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EXPORT-IMPORT BANK OF INDIA

INDIAN CHEMICAL INDUSTRY

NEW DIRECTIONS

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Indian Chemical Industry: New Directions

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CONTENTS

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LIST OF EXHIBITS

LIST OF TABLES

LIST OF BOXES

EXECUTIVE SUMMARY

Introduction

Chemical industry has been a critical component of the modern globalized world economy, converting raw materials like crude oil, natural gas, air, water, metals and minerals into diverse ready-to-use products which are essential to our daily lives. Apart from producing a wide range of finished products like fertilizers, pesticides, LED lighting and other agrochemical products, the industry also produces key inputs for other manufacturing activities like synthetic fibres and plastics and water chemistry that benefit living standards and consumers around the world.

Although the chemical industry is quite heterogeneous in character – ranging from commodity chemicals to research-driven products, it can broadly be classified into three major segments based on industry supply chain, viz., basic chemicals, specialty chemicals and knowledge-based chemicals.

On the global front, the chemical industry is not only important in terms of size but also in terms of its features, involving significant capital investment, high knowledge content and qualified human resources. Broadly, the Basic chemicals segment accounts for about 47% of the industry, Specialty chemicals with 25% share, and Knowledge-based chemicals hold a share of 28%. It is to be noted that the industry is a rich source of employment generation – about 15 million people are directly employed in the chemical industry. Apart from this, the industry's supply-chain spending also stimulates high levels of employment. An estimated 60 million jobs were supported through the purchase of goods and services by chemical companies in 2017, three-quarters of which was in Asia-Pacific alone.

In the last few years, the industry has received a substantial participation from the emerging markets economies across different levels of the value chain. The BRIC countries (Brazil, Russia, India, and China) accounted for 42.8% of global chemical sales in 2018. Nearly 75% of global chemical sales were attributable to BRIC, the EU and the USA in 2018.

In the modern times, the chemical industry acts as the basic building block for almost all other manufacturing industries such as textiles, pharmaceuticals, fertilizers, food processing, and paints. Its products permeate the entire spectrum of daily use items and cover almost every sphere of life. With regards investment, in absolute values, the level of world investment in the chemical sector stood at US$ 214 billion in 2018, 1.8 times higher compared to the levels in 2008. During this period, global investment grew 6% per annum on average, significantly lower than the Chinese investment growth of 10.6% during the same period.

The chemical industry, which was largely dominated by Europe and North America over the last many decades, has been increasingly finding new companies having their base in the emerging economies who are manufacturing quality products through innovative techniques. This paradigm shift in the global chemical industry is expected to create cross-border mergers and acquisitions resulting in the consolidation of the global industry. Simultaneously, leading chemical manufacturers are entering

emerging markets through joint ventures or acquisitions (mainly in the Middle East to gain access to feedstock, and in China and India to develop a local market presence).

In India, the chemical industry has emerged as one of the fastest growing, ranking third in Asia and the sixth largest market in the world with respect to output after USA, China, Germany, Japan and South Korea. Indian chemical industry's growth is largely driven by country's consumption growth story. The per capita consumption of chemicals in India is one-tenth of world average, and even when compared with other developing countries, Indian chemical consumption is low, making it an attractive destination to invest, grow and export.

Recent Trends in India

The chemical industry forms the backbone of industrial and agricultural development of India and provides building blocks for downstream industries, making it a significant contributor to India's national economic growth. The size of the Indian chemical industry is estimated to have reached around US$ 99 billion in FY 18. India is currently the sixth largest producer of chemicals in the world by sales value, accounting for 2.2% of the global share.

Over the last decade, the Indian chemical industry has evolved from being a basic chemical producer to becoming an innovative industry. With increasing investments in research and development (R&D), the industry is registering significant growth in the knowledge arena, including specialty and fine chemicals. The industry now produces many fine and specialty chemicals which have very specific uses and are essential for increasing industrial production.

Across the basic chemicals segment, while the production of dyes & pigments registered the highest AAGR of 6.9% during FY 15 - FY 19, inorganic chemicals registered the slowest average annual growth of 3.1%. Even though the AAGR for all sub-segments remained positive during FY 15 - FY 19, the positive and encouraging fact among the various segments of the Indian chemical industry has been the performance of specialty chemicals, primarily dyes and pigments.

The average annual growth in production of dyes and pigments was close to 7%, from 285 MT in FY 15 to 370 MT in FY 19. This high growth could partly be attributed to the low base and low absolute volumes of dyes and dyestuffs, but more significantly, it implies a consistent increase in market demand of such products. Given that the specialty chemicals are knowledge oriented, per unit price realization is far higher than most other segments of the chemical industry.

Chemicals, in 2018, was the fifth-largest component of the manufacturing sector's total value added, after machinery & equipment, high-tech goods, motor vehicles, and food products. In 2018, the top ten chemical-producing countries had a combined turnover of US$ 3.2 trillion, accounting for 86.7% of global chemical sales.

The volume of major chemicals produced in India amounted to 23 million MT in FY 19, out of which 9.6 million MT were Basic Chemicals and 13.4 million MT petrochemicals. The total production of the Indian chemical industry increased at an average annual rate of 4.8% – from 23 million MT in FY 15 to 27 million MT in FY 19.

India's Foreign Trade in Chemicals and Competitiveness of Exports

The share of overall chemicals and related products (including pharmaceuticals) in the country's total exports has been exhibiting a gradual upward trend, indicating that the growth in their exports during the recent past has outperformed India's total exports. Growth in exports of chemicals and related products for 2018 stood at 10.7% as compared to a negative growth of 9.2% in the country's overall exports. Further, during 2009 and 2018, while the overall merchandize exports from India have grown at an AAGR of 8.1%, the chemical exports grew at an AAGR of 12%.

India's exports of chemicals have been predominated by organic chemicals – export of which registered at a healthy average annual rate of 11.2% from US$ 12.1 billion in 2014 to US$ 17.7 billion in 2018. During the same time, India's imports of major chemicals grew at an average of 7.7% from US$ 25.8 billion in 2014 to US$ 33.3 billion in 2018. More than 50% of this import demand was met by supplies from China. Put overall, the industry as a whole had trade deficit amounted to US$ 7.3 billion in 2018, marginally lower than the deficit of US$ 7.5 billion in 2014.

