned in a linear direction. For the purpose of facilitating direct connectivity to the central and distant hinterlands, seven state and national highway projects are proposed. All of these projects provide linkages between the central spine of NH5 and other highways like NH7, NH18, NH9, NH214, and NH221. Several of these (e.g. Tada-Kadapa, Guntur-Anantpur, Nellore – Gooty - Bellary, and Guntur-Kurnool) would, in time, act as spines along which other districts of Andhra Pradesh would get better economic connectivity to the corridor nodes.

Strengthening the Rail Spine and Grid

VCIC is served mainly by the Chennai–Visakhapatnam segment of the Chennai–Kolkata line, which is one of the seven high-density corridors in the Indian Railways network. The spine is co-terminus with the Vijayawada division of the South Central Railway Zone, which is one of its busiest routes. Analysis of line capacity and utilization figures suggests that the capacity utilization of the entire stretch is more than 80%.

- **Need to Have: Development of DFCs.** While short-term measures for capacity augmentation like tripling and quadrupling signaling technologies or increasing train speeds may be considered, they will have a limited effect in the long-term considering demand in the corridor. Therefore, development of two segments of the DFC (Delhi–Chennai and Visakhapatnam–Vijayawada) is proposed to be taken up for further study. The needs and time horizons for development of these DFCs is expected to be determined at the regional perspective planning stage of this study, based on when execution planning can commence.
- **Critical: Nine new rail links.** The railway network of the VCIC region has several gaps in direct connectivity, predominantly in the southern part of the network, which impedes direct connectivity between hinterland centers and the coast. Nine new rail links already under consideration by Indian Railways (six in the southern network and three in the northern network) are proposed to be taken up for accelerated execution to close these gaps. These include projects that are physically outside the corridor delineation, but are critical to connecting the corridor.

Node-Level Intervention 1: Enablement of Key Gateways Proximal to Nodes

As part of the VCIC strategy, four industrial nodes was identified, and an assessment of the core gateway ports and airports proximal to the nodes was conducted. Each node was mapped against a specific port cluster and airport node:

- **Yerpedu–Srikalahasthi:** Krishnapatnam Port cluster and Tirupati Airport
- **Gannavaram–Kankipadu:** Machilipatnam Port cluster and Vijayawada Airport
- **Kakinada:** Kakinada cluster and Rajahmundry Airport
- **Visakhapatnam:** Vizag–Gangavaram Port cluster and Vizag Airport

As a first step, the state of ports and airports were considered in the context of VCIC's development needs, and based on this analysis, strategies will be proposed for the future integrated development of the corridor.

Strategy for Enabling Port Gateways

VCIC aims to leverage its nautical advantage for the benefit of the industrialization strategy.

Current-state assessment

- The ports of the VCIC region north of Chennai handled around 115 million tons of cargo in 2013–14. However, except Vizag, none of the ports of the VCIC region rank is among the top 10 ports in the country. Vizag port is also declining in traffic and losing its prominence among Indian ports, due to the effects of the economic downturn and the poor state of cargo development along the coastline.
- There is a marked imbalance in cargo throughput toward bulk cargo. However, to enable manufacturing-oriented growth, it is critical to focus on container throughput. Compared with the rest of India, VCIC's ports handle a very low proportion of container cargo (less than 3%), and this is only through Visakhapatnam and Krishnapatnam ports.
- Further, there is poor development of container shipping services. Except Chennai, none of the ports on the east coast have direct services to the destination ports. Instead, they host smaller parcel container vessels in feeder routes, through vessels of small parcel sizes and limited frequencies. This increases the direct and indirect costs of container logistics.

Development imperatives

- The fleet capacity of shipping liners is changing toward a preference for larger vessels. As they are replaced by larger vessels, existing mainline vessels are expected to cascade down to feeder routes. Such an effect will increase the pressure on ports to increase their sea-side, land-side, and evacuation capacities.
- At the same time, the container port of Chennai is getting increasingly congested due to lack of evacuation and land for a back-up area. This points to a development opportunity for ports like Krishnapatnam that have deep drafts, land for expansion in areas without urban sprawl, and superior connectivity. Direct services will provide several logistical advantages by increasing choices for services, facilitating greater agglomeration, and bringing down unit costs of services.
- However, for this to happen the ports of the VCIC region need to be enabled for sufficient cargo agglomeration and ease of direct connectivity. This will involve strategies to tap into the industrial cargo hinterlands beyond the VCIC region, and investments in connectivity and logistics infrastructure.

