

Mark up for growth

PCPIR in Andhra Pradesh

*PwC background paper for
ASSOCHAM seminar on
PCPIR in Andhra Pradesh:
Opportunities and Challenges*

20 May 2011





A large, curved industrial pipe dominates the right side of the image. In the background on the left, a man in a blue uniform is partially visible, looking towards the pipe. The scene is set outdoors under a bright sky.

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Dilip Modi

President, ASSOCHAM

It is a matter of great privilege and honor to be associated with prestigious program on promoting PCPIR in Andhra Pradesh. I appreciate the initiative of ASSOCHAM as the subject is well chosen and taken up in appropriate time.

Considering the growth of petrochemical industries in China, development of PCPIR would enable India to realize its tremendous potential in this sector. I am sure that favorable investment environment of Andhra Pradesh coupled with its potentials in petrochemical and chemical sector would position Andhra Pradesh as a leader in this sector.

I am sure that the deliberations and suggestions of this conference would further strengthen the PCPIR in Andhra Pradesh and inspire other states too.

I wish this conference a grand success.

Dr. J. GEETA REDDY
Minister for Major Industries



It gives me great pleasure to note that Associated Chambers of Commerce and Industry of India (ASSOCHAM) southern regional chapter is organizing a “National Seminar on PCPIR (Petroleum, Chemicals & petrochemicals Investment Region Andhra Pradesh)” in Hyderabad on 20th May 2011.

I am glad to note that the prime objective of the seminar is to bring all the stake holders and policy makers on one platform to take forward the PCPIR region AP and to discuss and deliberate on the objective of setting up of PCPIRs in a planned manner to achieve synergies and for value added manufacturing, research and development & supply chain efficiencies.

I wish the seminar great success.



Neelkamal Darbari

Joint Secretary to the Govt. of India

It is very appropriate that ASSOCHAM is organizing a Conference on 'PCPIR – Andhra Pradesh Opportunities and Challenges'. The PCPIR Policy of the Government of India is aimed at creating synergies in infrastructure for development of the petroleum, chemicals and petrochemicals sector in a holistic manner. The Policy envisages a close partnership between the Central and the State Governments, Industries and domestic as well as international investors. Since the introduction of the Policy in 2007, there have been significant developments in the global economy that have posed new challenges in the actual implementation of the PCPIRs. The Conference is very timely and I am sure that it will bring into focus key issues that should engage all of us concerned with the growth and development of the PCPIRs.

I wish the Conference all success.



B. R. Meena

Vice Chairman and Managing Director

I am glad to know that ASSOCHAM Southern Region, Bangalore is organizing a one day seminar on PCPIR opportunities and challenges at Hyderabad on 20th May, 2011. PCPIR Policy is the initiative of GOI for ensuring over all development of the region besides generating huge employment potential. The impetus is on physical infrastructure by way of support by GoI and GoAP concerned. Recently, through a Mid-Course Policy shift, GOI is contemplating to extend some fiscal incentives to boost the development of PCPIRs. AP has all resources viz., 3 ports, major water supply scheme, abundant power and huge gas reserves in KG basin to make AP PCPIR a grand success in the years to come. GoAP is making all efforts to persuade HPCL to put up the Naptha Cracker Unit in Vishakhapatnam. It is hoped that once the anchor unit is set up, the PCPIR would go full stream.

I congratulate ASSOCHAM for taking the above initiative and wish the programme all success.



D.S.Rawat

It gives me a great pleasure that ASSOCHAM is organizing a conference on Opportunities and Challenges PCPIR in Andhra Pradesh. This seminar is of great relevance considering the potentials Petroleum, Chemicals and Petrochemical sector in India. This study “Mark Up for Growth: PCPIR in Andhra Pradesh” categorically highlights the scope of developing PCPIR in Andhra Pradesh. I fervently hope this report will guide us to further promote development of PCPIR in Andhra Pradesh.

I sincerely thank and acknowledge the support extended to us by the Ministry of Chemicals and Fertilizers, Government of India, Government of Andhra Pradesh, Andhra Pradesh Industrial Infrastructure Corporation Ltd. I also thank our HPCL, GMR Group, ESSAR Oil for partnering with us in organizing this event. I express my gratitude to all speakers, sponsors and media partners.

My special thanks to our knowledge partner PricewaterhouseCoopers India for formulating this background paper. I wish this conference a grand success and hope that the sessions and the publication will provide insight and prove relevant to all.