In order to identify the products based on their competitiveness, the four-quadrant analysis is undertaken based on the HS Code classifications at 6-digit level, whilst calculating their NRCA and mapping them against the AAGR of global imports of all products. The analysis considers two major determinants of the India's chemicals industry's performance in overseas markets at a granular level, namely the NRCA for products at the national level, and Annual Average Growth Rate (AAGR) for global imports. Based on these considerations, a four-quadrant matrix is prepared for product identification, classified as:

- *Product Champions* - These products have the maximum potential, as the world import demand for these products has shown robust AAGR. At the same time, India's exports of these products to the world have also remained competitive, reflecting a positive NRCA values for such products. In the analysis, there are 200 products at HS 6-digit level which could be classified as Product Champions, out of which 34 products were from HS 28 (Inorganic chemicals; organic or inorganic compounds of precious metals, of rare-earth metals, of radioactive elements or of isotopes); 156 products from HS 29 (Organic chemicals); and 10 products from HS 32 (tanning or dye extracts).
- *Underachievers* - Underachievers are those set of products where India has the potential but have not been competitive enough to tap it. The global import demand of these identified products has exhibited significant growth over the period under consideration, while NRCA of these products is negative. In the analysis, 156 products came under this category at the HS 6-digit level, out of which 55 products were from HS 28; 90 products from HS 29; and 11 products from HS 32. The industry can strive towards increasing competitiveness in these markets for the identified products.
- *Growers in Declining Markets* - Products falling under this category are those which are showing growth, but in a declining market where demand is waning. Here, the identified products have a positive NRCA for India. In the analysis, 99 products came under this category at the HS 6-digit level, out of which 35 products were from HS 28; 46 products from HS 29; 13 products from HS 32 and 5 products from HS 3808.
- *Losers in Declining Markets* - India's Chemical and Dye Industry does not exhibit competitiveness in these products, and they also register weak global import growth during the period under consideration. In the analysis, 85 products came under this category at the HS 6-digit level, out

of which 48 products were from HS 28, 25 products from HS 29, 10 products from HS 32 and 2 products from HS 3808. The total value under this category stood at US$ 1.41 billion in 2018, contributing to 5% of India's total chemical exports. Indian companies involved in exporting products under this segment may like to diversify from this category.

Foreign Direct Investments in the Chemical Sector

Chemicals industry in India is increasingly becoming a globalized industry. Foreign direct investment (FDI) in the chemical industry and trade between parent firms and their subsidiaries is increasingly becoming significant for the sector. FDI has had a positive impact on growth, development, productivity and competitiveness for the Indian chemical industry. The country has benefited from the transfer and use of technology and the associated benefits of FDI inflows, which has increased over the last few years due to the several incentives that have been provided by the Government of India. The policy now allows for 100% FDI in chemicals under the automatic route.

In the last few years, chemical sector has been one of the top ten sectors receiving the FDI equity inflows in India. During April 2000 - September 2019, the chemical sector in India (excluding fertilizers) received FDI equity inflows worth US$ 17.2 billion. It is important to note that the growth of FDI equity inflows in the sector has been rather uneven. This is evident from the fact that while the FDI equity inflows recorded an AAGR of 33% during FY 12 to FY 19, a negative CAGR of (-) 8.3% was registered during the same period for the industry.

The total FDI equity inflows across the entire chemical sector (including pharmaceuticals) in India stood at US$ 2.2 billion in FY 19, US$ 71 million lesser from the previous fiscal. Even though the sector's share in total FDI inflows in the country has remained relatively low at 9%, it has grown remarkably in the last few years. During FY 12 – FY 19, excluding fertilizers, the total FDI inflows in the sector grew at an AAGR of 20%, with FDI in Drugs and Pharmaceuticals, despite being uneven, registering an AAGR of 165% during the same period. In the upcoming years, the FDI inflows in the Indian chemical sector are expected to go further up, given the fact that in order to increase the share of manufacturing in GDP to at least 25% by 2025 (from the current 16%), investments in chemical industry are crucial to propel the growth across both the industry and the manufacturing sector.

Imperatives to Realize Export Potential in Chemicals

The chemical industry, in India, directly or indirectly touches over 95% of all manufactured products. While the industry has registered phenomenal growth in the last two decades, it is to be noted that the sector's growth has largely been a result of growth in the FMCG sector. However, delivering profitable growth in a hypercompetitive market, low-growth world has become a bigger challenge today. To effectively address these roadblocks, the Study recommends a set of strategies to enable the sector reach its envisaged export potential.

Exploring New Markets

Leading chemical manufacturers are entering markets through joint ventures or acquisitions (mainly in the Middle East to gain access to feedstock, and in China and India to develop a local market presence). The most successful chemical producers soon are likely to be those that embrace the

changing dynamics in the global chemical industry and effectively position themselves in emerging markets. It's also important to consider regional differences - mature products in one region may be innovative products in another. At the same time, there may be a need to explore a new business model, packaging, or a delivery method, for example, to successfully deploying a product line in a certain region, and all these can be ascertained by enhancing customer relationships.

The Indian chemical industry, which has largely concentrated in the domestic market, needs to explore the tremendous opportunities it has abroad. This can be undertaken by either acquiring companies abroad or through Greenfield projects (which will have a certain gestation period). The other option is exploring markets through better networks, making up channel sales force, making business associates, making assignment-based agents, and enhanced marketing in the various regions.

Need for Greater Integration into the GVCs

Emphasis is laid on substitution of imports through capacity additions and more importantly the identification of need for greater integration into the Global Value Chains (GVCs) to enable specialization at various stages of production.

Analysing the forward and backward linkages in the Chemical sector in the Indian and Chinese context, it is observed that India has been having an increased dependence (backward linkage) on China for some critical inputs used by the chemical and pharmaceutical industry. During 2009-18, while India's import of chemicals from the rest of the world increased at an AAGR of 11.1%, the imports from China grew at an AAGR of 13.7%, making up for about 46% of India's total chemical imports in 2018. It is recommended that in order to reduce the import dependence from China and boost the chemical exports from India, greater focus should be laid on enhancing India's integration into the GVCs, enabling domestic manufacturers to specialize across various stages of production.

Import Substitution through Capacity Addition

Further, it is noted that heavy dependence on China for imports of chemicals, that are key inputs for both the pharmaceutical and the manufacturing sectors, could adversely impact the domestic markets even if the prices are increased slightly. Import substitution, in this regard, is not only required to make India self-reliant in end-to-end indigenous chemical manufacturing but more importantly, to make the sector globally competitive.