Port cluster assessment

- The coastline can be logically divided into three clusters of port locations:
 - o The northern cluster comprises the ports of Visakhapatnam and Gangavaram, which dominate the current throughput via the corridor (mainly for bulk cargo and low-value containerized traffic from proximal centers). Vizag port is the only port handling container cargo. Analysis suggests that Gangavaram port is likely to continue to be preferred by users and liners for bulk cargo, and will eat into the share of Vizag port. This suggests a need for re-balancing in terms of investments in container capacity at Vizag in the medium- to long-term.
 - o The central cluster comprises the ports around the Krishna Godavari basin (Kakinada and Machilipatnam clusters). These ports typically have channel, draft, and land-side restrictions, and limited operations. Therefore, they may not be able to develop as large port locations. However, they are well-suited to service the captive needs of industrial users. While Machilipatnam port has plans to invest in container capacity, it has yet to commence construction. Kakinada SEZ port may be an alternate location for future container capacity, subject to overcoming technical constraints.
 - o The southern cluster of ports is anchored around the operational port of Krishnapatnam. The availability of deep drafts, land, and spinal connectivity, and lack of urban sprawl are key advantages in this cluster, providing bandwidth for expansion as large ports. While currently focused on coal cargo for a limited set of users, the southern cluster is expected to see large containerized movement owing to the development of VCIC and Chennai-Bangalore Industrial Corridor nodes, as well as from the gradual shift of container traffic from the congested Chennai port to the southern cluster.

Assessment of demand-supply gaps in the “business-as-usual” scenario

Against the current demand estimate, there is significant bandwidth for capacity expansion at several ports.

If the cargo growth mirrors past trends along the Andhra Pradesh and Indian coastlines, then the resultant growth in demand is expected to be met by the addition in capacity at the four operational ports, considering their master-planned capacity.

The ports of Krishnapatnam and Visakhapatnam can expand from their current container capacities of 1.7 million twenty-foot equivalent units (mTEUs) to 7.5 mTEUs with relative ease. Therefore, considering capacity augmentation at these two ports, expected capacity is seen to surpass demand.

The expected augmentation of capacity to 6.0 mTEUs at Krishnapatnam will allow for the handling of overflow cargo coming from Chennai port in the immediate-term.

The above projections are based on business-as-usual scenario and have not taken account of additional aspects like localized demand-supply scenario. A more granular view on the

port cluster's demand–supply assessment is expected to be undertaken in Phase 2, which will consider the demand created by development of VCIC nodes.

Summary of recommendations

The port-centric development strategy aims to align with large-scale, manufacturing-led economic development through the nodes and integrate India into global manufacturing supply chains.

The port development strategy should target brownfield development of two or three mega container ports close to the nodes (primary candidates are the Vizag–Gangavaram and Krishnapatnam clusters), with the ability to handle large container vessels of 10,000+ TEUs and the necessary supporting multi-modal connectivity and supply chain and logistics infrastructure.

From a bulk cargo perspective, the state may enable port capacity creation across the coastline by prioritizing movement of energy cargo (thermal coal, liquid natural gas) that will be important for the development of the VCIC region.

Rather than focusing on further capacity development, which is best left to market forces, the strategy should primarily aim at accelerating cargo agglomeration in the region and making the ports competitive for direct calls from major container hubs. This can be achieved by

- focusing on supply-chain efficiency and cargo agglomeration so that the state can lead in containerization trends, with increasing sophistication and value-added through container cargo;
- ensuring last-mile connectivity to attract cargo from neighboring hinterlands; and
- connecting distant hinterland centers to capture traffic from neighboring and distant hinterlands, and east-bound traffic.