Kameswara Rao

Leader Energy Utilities and Mining Practice, PwC India

ASSOCHAM & PwC have come together in an important initiative to present a birds-eye-view perspective on Petroleum, Chemicals and Petrochemicals Investment Regions (PCPIR) and the opportunities & challenges for PCPIR in Andhra Pradesh. This background paper, introduces the concept of a PCPIR, discusses global success studies, examines the scenario in India in general and Andhra Pradesh in specific and then endeavors to list down a few guiding factors to enable a successful future of PCPIRs in India.

I wish to acknowledge the immense contribution by the PwC team including Deepak Mahurkar, Associate Director, Sakshi Marwah, Senior Consultant, Raman Jee Jha, Consultant and Saurabh Jha, Knowledge Manager (Oil & Gas), PwC. We would also like to extend our heartiest gratitude to the PwC Brand & Communication (B&C) team without whose contribution this background paper would not have been a possibility.

We at PwC are indeed grateful to ASSOCHAM for the opportunity provided to associate with the publication. We wish the seminar great success.

A Primer

PCPIR

The petroleum, chemicals and petrochemicals sectors in India are well established and have recorded a steady growth over the years. These sectors are major contributors to India's economic growth and regional development. Government of India has over the years taken many positive steps drive growth of the industry and put it on the global map. In a similar initiative, the Government of India notified the Petroleum, Chemicals and Petrochemical Investment Regions (PCPIR) policy in 2007 to provide a major fillip to the refining, petrochemicals and chemical industries in the country.

Objective of Setting up a PCPIR

The PCPIR policy aims to ensure planned development of industrial hubs focused on the petroleum, chemical and petrochemical sectors with an integrated and sustainable approach in order to extract synergies for world class manufacturing, research and development. It is envisaged that the PCPIRs will help in promoting investment in the sector and making India a key hub for both domestic and international markets. Government intends to provide a transparent and investor friendly policy and facility regime in order to attract major investments from both Indian and foreign investors. The PCPIRs would reap the benefits of co-siting, networking and greater efficiency through the use of

common infrastructure and support services. PCPIR would have high-class infrastructure and will provide a conducive environment for setting up businesses. This would thus result in a boost to manufacturing, augmentation of exports and generation of employment. PCPIR would help in paving way for inclusive growth in region, sector and economy.

A PCPIR would be a specifically delineated investment region with an area of around 250 square kilometres planned for the establishment of manufacturing facilities for domestic and export led production of petroleum, chemicals & petrochemicals, along with the associated services and infrastructure.

A PCPIR consists of a processing and a non-processing area. The processing area would occupy a minimum of 40% of the total area, i.e. about 100 square kilometres. It includes the manufacturing facilities, along with associated logistics and other services, and required infrastructure. The non-processing area would hence occupy a maximum of 60% of the total area, i.e. about 150 square kilometres and would include residential, commercial and other social and institutional infrastructure.

The key features of a PCPIR as per the PCPIR policy are depicted below:

Features of a PCPIR

- A specifically delineated investment region
- Area of about 250 square kilometers
- Planned for setting up of manufacturing facilities for domestic and export led production of petroleum, chemicals & petrochemicals, along with the associated services and infrastructure
- A combination of production units, public utilities, logistics, environmental protection mechanisms, residential areas and administrative services
- It may include one or more Special Economic Zones (SEZ), Industrial Parks, Free Trade & Warehousing Zones, Export Oriented Units, or Growth Centers
- The PCPIR could cover existing settlements/industries & estates/ services and would therefore benefit from and be complementary to the region. The concerned state government