Fund for SMEs in the Chemical Industry

India's chemical industry is one of the largest and most diversified industries in the country and it consists of several small industries that cover hundreds of segments. However, given the paucity of funds available with them they are unable to upgrade themselves. They face not only technical constraints, but also feels challenged due to lack of quality manpower. With a significant market potential abroad, these SMEs needs to move up the value chain so as to exploit the opportunities in overseas markets. The SMEs also needs to conform by the various rules, regulations and good practices prevalent abroad.

A suitable fund may be constituted by the Government on the lines of the Technology Upgradation Fund as available to the textile industry, or provision of accelerated depreciation as available to the solar energy sector. The fund can also be utilized to access designs, patents, processes and technology. Such an initiative will make the industry, particularly the SMEs more robust and self-reliant.

Investments

Lastly, with regards investments, investments in the Indian chemical industry assumes greater importance on the two fronts – technology and innovation. Technological development may be achieved by the chemical industry at two levels. In the bulk products segment, the chemical industry should undertake process innovation with the objective of reduction in cost of production. In addition, the industry needs to invest in technological resources that would lead to specialized product development. Liberalization process has already increased the possibility of intra-firm transfer of technology and management practices in the form of consolidation within the economy as also from developed countries through foreign direct investment.

More specifically, on the technical front, the total R&D investments in the chemical sector stood at 0.3% of total sales in FY 19. Apart from sustaining growth in the domestic market, R&D activities are equally crucial for the home-grown players to have a larger pie of the global markets as well.

CHAPTER

INTRODUCTION

The chemical industry has been an integral part of the global economic landscape for many centuries, contributing to 7% of the world's GDP in 2017. From its inception in Europe during the industrial revolution to now, the industry has evolved manifolds, exceeding the US$ 5 trillion mark in 2017 and is projected to double the size by 2030[1].

Chemical industry is a critical component of the modern globalized world economy, converting raw materials like crude oil, natural gas, air, water, metals and minerals into diverse ready-to-use products which are essential to our daily lives. Apart from producing a wide range of finished products like fertilizers, pesticides, LED lighting and other agrochemical products, the industry also produces key inputs for other manufacturing activities like synthetic fibers and plastics and water chemistry that benefit living standards and consumers around the world. This implies that the business cycles of end user segments significantly affect the performance of the chemical industry.

As outlined in the Division 20 of Eurostat's NACE Rev. 2, the chemical industry broadly contains the following sub-sectors:

- Manufacture of basic chemicals, fertilizers and nitrogen compounds, plastics and synthetic rubber in primary forms;
- Manufacture of pesticides and other agrochemical products;
- Manufacture of paints, varnishes and similar coatings, printing ink and mastics;
- Manufacture of soap, detergents, cleaning, polishing, perfumes and toilet preparations;
- Manufacture of other chemical products, including explosives and pyrotechnic products, glues, essential oils and chemical products not elsewhere classified (e.g. photographic chemical material, composite diagnostic preparations, etc.);
- Manufacture of man-made fibers.

Although the chemical industry is quite heterogeneous in character – ranging from commodity chemicals to research-driven products, it can broadly be classified into three major segments based on industry supply chain, viz., basic chemicals, specialty chemicals and knowledge-based chemicals.

[1] Global Chemical Outlook 2019, UNEP

Table 1: Classification of the Chemical Industry

Segments	Characteristics	Constituent Industries
Basic	• High Volume, Low Value-Added • Limited product differentiation across manufacturers • High entry barriers on account of high capital spending and stringent regulations	Petrochemicals, Fertilizers, Inorganic Chemicals, Other Industrial Chemicals
Specialty	• High product differentiation and value-addition • Typically, smaller production units • Low capital investment levels	Adhesive sealants, Catalysts, Industrial gases, Plastic additives
Knowledge	• Differentiated chemical and biological substances • High investment in R&D and marketing	Agrochemicals, Pharmaceuticals, Bio-technology

Source: EXIM Bank Research

Global chemical industry

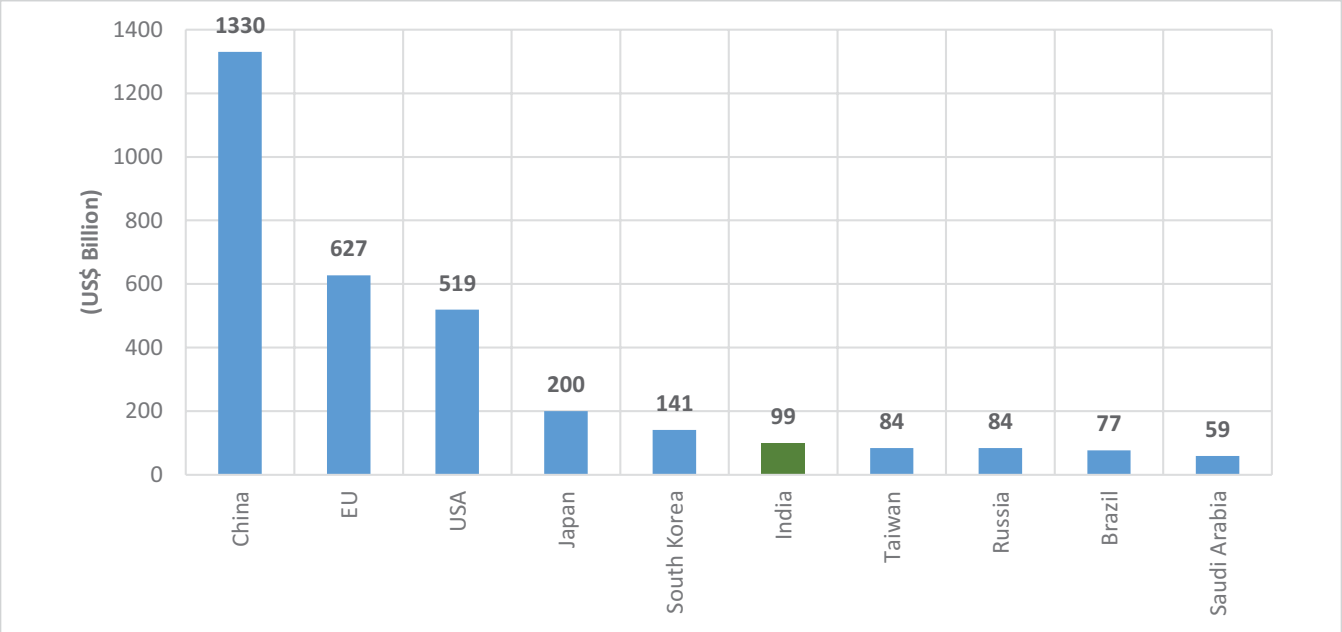
The global chemical industry, as categorized above, is not only important in terms of size but also in terms of its features, involving significant capital investment, high knowledge content and qualified human resources. Broadly, the Basic Chemicals segment accounts for about 47% of the industry, Specialty Chemicals with 25% share, and Knowledge-based Chemicals hold a share of 28%.