Strategy for Enabling Airport Gateways

Assessment of services

- The VCIC region is home to all four operational airports in the state of Andhra Pradesh. Their combined level of demand is very low with annual throughput of less than 1.5 million passengers (<1% of India's air passenger traffic) and less than 2,000 metric tons of cargo (<0.1% of India's air cargo traffic). The low level of incumbent demand is mirrored in the lack of airline network penetration and network development.
- Cargo traffic is limited to Visakhapatnam airport. Despite its status as a customs airport with limited connectivity to two international locations, it does not handle any international cargo.
- All airports in the state operate at less than 60% utilization of their rated capacity for passenger traffic. Passenger traffic projections based on Airports Authority of India (AAI) estimates indicate that the capacity already commissioned or planned is more than sufficient to handle the next 10 years of baseline traffic.

- Visakhapatnam airport, the only VCIC airport to handle cargo traffic, has recently developed a new cargo complex, which is yet to be commissioned. Other airports have plans to develop cargo terminals.
- It does not seem likely that the incumbent air traffic can support sufficient airline demand aggregation in the near future to warrant creation of large airport hubs for the state. For this level of incumbent demand, ongoing brownfield capacity development proposals by AAI are expected to be sufficient to handle traffic growth in the short-term.

Future opportunities and development considerations

- Demand from the VCIC industrial nodes (both for passenger and cargo traffic) will need to be considered in the medium- to long-term. Cargo demand is expected to be triggered by a few industries that are dependent on time-sensitive and secure movements of high-value cargo (like electronics). This may require specific capacity augmentation through appropriate development models to be considered at the master planning stage.
- In the future, specific political and economic development trends in the hinterlands (e.g., development of the capital city at Vijayawada) may act as triggers for airline network development. The implications and their impact on neighboring airports are outside the scope of this study, but will need to be considered at the time of master planning for VCIC.

Summary of recommendations

- The airport development strategy for the VCIC region should carefully consider the very low level of current incumbent air passenger and cargo traffic. This study recommends considering future airport development in two different time horizons:
- **Short- to medium-term.** Sufficient capacity exists to cater to the expected base demand. Therefore, the strategy should be focused on two initiatives:
 - Attention is required to enhance the base demand by incentivizing direct airline services to the existing airports through service upgrades (e.g., 24x7 operations, night landing facilities, customs and immigration) and operational de-bottlenecking.
 - Considering the short distance to the neighboring airport hubs (three of India's top six international airports), facilitating excellent road connectivity to these hubs from the cities and cargo-generating centers is likely to be more capital-efficient in the short-term.
- **Long-term (beyond 10 years).** Master-planning of the VCIC region should consider demand from business-induced scenarios resulting from political developments in the overall state, development of the coastal corridor, and additional economic investments.

Node-Level Intervention 2: Enablement of Network Connectivity Centered on Nodes and Node-Linked Gateways

- The strategy for network connectivity considers the need to inter-connect nodes, gateways, and hinterland centers outside the VCIC region.
- Besides the gateways and nodes, key hinterland centers have been identified within and outside VCIC, that directly provide sourcing and distribution opportunities, or behave as transit nodes for onward movement. Enablement of hinterland centers by superior connectivity to the gateways can have the following beneficial effects:
 - accelerate cargo agglomeration in the VCIC region and re-balance the export–import mix, and accelerate development of shipping services, container capacity, and logistics infrastructure; and
 - reduce unit costs of logistics infrastructure and services by increasing utilization of fixed infrastructure and fleets of trucks and railway rakes (e.g., through bi-directional movement).
- **Project long-listing.** For the purpose of evaluation, a long-list of 135 projects were considered as candidates based on detailed primary and secondary analysis, both at a corridor-level and at a node-level. These selected projects span railway and roadway connectivity, and comprise both greenfield (new capacity creation) and brownfield (existing capacity augmentation) projects.
- **Shortlisting and categorization.** Based on detailed analysis for relevance to VCIC, a shortlist of 84 projects was generated, of which 28 projects were found to be of relevance to the entire corridor and categorized as such. Ten more projects were categorized as conditional projects, which are of high importance only if another independent infrastructure project is commissioned. The remaining set of 46 projects was taken up for analysis and tested for strategic importance to the nodes across the five connectivity types (Table C).
- **Project prioritization.** A matrix was developed to assess the prioritization of the projects for implementation over the given time-frame:
- **Level of criticality.** Each of these projects were then tested for strategic importance to the node and categorized as either critical, need-to-have, or good-to-have.

