India’s Petrochemical Vision 2030 – Opportunities and Challenges

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Indian Petrochemical Sector – a key pillar of the economy

- **Total demand at 17m MT – a USD $20bn+ market**

- **5 year historic demand growth at CAGR 8% - 2.5X of global**

- **Current capacity of 15m MT**

- **Significant capacity addition by 2020 – total capacity to reach 22m MT**

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Key question – what is the potential over the next 10-15 years?
We believe there is significant headroom for growth

**Per capita consumption much lower than global peers**

Plastics consumption per capita (Kg, 2016)

- N. America: ~60 Kg
- Japan: ~40 Kg
- China: ~30 Kg
- Europe: ~30 Kg
- India: ~10 Kg

*(Global avg.)*

**Key growth drivers likely to have significant impact**

- Economic growth to fuel demand in key end user segments - packaging, automotive, infrastructure, textile etc.
- Changing consumer behaviors – increased adoption of downstream products
- Government-led initiatives to create demand impetus – e.g. Make in India, Swachh Bharat, Housing for all, etc.
Indian petrochemical demand can register 3X growth - potential to be a ~USD $70 billion market by 2030

India’s per capita consumption growth

1. Includes major derivatives of propylene, ethylene, aromatics & butadiene; Estimated at current prices
Source: A.T. Kearney Global Petrochemical Model, Nexant
Five key challenges have held the sector back from realizing full potential – solving them is critical

1. Underpenetrated end-user markets
   - Slow pace of adoption in many industry segments (e.g. limited use of plasticulture in agriculture, engineering plastics in automobile)

2. Limited access to competitive feedstock
   - Low domestic availability (ethane; NGLs)
   - Feedstock cost disadvantage vis-à-vis global gas / coal based capacities

3. Absence of robust ecosystem with downstream players
   - Slow implementation of petrochemical parks
   - Infrastructure and logistics bottlenecks

4. Low focus on R&D
   - Limited indigenous capabilities to develop production technologies, efficient catalysts, additives, etc.

5. Regulatory and policy issues
   - Incentives lower than several Asian countries (e.g. as import duty waiver on feedstock, cheap credit, etc.)
A three pronged **Action Agenda** needs to be adopted to realize India’s petrochemical potential.

**Action Agenda**

1. **Increase demand penetration**
   - a. Promote petrochemicals usage in key end use industries
   - b. Leverage government initiatives to drive consumption
   - c. Enhance focus on high value derivatives to negate feedstock disadvantage

2. **Improve cost competitiveness**
   - a. Setup petrochemical complexes integrated with refineries
   - b. Explore possibility of reverse SEZs; strategic partnerships for feedstock import
   - c. Build feedstock flexibility to optimize cost; create global scale capacities

3. **Strengthen key enablers**
   - a. Expedite petrochemical park implementation
   - b. Enhance focus on R&D
   - c. Provide regulatory & policy support and increase ease of doing business
Enhancing usage: Increased awareness; co-creation with end-users and focused R&D can help enhance demand

**End Use Industry**

**Current State and Opportunity**

**Infrastructure**
- **Per capita PVC consumption in kg**
  - India: 2
  - USA: 12

- **Applications other than pipes are in early stages**
- **Low per capita consumption**
- **Advancing new applications in infrastructure to substitute traditional options**
- **R&D and product development** to generate high performing/cost effective solutions
- **Increased awareness** in end-use industry

**Automobile**
- **Plastic (kg) per car**
  - India: 5.0
  - Developed nations: 19.0

- **Low usage of engineering plastic components**
- **Technical innovation** to develop advanced composites, engineering plastics to replace metal components
- **Joint development with user industries**
- **Significant potential to replace metal**

Source: Industry reports, Press releases, A.T. Kearney
Feedstock flexibility: Feedstock markets have been volatile, building flexibility would be critical

Ethylene cash cost comparison for Naphtha vs. imported gas for cracker in India ($/T)

1. Range driven by variation in ethane shipping cost ($150-$250/T) depending on size of vessel
Source: A.T. Kearney Global Petrochemical Model, Nexant, Bloomberg, EIA
Petrochemical parks: creating world class production ecosystem with scale and efficiency would be critical

### Petrochemical Parks Implementation

<table>
<thead>
<tr>
<th>Feedstock accessibility</th>
<th>Best in class infrastructure</th>
<th>End-user cluster</th>
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<tbody>
<tr>
<td>Refinery / feedstock company as anchor investor</td>
<td>Rail, road, airport connectivity</td>
<td>Industries across downstream value chain</td>
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<td>Utilities and other services</td>
<td>Support and ancillary industries</td>
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<td>Enablers – talent pool, social infra. etc</td>
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Five-pronged **action agenda:**

1. **Develop vision and implementation roadmap for each hub**—in line with global benchmarks
2. **Build core infrastructure** such as multi modal logistics linkage, utilities via suitable SPVs
3. **Establish investor friendly processes** such as ‘single window’ clearance, policy support for land acquisition
4. **Provide incentives** for competitive business case
5. **Establish a dedicated steering team** with **center, state govt. and industry representation**

Source: Press articles, India chemicals website, A.T. Kearney
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| and Africa     | Doha      | Johannesburg |         |            |          |         |           |           |            |          |           |         |          |          |          |           |          |