The industry plays an important role in global economic and social development; it is a science, technology and knowledge-based industry that is essential to a sustainable world economy while at the same time contributing towards improved health and nutrition. In addition, the industry is a rich source of employment generation – about 15 million people are directly employed in the chemical industry[2]. Apart from this, the industry's supply-chain spending also stimulates high levels of employment. An estimated 60 million jobs were supported through the purchase of goods and services by chemical companies in 2017, three-quarters of which was in Asia-Pacific alone.

Chemicals, in 2018, was the fifth-largest component of the manufacturing sector's total value added, after machinery & equipment, high-tech goods, motor vehicles, and food products. In 2018, the top ten chemical-producing countries had a combined turnover of US$ 3,220 billion, accounting for 86.7% of global chemical sales.

[2] Global Chemicals Outlook 2019, UNEP

Exhibit 1: Global Sales of the Chemical Industry: 2018



Source: CEFIC, EXIM Bank Research

In the last few years, the industry has received a noteworthy participation from the emerging markets economies across different levels of the value chain. The BRIC countries (Brazil, Russia, India, and China) accounted for 42.8% of global chemical sales in 2018. Nearly 75% of global chemical sales were attributable to BRIC, the EU and the USA in 2018. The remaining quarter of global chemical sales were generated mainly by emerging countries in Asia, including the Middle East[3].

By region, Asia Pacific (APAC) led the way, creating 51% of the worldwide chemical industry's GVA in 2018, followed by North America and Europe with a contribution of 21% and 17% to the total GVA, respectively.

Six countries out of the top ten producers in 2018 were in Asia (China, Japan, South Korea, India, Taiwan, and Saudi Arabia), generating chemical sales of US$ 2,094 billion – 51.5% of the world market. It is to be noted that in 2018, China's sales levels at US$ 1,330 billion were higher than the EU and the US markets combined.

The chemical industry depends on free trade and open markets, both for its raw materials and as outlets for its products. The industry relies increasingly on tightly interconnected clusters that participate in global value chains. In most cases, basic chemicals undergo several processing stages to be converted into downstream chemicals. This explains why, in terms of consumption, the chemical industry is its own largest customer and accounts for approximately 33% of the total consumption.
It is crucial to note that the chemical industry has benefited tremendously from China's economic growth of the past two decades. China's capacity could not be built fast enough to meet domestic demand, so chemicals had to be imported. This allowed the West European and the North American players to grow while their home markets were experiencing near stagnation.

[3] CEFIC 2020 Facts & Figures

The positive relationship between global development and chemical industry innovation is also empirically well established. Thus, for instance:

- Synthetic dyes were pivotal to the development of textiles during the Industrial Revolution, and led to the birth of the pharmaceuticals industry;
- Petrochemicals initiated the post-war plastics and materials revolution;
- Fine and specialty chemicals offered and continue to offer a multitude of products, both for consumer and industrial applications or processes, active ingredients for crop

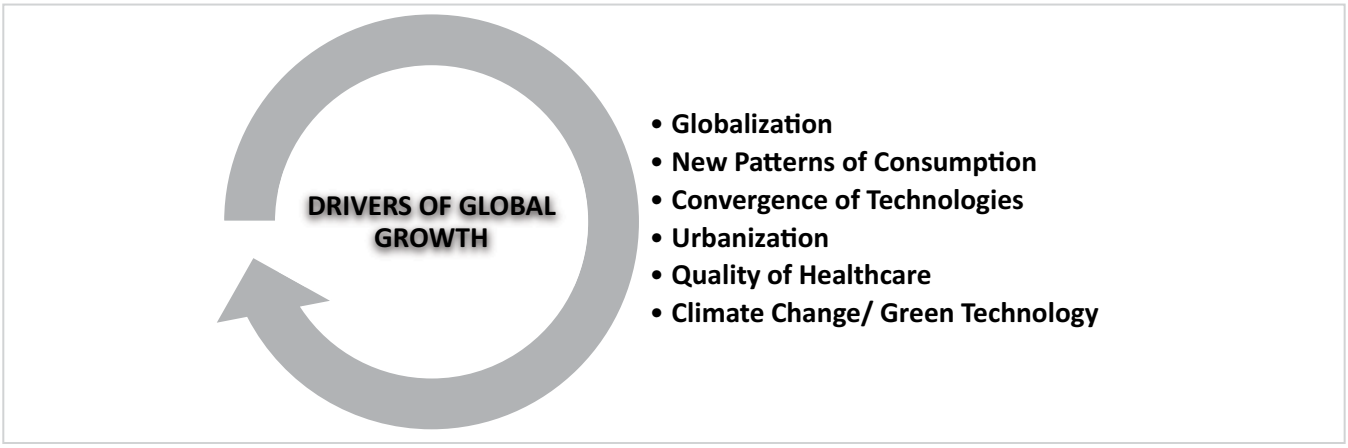
Today, the chemical industry acts as the basic building block for almost all other manufacturing industries such as textiles, pharmaceuticals, fertilizers, food processing and paints. Its products permeate the entire spectrum of daily use items and cover almost every sphere of life.

With regards investment, in absolute values, the level of world investment in the chemical sector stood at US$ 214 billion in 2018, 1.8 times higher compared to the levels in 2008. During this period, global investment grew 6% per annum on average, significantly lower than the Chinese investment growth of 10.6% during the same period.

The chemical industry, which was largely dominated by Europe and North America over the last many decades, has been increasingly finding new companies having their base in the emerging economies who are manufacturing quality products through innovative techniques. This paradigm shift in the global chemical industry is expected to create cross-border mergers and acquisitions resulting in the consolidation of the global industry. Simultaneously, leading chemical manufacturers are entering emerging markets through joint ventures or acquisitions (mainly in the Middle East to gain access to feedstock, and in China and India to develop a local market presence).