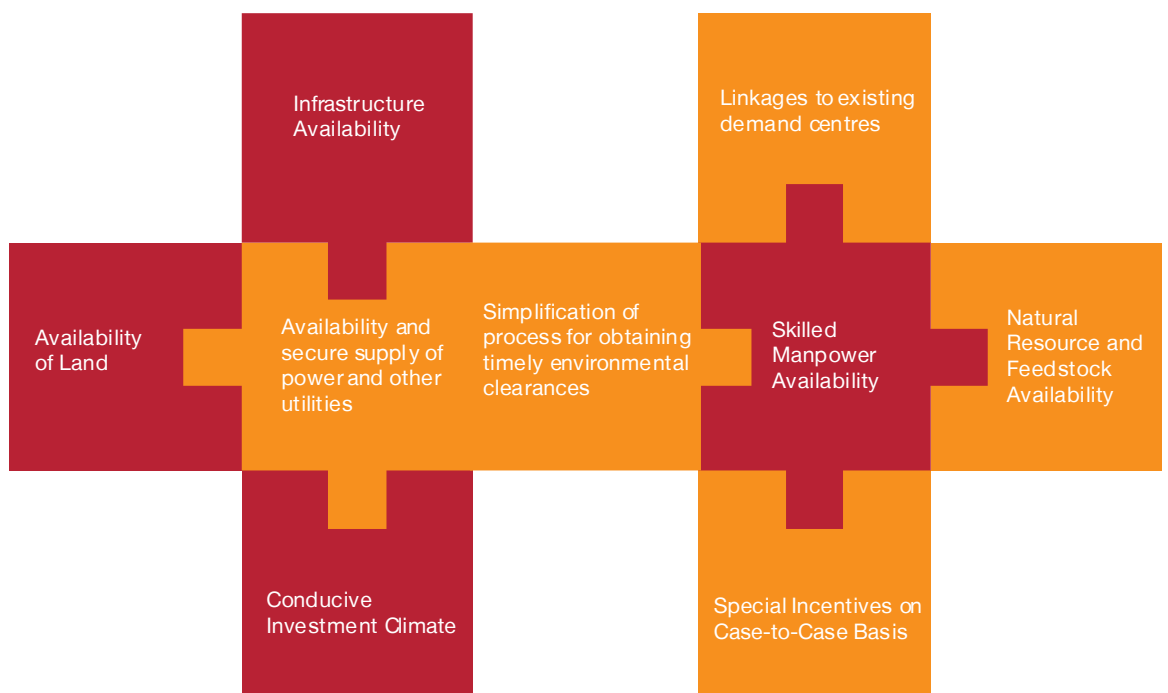
may not acquire the entire area comprising the PCPIR, but it will notify the same.

- Each PCPIR would have a refinery/ petrochemical feedstock company as an anchor tenant
- Internal infrastructure will be built and managed by a Developer, or a group of Co-developers
- External linkages including Rail, Road (National Highways), Ports, Airports, and Telecom, will be provided by Government of India and the concerned state government
- The users of PCPIR infrastructure will pay for its use, except to the extent that the government supports the service through budgetary resources

Enablers for a PCPIR

A PCPIR requires some enabling ‘Push-Pull’ factors that are vital for its establishment and for it to achieve the objectives it was set out to achieve. These factors are like piece of a puzzle and without the presence of any of these pieces, the whole picture cannot be completed. These enabling factors are depicted in the figure below:

Enabling Factors for PCPIR



Differentiators for a PCPIR

One of the major objectives of setting up a PCPIR is attracting significant investment from both domestic and foreign investors. This requires a PCPIR to differentiate itself from other investment avenues available to the investors i.e. provide a unique selling proposition.

These differentiators include availability of infrastructure, availability of natural resources in the region, export promotion policies, and a defined legal framework.

However, one of the most important differentiator that a PCPIR offers to a potential investor is the 'cost advantage' achieved due to various factors including the economies of scale, integrated approach, sharing of infrastructure and support services etc. This is vital for any company interested in investing in a PCPIR as the cost savings provide a definite competitive edge not only in the domestic market but in the regional and global markets as well.

Chemical hubs worldwide

Large scale industrial clusters for the chemicals industry have developed in Europe and the USA since the beginning of the 19th century. These include Port of Rotterdam (Netherlands), Port of Antwerp (Belgium), and Bayport Estate in Houston (USA).

Asia and Middle East have seen the development of these hubs towards the latter half of the century. These hubs include Jurong Island in Singapore, Jubail & Yanbu in the Kingdom of Saudi Arabia and the Chinese hubs at Nanjing and Shanghai. **A common thread that runs across all these hubs is that they have been developed in regions having an established port infrastructure.**