Table C: Shortlisted Connectivity Projects by Category and Node

Connectivity Category	Yerpedu–Srikalahasthi	Gannavaram–Kankipadu	Kakinada	Vizag	Total
Node-VCIC Gateway	2	1	3	5	11
Node-Hinterland	3	-	4	7	14
Hinterland-VCIC Gateway	1	3	4	4	12
Node-ex VCIC Gateway	-	-	1	-	1
Intra-Node	2	2	3	1	8
Total	8	6	15	17	46

- **State of readiness.** The status of project preparation was then assessed on a scale of 1 to 5: (1) conceptualization, (2) feasibility being studied, (3) feasibility assessed, (4) procurement, and (5) implementation.
- Critical and need-to-have projects that are in a high state of readiness are proposed for immediate- or short-term execution. Projects that are good-to-have or have a low state of readiness are proposed for medium- or long-term execution.
- **Summary of recommendations**
 - Of the 46 projects, 18 were judged to be critical and 18 as need-to-have projects.
 - However, of the 46 projects, only 16 are ready for execution in terms of project preparation. Fourteen projects are awaiting completion of their feasibility studies.
- **A time-line-driven view is recommended for execution of action steps:**
 - *Immediate priority.* Twelve projects (five road and seven rail) are considered ready either for monitoring or immediate execution. Projects that have already commenced execution are suggested to be monitored on a mission mode.
 - *Short-term.* Three rail projects are considered ready for short-term execution.
 - *Medium-term.* Apart from one project ready for execution, focused attention is required for accelerated completion of feasibility reports for 21 projects (15 road and six rail). Of these, six projects (four road and two rail) are critical for VCIC's development.
 - *Long-term.* Nine projects (five road and four rail) are considered to be ready for long-term execution.
- The list of all the projects along with their rationale is provided in the main section of the report.

Multi-Modal Transport Infrastructure to Enable Competitive Value-Added: Conclusions and Recommendations

Power Strategy

Current-state assessment

- Power availability, rather than the cost of power, is a more critical challenge in the VCIC region, which is part of India's southern grid in the country. The southern grid had India's highest levels of energy and peak shortages in 2013–14 at 6.8% and 7.6%, respectively.
- The energy supply in the southern region is dominated by thermal coal, which forms more than 55% of the overall supply capacity in the country. Supply shortages have been experienced due to lack of fuel availability. On the transmission side, inter-regional transmission capacity is constrained in meeting the growing demand in the southern region and the commissioning of new links have not kept pace with growing demand.

Capacity development

- Twenty-nine generation projects have been proposed in the region over the next 10 years with cumulative capacity of nearly 34 gigawatts (GW). Fifty-one transmission

projects have also been proposed over the same period with evacuation capacity of close to 22 GW. The addition of generation capacity is expected to be dominated by independent power producers, whereas transmission capacity will come predominantly through state investments.

- Based on the energy demand forecasts in the 18th Electrical Power Survey, it is expected that the state of Andhra Pradesh and the VCIC region will have surplus power-generation capacity by 2017. Therefore, the existing pipeline of projects is determined to be sufficient.

Project prioritization

- Based on the state of readiness and strategic importance to meet growing demand, the current pipeline of generation and transmission projects within the state of Andhra Pradesh have been categorized for either immediate-, medium-, or long-term execution:
 - **Immediate-term.** Eight generation projects (8.5 GW) and 48 transmission projects (19.8 GW)
 - **Medium-term.** Two generation projects (4.0 GW) and three transmission projects (2.0 GW)
 - **Long-term.** 19 generation projects (21.7 GW)

Water Strategy

Current-state assessment

- The state of Andhra Pradesh has total cumulative water resources of 108 billion cubic meters (BCM), of which 78 BCM is surface water. About 65 BCM of surface water is being utilized, predominantly for irrigation. Per capita consumption of water for urban domestic users is one of the lowest in the country.
- Providing water for industrial use has been a challenge in the past. Districts closer to the coast have higher surface and ground water availability, while the westward districts have limited supply of both the sources of water.