The most successful chemical producers soon are likely to be those that embrace the changing dynamics in the global chemical industry and effectively position themselves in emerging markets. Coupled with this, are the growing trade agreements across the globe which would engender creation of newer market for chemical companies. Exhibit 2 provides a visual snapshot of the key factors that are driving the growth in the chemical industry.

Exhibit 2: Trends Driving the Growth of the Chemical Industry



Source: CEFIC, EXIM Bank Research

Sustainability

It must be understood that with increasing environmental consciousness, the growth of the industry needs to be in synchronization with nature through greater realization and increased attention to safety, health, and environmental standards. There is need to create awareness about the safe use of chemicals, to prevent harmful fallouts on the environment and human beings. Laws regarding these aspects across the world, including India are becoming more and more stringent. This gains even more significance because India is a signatory to important international conventions such as the Chemical Weapon Convention, the Rotterdam Convention, the Stockholm Convention, the Montreal Protocol, and the Kyoto Protocol.

The main objective of these conventions is to protect human health and the environment from the potential hazards of different chemicals. The global chemical industry needs to come forward and take steps to implement the principles underlying these conventions. This would go a long way in rendering the world economic growth more sustainable. The chemical industry, globally, has positively contributed towards a variety of the UN's Sustainable Development Goals (SDGs), with a focus on SDG 9: to promote sustainable industrialization and foster innovation.

New technologies are available for industrial waste management and need to be adopted on a global scale. All this would entail continuous innovation in different areas with a view to meet future demands in energy, healthcare, and climate change in a more efficient manner.

As far as the Indian chemical industry is concerned, given the level of cut-throat competition, the industry needs to look beyond the domestic shores in a more proactive manner, primarily through a two-pronged approach that would entail market diversification and expansion along with mapping of international demand for chemical products to identify a product-market strategy.

This Study

Indian chemical industry is one of the fastest growing in the world. Currently, it ranks third in Asia and is sixth largest market in the world with respect to output after the USA, China, Germany, Japan and South Korea. Indian chemical industry's growth is largely driven by country's consumption growth story. Per capita consumption of chemicals in India is one-tenth of world average, and even when compared with other developing countries, Indian chemical consumption is low. This makes India a very attractive destination to invest, grow and export.

This Study acknowledges that the chemical industry by itself is very large. Hence, to justify the analysis in this Study, it restricts itself to analyzing the performance of four specific segments within the industry, which inter-alia, includes – organic chemicals, inorganic chemicals, tanning or dyeing extracts, and insecticides, rodenticides, fungicides, herbicides, etc. The international trade of these products has been examined based on harmonized codes (HS-Codes) as available from the United Nations International Trade Statistics Database.

In this Study, a section has been dedicated to studying the performance of India's domestic chemical industry (analyzing the aforesaid categories), followed by an in-depth analysis of the global trade market. The Study concludes by identifying a set of strategies that could be adopted at the backdrop of some of the challenges that the Indian chemical industry faces. The overarching objective of the Study is to augment India's chemical exports.

CHAPTER

INDIAN CHEMICAL INDUSTRY

Background

Chemical industry is among the oldest industries in India and constitutes an important segment of the Indian economy contributing around 2.1% towards the country's GDP and accounting for 16% of India's manufacturing sector[4]. The industry forms the backbone of industrial and agricultural development of India and provides building blocks for downstream industries, making it a significant contributor to India's national economic growth.

The size of the Indian chemical industry is estimated to have reached around US$ 99 billion in FY 18. India is currently the sixth largest producer of chemicals in the world by sales value, accounting for 2.2% of the global share, and is expected to grow to US$ 304 billion by FY 25[5].

The chemical industry comprises both small and large-scale units. The fiscal concessions granted to the small sector in mid-eighties led to the establishment of a large number of units in the Small-Scale Industries (SSI) sector. Many MNCs also participate in the industry. Major chemical producing states in India are Gujarat and Maharashtra, with some base at other states including Andhra Pradesh, Tamil Nadu, Karnataka, and West Bengal.

The chemical industry, which includes basic chemicals and its products, petrochemicals, fertilizers, paints and varnishes, gases, soaps, perfumes, and toiletries, is one of the most diversified of all industrial sectors covering more than 80,000 commercial products[6].

Over the last decade, the Indian chemical industry has evolved from being a basic chemical producer to becoming an innovative industry. With increasing investments in research and development (R&D), the industry is registering significant growth in the knowledge arena, including specialty and fine chemicals. The industry now produces many fine and specialty chemicals which have very specific uses and are essential for increasing industrial production. These find wide usage such as food additives and pigments, polymer additives, anti-oxidants in the rubber industry, etc.

Given this varied range of products, the scope of analysis in this Study has been confined to basic, specialty and agricultural chemicals. Thus, the analysis in the study would include those for organic

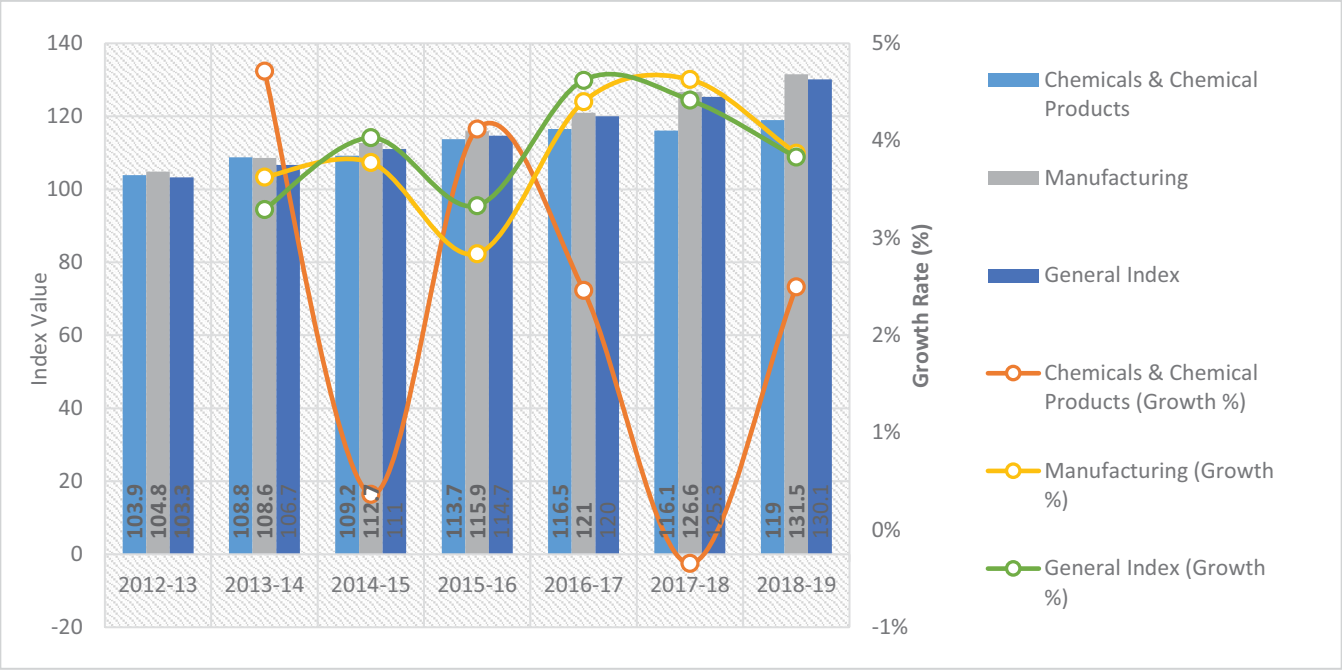
[4] Make in India: Sector Survey
[5] Indian Chamber of Commerce
[6] Department of Chemicals and Petrochemicals, Ministry of Chemicals and Fertilizers, Government of India