Global chemical hubs



Location	Name of the Hub	Background	Key Companies
Rotterdam, Netherlands	Chemical Estate in Port of Rotterdam (POR)	1903, Refineries set up by Shell	Shell, Akzo Nobel, Exxon Mobil, DSM, Degussa, Lyondell Basell, Huntsman
Houston, USA	Bayport Chemical Estate	Refinery set up by Exxon Mobil in 1930s	Shell, BASF, Air Liquide, Du Pont, Ineos, LyondellBasell
Antwerp, Belgium	Chemical Estate in Port of Antwerp (POA)	Petrochemical industry in emerged in the 1930s with the construction of two refineries, after WWII two additional refineries were set up	Air Liquide, BASF, Total, Bayer Material Science, Exxon Mobil
Jurong Island, Singapore	Jurong Islands Chemical Estate	Refineries set up by three companies in 1960s	BASF, Celanese, Exxon Mobil, Dupont, Mitsui Chemical, Chevron, Texaco, Shell

Jabel & Yanbu Cities, Saudi Arabia		The Royal Commission for Jubail and Yanbu (RCJY) was established as an autonomous organization of the Saudi Government in 1975	Saudi Aramco, SABIC
Shanghai, China	Shanghai Chemical Industrial Park	Developed as of Chemical estates under the 10th-Five year plan	BP, BASF, Bayer, Degussa, Huntsman, SUEZ, Vopak, Air Liquide, Praxair
Nanjing, China	Nanjing Chemical Industrial Park	Developed as a part of China's drive to expand the chemicals sector and attract foreign investment	Sinopec, BASF, Ciba

Each of these hubs have played an instrumental role in attracting significant amount of investments, creating huge employment opportunities and also transforming the infrastructure in and around the regions of their development.

For instance, Jubail and Yanbu were developed at an overall investment of 84 billion Riyal. The cities have attracted over 233 industries that have invested more than 244 billion Riyal and created over 107,000 jobs.

Similarly, Jurong Island hosts over 95 major global companies such as Shell, ExxonMobil, Chevron, DuPont, BASF, Sumitomo Chemicals and Mitsui Chemicals. Jurong Island has drawn cumulative fixed asset investments of over \$30 billion and is providing employment to 8,000 as of date.

The port of Antwerp is the largest and most diversified petrochemical centre in Europe. Seven of the ten largest chemical companies in the world have one or more production sites within the cluster. The Antwerp port area produces more chemical substances than anywhere in the world.

More than 45 chemical companies and 5 refineries form one of the world's largest oil and chemical centres at the port of Rotterdam.

The Indian chemical industry is around USD 40 billion in size (3% of GDP), employing 1 million people (both direct & indirect employment), with a total investment of USD 60 billion. The petrochemical capacity growth rate which has been 3-4% p.a. over the last 5 years is expected to increase 4 times to 12-15% p.a. over the next 5-7 years. A mega trend that has emerged in the global chemicals and petrochemicals industries in the recent years is the eastward shift of these industries towards the Middle East and Asia supported by the emergence of global petrochemicals hubs in these regions. This simultaneously represents a 'tremendous window of opportunity' for the Indian chemicals and petrochemicals industries. The Indian chemicals and petrochemicals industry can take advantage of this 'shift' and attract large investments from investors keen to invest in the region near the mega demand centres— India and China. However, the Indian industry faces major competition from the hubs in China, Singapore and the Middle East to grab a share of this investment pie. Therefore, the Indian industry needs to maintain certain levels of 'competitiveness' and 'cost-effectiveness' to tackle this competition. Therefore, PCPIRs with their integrated and resource efficient approach are vital for the Indian chemicals and petrochemicals industry.

Narrating the Indian Experience

PCPIRs are expected to play a vital role in India's story of inclusive growth and development. As on date, Government of India has notified four PCPIRs, namely, Dahej in Gujarat, Haldia in West Bengal, Paradeep in Orissa and Vishakhapatnam in Andhra Pradesh.

Proposals of the Governments of AP, Gujarat and West Bengal for development of PCPIRs were approved by the Cabinet Committee on Economic Affairs (CCEA) in 2009, while the Orissa PCIPR got government approval in 2010. Proposal of the Government of Tamil Nadu for a PCPIPR at Cuddalore has recently been approved by the Cabinet Secretary. The proposal has now been forwarded to the CCEA.