Future demand assessment

- Over the next 10 years, around three-fourths of the state’s projected industrial water demand is expected to arise from districts within the VCIC region.
- Among corridor districts, the four nodal districts—Visakhapatnam, East Godavari, Krishna, and Chittoor—together account for around 60% of VCIC’s water demand.
- Two shortlisted nodes (Kakinada and Gannavaram–Kankipadu) are currently dependent on groundwater for industrial demand; and there is a consequent need to plan industrial water supply projects. Industries in the other two nodes (Visakhapatnam and Yeperdu–Srikalahasti) are using surface water, but its availability is uncertain and the supply is heavily dependent on rainfall.

Key conclusions and recommendations

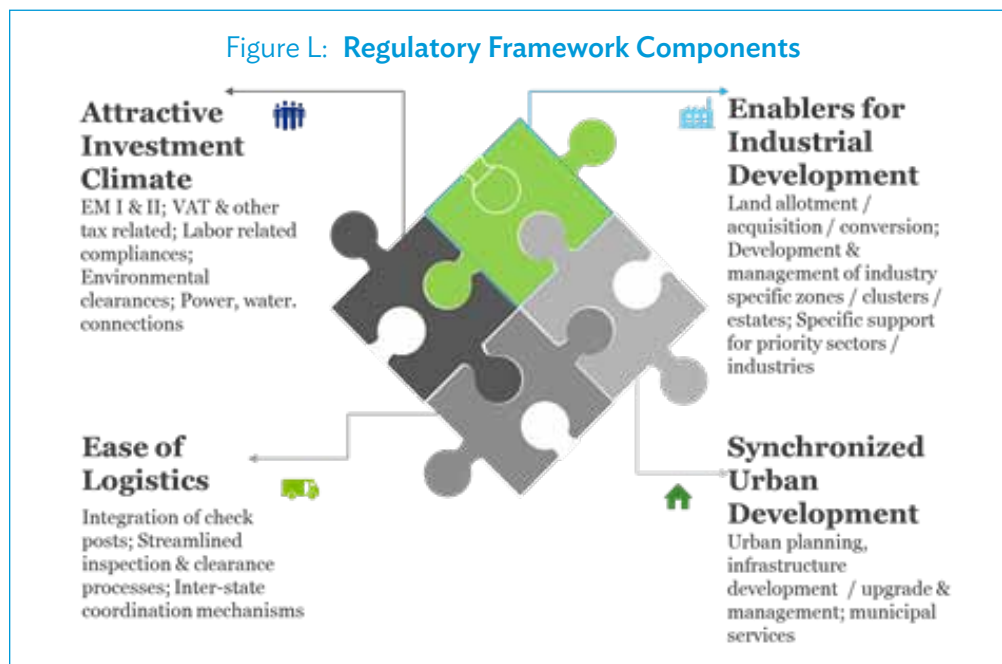
In order to increase the reliability and availability of industrial water in the state of Andhra Pradesh, the following steps need to be taken:

- identify need for new reservoirs or desalination projects in areas with poor surface water availability;
- develop reservoirs at key industrial nodes;
- focus on water use efficiency to increase productivity in the shortlisted industry sectors, and introduce water recycling in the shortlisted industries based on international standards;
- rationalize and/or remove differential water tariffs to incentivize water recycling and water use efficiency; and
- establish a dedicated agency for water planning and management to drive industrial water policy for the entire VCIC region.

The Regulatory Framework

The regulatory environment in India is relatively complex, with the power to administer individual regulations being vested with multiple agencies at the central, state, and district government levels, leading to the need for suitable institutional frameworks to ensure a coordinated approach.

There are four essential components of the regulatory framework (Figure L).



Attractive investment climate. This involves making the investment climate conducive for the establishment and operation of industrial investments through simplified and timely clearances and compliances for (i) setting up new units or expanding existing units, and (ii) operating a business in its normal course (Table D).