and inorganic chemicals, tanning, dye extracts, and insecticides and pesticides.

Index for Industrial Production

The 'Chemicals and Chemical Products' is an important industry group within the index for industrial production (IIP) with the weight of this category being 7.87 out of 100 in the IIP. The IIP for the Chemicals and Chemical products in October 2019 stood at 155.5, 31.7% higher as compared to the level in October 2018. It is to be noted that this was a spike in the production trajectory of the chemical industry, which grew by just 0.4% till September 2019 in the current fiscal.

Exhibit 3: Trends Driving the Growth of the Chemical Industry



Source: Data accessed from CMIE Industry Outlook, January 2020; EXIM Bank Research

Production

The production of major chemicals in FY 19 stood at 11,578 thousand MT, compared to 11,068 thousand MT in FY 18 implying a y-o-y growth of 4.6%. During FY 15 and FY 19, the production of major chemicals in India registered an AAGR of 4.7%[7].

Despite being a part of the manufacturing sector, the growth in Indian chemical industry in the last few years pales out with regards to both the manufacturing and domestic industrial sector. During FY 15 and FY 19, while the manufacturing sector registered an average growth of 3.8% annually, manufacturing of chemicals and chemical products grew at an average of just 1.8%. However, the growth trends have been different this year. The cumulative growth in manufacturing sector during April-October 2018-19 over the corresponding period of 2017-18 has been just 0.57%, while cumulative growth in chemical & chemical products during April-October 2018-19 over the corresponding period of 2017-18 stood at 4.8%.

[7] Department of Chemicals and Petrochemicals, Ministry of Chemicals and Fertilizers, Government of India

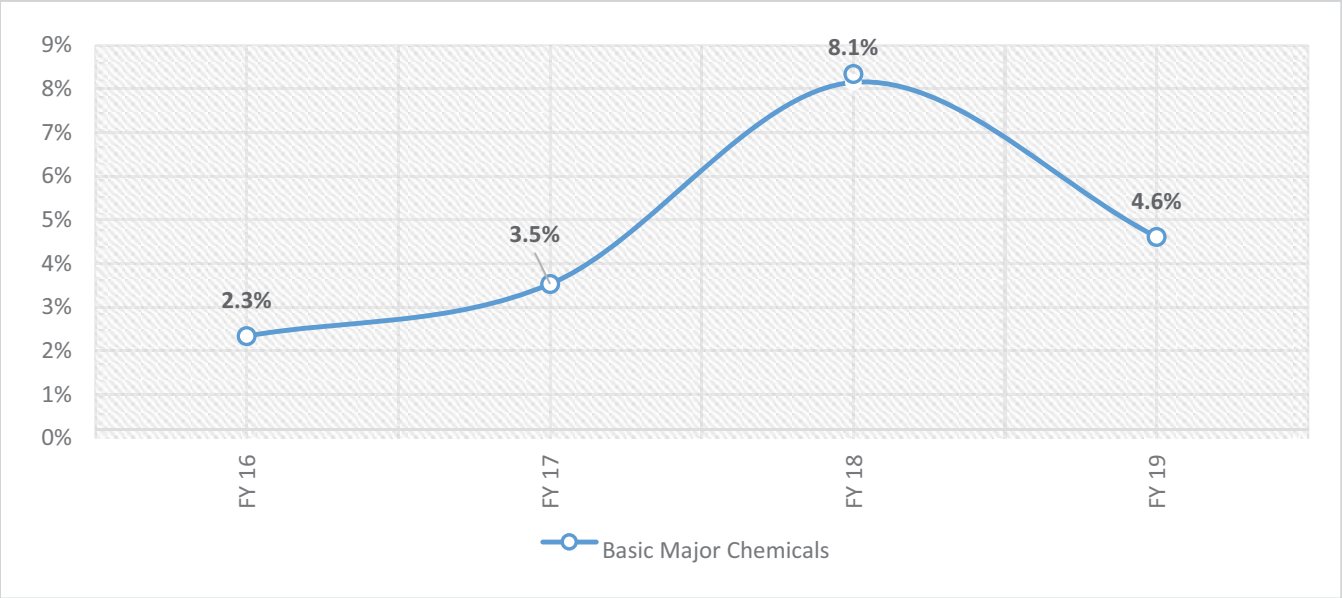
Table 2 : Classification of the Chemical Industry

Group	Sub – Products
Alkali	Soda ash, Caustic soda, and Liquid chlorine
Inorganic chemicals	Aluminum fluoride, Calcium carbide, Carbon black, Potassium chlorate, Sodium chlorate, Titanium dioxide and Red phosphorous.
Organic chemicals	Acetic acid, Acetic anhydride, Acetone, Phenol, Methanol, Formaldehyde, Nitrobenzene, Citric acid, Maleic Anhydride, Penta Erithritol, Aniline, Chloro methanes, ONCB, PNCB, MEK, Acetaldehyde, Ethanolamines, Ethyl acetate and Ortho nitro toluene.
Pesticides	Pesticides and insecticides registered under the Insecticide Act of 1968.
Dyes and dyestuff	Azo dyes, Acid direct dyes, Basic dyes, Fast colour bases, Ingrain dyes, Oil soluble (solvent dyes), Optical whitening agents, Organic pigment colours, Pigment emulsion, Reactive dyes, Sulphur dyes, Vat dyes, Food colours and Napthols

Source: Ministry of Chemicals & Fertilizers, EXIM Bank Research

The volume of major chemicals produced in India amounted to 23 million MTs in FY 19, out of which 9.6 million MT were basic chemicals. The total production of the Indian chemical industry increased at an average annual rate of 4.8% – from 23 million MT in FY 15 to 27 million MT in FY 19.