Summary of Indian PCPIRS



Name and location	Area (sq.km.)	Anchor Tenan	Approval Status
Bharuch, Gujarat	453	OPAL (ONGC and GSPC)	Approved
Visakhapatnam, Andhra Pradesh	603	HPCL and GMR	Approved
Haldia, West Bengal	250	Indian Oil Corporation and CALS Refinery Limited	Approved
Mangalore, Karnataka	300	MRPL/ONGC	Planned
Cuddalore, Tamil Nadu	250	Nagarjuna Oil Corporation	Approved by the Cabinet, forwarded to CCEA
Paradeep, Orissa	284	Indian Oil Corporation	Approved

The next section provides an overview of the approved PCPIRs other than the AP PCPIR which has been covered in detail in the next chapter.

Gujarat PCPIR

- Gujarat PCPIR, a brownfield development, consists of existing Dahej and Vilayat Estate and proposed Dahej multi-product SEZ. It is in close proximity of other chemical estates, onsite chemical port terminal and LNG terminal.
- ONGC Petro additions Ltd (OPaL), a JV of Oil and Natural Gas Corporation and Gujarat State Petroleum Corporation (GSPC) is the anchor tenant and is constructing a multi feed petrochemical cracker in the PCPIR.
- The existence of many chemical, petroleum and petrochemicals estate around PCPIR coupled with availability rich natural resources and feedstock in the region provide it with a unique advantage.

- Many companies have already proposed plans for a variety of projects in the PCPIR with total committed investments of USD 5 billion. Private developers are developing 3 SEZs in the PCPIR.

West Bengal PCPIR

- West Bengal PCPIR, a brownfield development combines Haldia mainland (200 sq km approx) and Nayachar Island (50 sq km approx).
- The site already consists of a port and other required infrastructure in addition to many large chemical, petrochemicals and petroleum facilities. The project has approved infrastructure investments of Rs. 2,108 crores (USD 421.6 million) from Government of India
- Nayachar Island is being developed primarily as an island processing zone complimenting the Haldia mainland. The island has a large waterfront that can provide easy access to jetties and other water transport facilities.

- The PCPIR aimed at establishing West Bengal as major petroleum, petrochemicals and chemicals is ensured feedstock availability from Indian Oil Corporation. Location of the PCPIR provides it a strategic advantage for sourcing feedstock from South East Asia. Existing units such as Haldia Petrochemicals, South Asian Petrochemicals etc. would drive the growth of downstream petrochemicals as well as consumers units by providing feedstock.

Orissa PCPIR

- Orissa PCPIR, a Greenfield project, is proposed to be developed in Paradeep, with the refinery cum petrochemical complex of Indian Oil Corporation as the anchor tenant.
- The refinery cum petrochemicals complex will serve as an enabler for the downstream petrochemicals units planned in the region by ensuring feedstock availability. Proximity to the Paradeep port will facilitate feedstock sourcing and enhance connectivity to markets to the end products.
- The PCPIR has received investment commitment of USD 572 million from the Orissa government for infrastructure developments. The Central Government will also invest Rs. 796 crores for infrastructure development under “Viability Gap Funding”. Phase – I of the PCPIR is expected to be completed by 2015 and the entire project completion is expected by 2030.

Challenges for PCPIR's in India

- One of the major challenges for PCPIRs in India is availability of Feedstock. India is heavily dependent on imports to meet its crude oil requirements. The recent production decline from KG-D6 and the lack of new discoveries do not augur well for gas availability and supply security in the country.
- Land Acquisition and getting environmental clearances could also emerge as a potential challenge for PCPIRs due to protests and other delays.
- The timely development of supporting infrastructure and external linkages is also vital for the successes of these major investments.
- Indian PCPIRs have to constantly compete with countries in the Middle East and South East Asia for attracting investments in the chemicals and petrochemicals sector.

Destination for PCPIR

Andhra Pradesh

The signing of MoU between Government of India and the State Government of Andhra Pradesh in October 2009 for establishment of AP PCPIR between Visakhapatnam and Kakinada has placed the state on the Industrial map of India.