Table D: **Attractive Investment Climate**

Parameter	Characteristics	
Prior to commencement	<ul style="list-style-type: none"> Multiple agencies responsible for individual approvals (state and district governments) 	<ul style="list-style-type: none"> Presence of Single Window system <ul style="list-style-type: none"> Departments and clearances covered Use of common application Form
	<ul style="list-style-type: none"> Time taken for issuing approvals by concerned competent authorities 	<ul style="list-style-type: none"> Presence of citizen charters at respective agencies giving timeframe within which to issue approvals Provision of deemed approval in case concerned competent authority does not issue approval within notified time frame
	<ul style="list-style-type: none"> Institutional framework for processing applications 	<ul style="list-style-type: none"> Constitution and empowerment of state and district level committees Empowerment and operational flexibility of Single Window nodal agency Extent of exemptions, delegation of powers
	<ul style="list-style-type: none"> Monitoring framework for application processing and clearances 	<ul style="list-style-type: none"> Deployment of IT-enabled application for tracking application status with dashboard; MIS reports available to concerned competent authorities, Single Window nodal agency, and state and district level committees Availability of e-mail and SMS alerts to applicant on change in application status
Post-commencement of operations, in normal course of business	<ul style="list-style-type: none"> Multiplicity of inspections at different points in time 	<ul style="list-style-type: none"> Presence of policy for coordinated and joint inspections by (i) officials within same departments and (ii) by different departments and agencies
	<ul style="list-style-type: none"> Procedure for inspection 	<ul style="list-style-type: none"> Presence of standard operating procedures and approved check lists for inspections Availability of such standard operating procedures and approved checklists in public domain
	<ul style="list-style-type: none"> Multiple registers with same set of information required by multiple government agencies at different points in time 	<ul style="list-style-type: none"> Policy for using online repository of information whereby relevant information to be made available to respective government agency based on requirement

Table E: Assessment Framework—Ease of Logistics

Parameter	Characteristics
Intra- and inter- state movement of goods	<ul style="list-style-type: none"> • Multiple state level regulating and enforcement agencies responsible for supervising movement of goods • Presence of integrated check-posts having representatives from the respective enforcement agency • Presence of integrated check-posts at border having representatives from both states for joint inspections with institutional mechanism for capturing and sharing data of mutual interest
Inter-state movement of goods	<ul style="list-style-type: none"> • Uniformity in levy of Entry Tax on goods • Applicability of Entry Tax on goods in state • Presence of differential Entry Tax rates for same goods in different states
	<ul style="list-style-type: none"> • Uniformity in levy of state VAT for same commodities across states • Presence of differential state VAT rates for same commodities in different states
	<ul style="list-style-type: none"> • Uniformity in forms and processes for documenting movement of goods across state borders • Presence of uniform set of forms, processes, and procedures in terms of waybill format and common platform for generating waybills

Ease of Logistics. Logistics in the context of industrial and economic corridors essentially covers (i) intra-state movement of inputs and outputs across separate administrative jurisdiction (e.g., districts), (ii) inter-state movement of goods, and (iii) movement of goods across international borders. Table E provides an assessment framework that covers the intra- and inter-state movement of goods.

Enablers for industrial development. One of the first challenges for facilitating new industrial development is acquiring land. There is the need to have enabling laws and effective institutional arrangements to facilitate land management. This includes the introduction of mechanisms (e.g., land pooling) and revamping the land acquisition mechanism to make it more fair and equitable.

Synchronized urban development. Currently, urban development and management agencies are focused on land use planning and municipal service provision. Local economic development is not part of their mandate and there is no focus on supporting economic activity. Cities do not do much to influence the location of economic activities by providing supporting infrastructure or services.

Agencies that promote industrial development focus on the economics of setting up and operationalizing industrial facilities. The only attention paid (if at all) to urbanization is for the limited provision of workforce housing. As a result, new industrial developments arise in locations away from existing cities and new urban agglomerations form around them in an unplanned and haphazard manner.

The Conceptual Development Plan of VCIC recognizes these issues and provides a framework for industrial development that promotes urbanization and assumes that a certain level of urbanization is necessary to support industrialization.