Exhibit 4: Growth in Production of Basic Chemicals in India: FY 16 – FY 19



Source: Data accessed from CMIE Industry Outlook, January 2020; EXIM Bank Research

Across the basic chemicals segment, while the dyes & pigments registered the highest AAGR of 6.9% during FY 15-FY 19, inorganic chemicals registered the slowest average annual growth of 3.1%.

Even though the AAGR for all sub-segments remained positive during FY 14 – FY 19, the positive and encouraging fact among the various segments of the Indian chemical industry has been the performance of specialty chemicals, primarily dyes and pigments.

The average annual growth in production of dyes and pigments was close to 7%, from 285 MT in FY 15 to 370 MT in FY 19. This high growth could partly be attributed to the low base and low absolute

volumes of dyes and dyestuffs, but more significantly, it implies a consistent increase in market demand of such products. Given that the specialty chemicals are knowledge oriented, per unit price realization is far higher than most other segments of the chemical industry. Hence, growth in this segment in value terms is likely to be far greater than what is evidenced in volume terms.

Table 3: Production of Major Chemicals and Petrochemicals: Recent Trends ('000 MT)

Group	FY 15	FY 16	FY 17	FY 18	FY 19	AAGR (FY 15 - FY 19)	Share in major basic chemicals
Basic Major Chemicals							
Alkali Chemicals	6625	6802	7009	7631	8043	5.0%	69.5%
Organic Chemicals	1619	1589	1638	1799	1884	3.9%	16.3%
Inorganic Chemicals	944	1002	1053	1058	1064	3.1%	9.2%
Dyes and Pigments	285	304	320	367	370	6.9%	3.2%
Pesticides	186	188	214	213	217	4.1%	1.9%
Total	**9659**	**9885**	**10234**	**11068**	**11578**	**4.7%**	**100.0%**

Source: Data accessed from ITC Trade Map, December 2019; EXIM Bank Research

In the production of major basic chemicals, Alkali accounted for around 70% of the total production of major chemicals in FY 19.

Within the chemical segment, the Indian inorganic chemical industry is highly fragmented and includes both large public and private units, as well as small scale units with the larger units dominating the industry. Inorganic chemicals, which are largely of mineral origin and do not contain carbon, are mostly used in industrial and agricultural sectors as either processing aids or as catalysts. Due to the nature of the segment, the inorganic chemical industry is highly regulated in terms of health, safety, and environment. This segment of the industry registered an average annual growth of 3.1% during the FY 15 to FY 19 period, with a double digit y-o-y growth of 10% registered in FY 18. The only two segments of the chemical industry which grew at less than 1% during FY 15 to FY 19 were Performance Plastics and Synthetic Fiber. However, the muted growth across the two did not affect the overall performance of the sector.

India's Trade in Chemical Products: An Analysis

The share of overall chemicals and related products (including pharmaceuticals) in the country's total exports has been exhibiting a gradual upward trend, indicating that the growth in their exports during the recent past has outperformed India's total exports. During 2014 to 2018, while India's overall exports grew at 1.1% on an average, the same for chemicals was approximately 10%. Growth in exports of chemicals and related products for 2018 stood at 10.7% as compared to a growth of 9.2% in the country's overall exports. However, India has remained a net importer of chemicals for a long time and registered a negative trade balance of US$ 7.3 billion in 2018.

Table 4: India's Major Chemical Export and Import Markets in 2018

HS 28			
Total Export: US$ 2.0 billion, Total Import: US$ 7.2 billion			
Export Destination	**% share**	**Imports sourced from**	**% share**
UAE	18%	China	15%
Egypt	7%	Australia	9%
USA	6%	Morocco	8%
Iran	4%	Vietnam	7%
China	4%	Senegal	7%

HS 29			
Total Export: US$ 17.7 billion, Total Import: US$ 22.5 billion			
Export Destination	**% share**	**Imports sourced from**	**% share**
China	17%	China	38%
USA	10%	USA	8%
Germany	4%	Singapore	8%
Indonesia	4%	Saudi Arabia	5%
Brazil	3%	South Korea	5%

HS 32			
Total Export: US$ 3.2 billion, Total Import: US$ 2.1 billion			
Export Destination	**% share**	**Imports sourced from**	**% share**
USA	7%	China	24%
Bangladesh	7%	USA	7%
China	7%	Germany	6%
Turkey	6%	Spain	5%
Germany	5%	Singapore	5%