PCPIR in the state of AP is a giant leap forward towards attracting domestic and foreign investments. With setting up of AP PCPIR, the state's objectives of attaining growth, development and employment generation are aligned with the national objective of creating a world class infrastructure such as widening of National Highways and State Highways, rail links, upgradation of airports etc. seaports, power supply and water supply. The notified area of PCPIR is 603.58 square kilometres (60,358 hectares). There are five Special Economic Zones (SEZs)

within the AP PCPIR including two Multi Product SEZs, two Pharma SEZs and one Apparel SEZ. Some of the major players who have expressed interest setting up units in AP PCPIR are as follows:-

1. Hindustan Petroleum Corporation
2. LG Polymers India Pvt. Ltd.
3. Coromandel Fertilizers Ltd
4. Andhra Petrochemicals Ltd
5. Rain Commodities Ltd.
6. Pharma City with Pharma SEZ
7. Hetero Pharma SEZ
8. Godavari Fertilizers & Chemicals Ltd
9. Nagarjuna Fertilizers & Chemicals Ltd
10. 1 MMT Crude Oil Strategic Storage Cavern by ISPRL (under process)

AP PCPIR has considerable potential for investments as indicated in the Table below:

Sectors	Projected Investments in next fiscal yearss	
	(Billion USD)	(Billion ₹)
Petroleum and Petrochemical Sectors	47	2,160
Chemicals, Pharma and Fertiliser Sectors	11.5	520
Ancillary Industries	4.5	200
Housing and Allied Infrastructure	7.6	350
External Infrastructure	4.5	200
Total	75	3,430

Source: Andhra Pradesh Industrial Infrastructure Corporation Ltd.

Key success factors for AP PCPIR

Strategic location and robust infrastructure back up are the supports for domestic and global players to invest in setting up units in AP PCPIR.

How do these factors work for the AP PCPIR are detailed hereunder:-

- 1. Strategic Location:** The spread of the AP PCPIR (600 sq km) as well as the coastline (140 km) are much larger. This strategic location of PCPIR in the coastal state of AP will certainly facilitate easy access to both the domestic markets and global markets including markets in South East Asia and East Asia.
- 2. Feedstock Availability:** Besides the already existing refinery of HPCL at Vishakhapatnam, one more refinery with a capacity of 15 million tonnes has been proposed by an HPCL-led consortium near Vishakhapatnam. The GMR group also, has plans of setting up a refinery of similar capacity in the Kakinada Special Economic Zone (KSEZ). Therefore, within the AP PCPIR region, there will be three major refineries that will provide the feedstock for the downstream units. In addition, The Krishna Godavari Basin (KG Basin) which is has the highest gas reserves (200 MMSCMD) in India. Thus availability of gas for units in AP PCPIR will not be constrained subject to the production profile of gas producing fields and gas pipeline connectivity of the units in the region.
- 3. Land Availability:** About 6, 240 hectares of land is available for allotment out of the total 7,600 hectares of land developed. Thus, land bank for new industrial units is readily available. Although, a large extent of land has already been acquired and infrastructure provided for, there exists a considerable scope to get more lands for industrial development.
- 4. Linkages to water supply:** As AP PCPIR abuts the Godavari River, availability of water is not a constraint for units in PCPIR. With the commissioning of a dedicated Industrial Water Supply Project to supply 776 million litres per day from River Godavari and River Yeleru, units in PCPIR can be assured of reliable water supply.
- 5. Power supply:** With an installed capacity of 14,086 MW, uninterrupted supply of power to units in AP PCPIR is assured. Capacity additions of another 10,000 MW in the next three years have been planned for. 220 / 132 kV sub-stations already exist in the region. There is an NTPC power station with 1000 MW capacity, being expanded by another 1000 MW capacity, in the vicinity.
- 6. Infrastructure Availability:** Units in PCPIR are connected by three ports, two airports linked by National Highway Golden Quadrilateral projects and rail connectivity to different locations. Investment outlay of Rs. 190,310 million is proposed for

external infrastructure development
the details of which are provided in the
table below:-

External Infrastructure Development	Total outlay for infrastructure development
	(million ₹)
Road Network - Improvement & Greenfield	43,810
New rail links & rail freight solutions	10,000
Greenfield airport, Air cargo complex & upgradation of existing airport	26,200
upgradation of port facilities	36,000
Other external infrastructure (logistics hubs, water supply, power supply, waste management)	74,200
Total outlay for external infrastructure development	1,90,310

Source: Andhra Pradesh Industrial Infrastructure Corporation Ltd.

6.1 **Ports:** AP PCPIR boasts of three large ports namely the Visakhapatnam Port, Gangavaram Port and Kakinada Deep Water Port. The Visakhapatnam Port is India's largest cargo handling port with handling capacity of 65 Million Metric Tonnes Per Annum (MMTPA). Gangavaram Port is India's deepest port with 21 metres draft and automated handling. Its present capacity is 35 MMTPA and ultimate capacity is 200 MMTPA. Kakinada Deep Water Port has four berths with 12 MMTPA handling capacity having 13 metres draft. Two more ports viz. A dedicated port at Kona and another one in Mutyalammappalem are also being planned in the region.

6.2 **Road and Railway Connectivity:** National Highway - 5 (Chennai – Kolkata) runs parallel to PCPIR. Industrial Parks and SEZs are connected through 4-lane access road to NH-5. Chennai - Howrah

Trunk Railway line runs close to PCPIR. National Highway 214 between Kathipudi and Kakinada will also be improved as 4 lanes in the first phase and to 6 lanes in the second phase. State Highway-97 is also proposed to be upgraded from 2 to 4 lanes. A 138 km PCPIR Expressway connecting Gangavaram Port to Kakinada Port is also proposed.

6.3 **Airports:** Domestic airports at Visakhapatnam and Rajhamundry in the region provide connectivity. Besides, additional investments in the proposed captive airport and air cargo terminal as well as in the new international airport at Vishakhapatnam have also been planned for.

None of the factors detailed above are mutually exclusive and will be able to support the successful development of AP PCPIR on a standalone basis. All these factors should co-exist as these will in tandem contribute to the success of AP PCPIR by way of attracting investments.

From Here On

PCPIRs in India

The success of PCPIR in Andhra Pradesh and other approved PCPIRs hinge on the pace and progress of the development activities proposed as a part of the development plans by the nodal agency. The first and foremost critical step is drafting of an implementation roadmap elaborating upon the projects and activities therein which need to be undertaken within the stipulated timelines as decided based on stakeholder consultations. This roadmap will also lay down the appropriate institutional framework and financing mechanisms for the various categories of projects identified for development in the PCPIR (e.g. land development, infrastructure development projects etc.), phasing of each of the projects, estimation of costs and revenue and the broad guidelines for project development.

Thus formulation and approval of action plan by all concerned stakeholder forms the starting point for project implementation. However, in order to ensure that the roadmap is adhered to in its entirety it is critical that the following guiding factors and determinants are taken into consideration:

1. **Lessons from Global Hubs**
2. **Stability in Investment Climate**
3. **Effective Project Monitoring and Evaluation Framework**

Lessons from Global Hubs

Valuable insights can be drawn for the upcoming PCPIRs by studying the models of Global Chemical Hubs listed in the earlier chapter. There are definite differences in the context and conditions in which these global hubs have thrived. However, many case studies on excellence

in planning and execution are there to be identified, interpreted and analyzed to suit Indian requirement. PCPIR authorities can also look for similar case studies in the industry itself.

Case Study: BASF: 'Verbund'

BASF's "**Verbund**" concept is widely regarded as one of the best examples of integrated production strategies with the most efficient use of resources. BASF terms it as the "Foundation for BASF's competitiveness and innovativeness in all regions".

The company has six world-scale Verbund sites that utilize cost-effective and energy-efficient production to achieve substantial savings for the company. The company's Ludwigshafen site alone saves over 500 million Euros by utilising a logistically optimized Verbund structure.

At the company's Verbund sites, production plants, energy and waste flows, logistics, and site infrastructure are all integrated, so that chemicals manufacturing process utilize lesser energy, give higher product yields and prevent wastage of resources.

In a **Production Verbund**, plants are linked to create efficient value added chains from basic chemicals to higher value products. The by-products of one plant can be used as raw material in some other plant.

In an **Energy Verbund**, the production and energy demands are linked to obtain significant gains in energy efficiency. The waste heat from one production process captures and utilized in other processes instead of releasing in the environment. BASF achieves savings of up to 1.5 million tonnes of oil equivalent per year by utilising the concept.

BASF's unique Verbund approach is depicted in the figure below.



Linking plants in a Production Verbund to create efficient value-adding chains from basic chemicals to higher value products

<p>Concept</p> <ul style="list-style-type: none"> • Integrated production • Secured raw material supply • Efficient use of by-products • Minimization of greenhouse gas emissions • Common infrastructure • Integral research platforms: global R&D Verbund • Integral customer interaction 	<p>Benefits</p> <ul style="list-style-type: none"> • Highly efficient production = cost leadership = significant cost savings: approx € 500 million p.a in Ludwigshafen alone • Resource efficiency and waste reduction = leadership in sustainability = energy savings: approx. 1.5 million tons of oil equivalent p.a. globally • Integral knowledge management = leadership in innovations (>1,000 patents p.a.) • Customer orientation = supplier of choice
<p>Partners in Verbund</p> <ul style="list-style-type: none"> • Production Plants • Research Units • Customers • Site Communities 	<p>Advantages for Economic Review and the Environment</p> <ul style="list-style-type: none"> • Efficient Utilization of Raw Materials and Energy • Natural Resources Conservation • Emission and Waste Reduction • Innovations for the Company

Source: BASF

Thus Verbund approach may be looked upon as a model to draw lessons for the upcoming PCPIRs in India.

Stability in Investment Climate

As a project developer, the policy and regulatory environment for the PCPIR is an external factor beyond the purview of the developer. However, this regime has a significant bearing on the investment decision making process. Therefore, it is important that the regime that is specified to the developer before the project initiation is stable and devoid of ambiguities.

Effective Project Monitoring and Evaluation Framework

The project monitoring and evaluation framework should ensure a regular evaluation of projects to avoid time and cost overruns and ensure effective implementation. Status reports from project developers must be scrutinized to identify any gaps and ensure corrective actions are taken. Various stakeholders in the institutional framework should be made accountable and also vested with authority.

List of Abbreviations

AP	Andhra Pradesh
CCEA	Cabinet Committee on Economic Affairs
GSPC	Gujarat State Petroleum Corporation
ISPRL	Indian Strategic Petroleum Reserves Limited
KG Basin	Krishna Godavari Basin
KSEZ	Kakinada Special Economic Zone
MMSCMD	Million Metric Standard Cubic Metres Per day
MMT	Million Metric Tonnes
MMTPA	Million Metric Tonnes Per Annum
OPaL	ONGC Petro additions Ltd
PCPIR	Petroleum, Chemicals and Petrochemical Investment Regions
SEZ	Special Economic Zone

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S. No.	Description
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4	Singapore~ A Global Chemical Hub, Factsheet 2011, by the Singapore Economic Development Board (EDB)
5	Website of the Royal Commission for Jubail and Yanbu, Visited on May 12, 2011
6	Website of the Port of Antwerp, Visited on May 12, 2011
7	Website of the Port of Rotterdam, Visited on May 12, 2011
8	Website of the Shanghai Chemical Industry Park, Visited on May 12, 2011
9	Website of the Government of Nanjing, Visited on May 12, 2011
10	Presentations made by the Government of Gujarat, Government of Orissa, Government of West Bengal and Andhra Pradesh Industrial Infrastructure Corporation Ltd. at the India Chem 2010 Conference
11	BASF Fact book on Verbund, June 2010

About ASSOCHAM

The Associated Chambers of Commerce and Industry of India (ASSOCHAM), India's premier apex chamber covers a membership of over 2 lakh companies and professionals across the country. It was established in 1920 by promoter chambers, representing all regions of India.

As an apex industry body, ASSOCHAM represents the interests of industry and trade, interfaces with Government on policy issues and interacts with counterpart international organizations to promote bilateral economic issues. ASSOCHAM is represented on all national and local bodies and is, thus, able to pro-actively convey industry viewpoints, as also communicate and debate issues relating to public-private partnerships for economic development.

ASSOCHAM members represent the following sectors:

- Trade (National and International)
- Industry (Domestic and International)
- Professionals (e.g. CAs, lawyers, consultants)
- Trade and Industry Associations and other Chambers of Commerce

About PwC

PwC firms provide industry-focused assurance, tax and advisory services to enhance value for their clients. More than 161,000 people in 154 countries in firms across the PwC network share their thinking, experience and solutions to develop fresh perspectives and practical advice. See pwc.com for more information.

In India, PwC (www.pwc.com/India) offers a comprehensive portfolio of Advisory and Tax & Regulatory services; each, in turn, presents a basket of finely defined deliverables. Network firms of PwC in India also provide services in Assurance as per the relevant rules and regulations in India.

Complementing our depth of industry expertise and breadth of skills is our sound knowledge of the local business environment in India. We are committed to working with our clients in India and beyond to deliver the solutions that help them take on the challenges of the ever-changing business environment.

The Indian firm has offices in Ahmedabad, Bangalore, Bhubaneshwar, Chennai, Delhi NCR, Hyderabad, Kolkata, Mumbai and Pune.

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