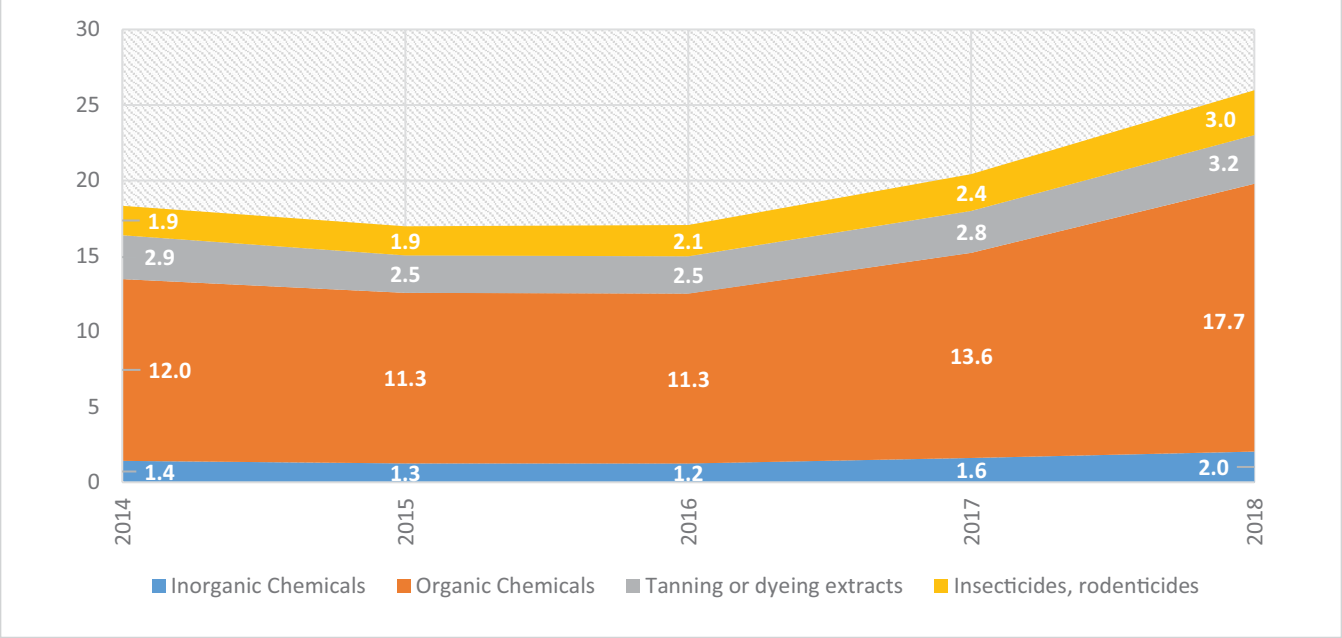
HS 3808			
Total Export: US$ 2.9 billion, Total Import: US$ 1.3 billion			
Export Destination	**% share**	**Imports sourced from**	**% share**
USA	19%	China	56%
Brazil	19%	USA	9%
France	4%	Germany	7%
Vietnam	3%	Japan	5%
Belgium	3%	Belgium	5%

Source: Data accessed from ITC Trade Map, January 2020; EXIM Bank Research

Exports

India's exports of chemicals have been predominated organic chemicals – export of which registered a healthy average annual rate of 11.2% during the last five years, increasing from US$ 12 billion in 2014 to US$ 17.7 billion in 2018. The other segments of the chemical industry also exhibited similar pattern – while exports of tanning or dyeing extracts increased at an average annual pace of 3.4% – increasing from US$ 2.9 billion in 2014 to US$ 3.2 billion in 2018, exports of other chemicals such as Insecticides, rodenticides etc. registered an AAGR of 11.5% increasing from US$ 1.9 billion to US$ 2.9 billion during this period.

Exhibit 5: India's Export of Major Chemicals: 2014-2018 (US$ Billion)

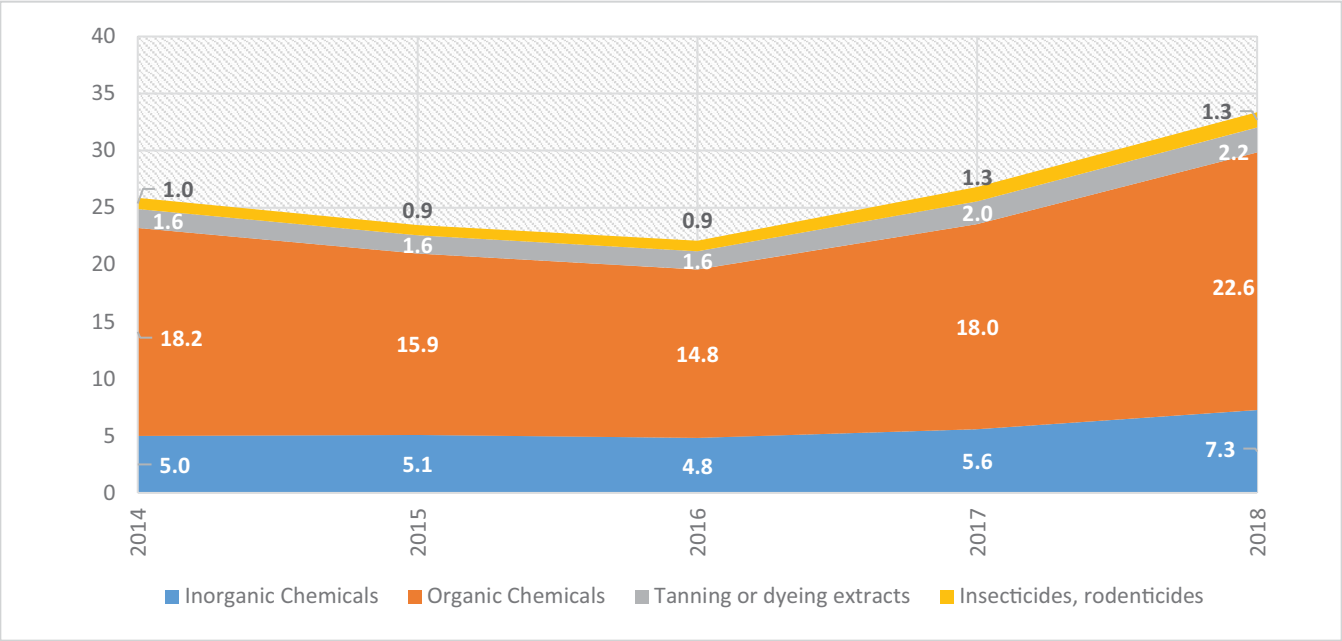


Source: Data accessed from ITC Trade Map, January 2020; EXIM Bank Research

Imports

During the same time (2014-18), India's imports of major chemicals grew at an average of 7.7% from US$ 25.8 billion in 2014 to US$ 33.3 billion in 2018. More than 50% of this import demand was met by supplies from China. Around 70% of India's total chemical imports comprised of organic chemicals, aggregating to US$ 22.5 billion in 2018, registering an AAGR of 6.8% during 2014-18.

Exhibit 6: India's Import of Major Chemicals: 2014-2018 (US$ Billion)



Source: Data accessed from ITC Trade Map, January 2020, EXIM Bank Research

Trade Balance

Overall for the industry, trade deficit amounted to US$ 7.3 billion in 2018, marginally lower than the deficit of US$ 7.5 billion in 2014. The reason why trade deficit remained largely unchanged was because of the increased surplus for HS 32 and HS 3808 offsetting the deficit contributed by HS 28 and HS 29.

Table 5: India's Trade Balance for the Chemical and Dye Industry: 2014 vs 2018

HS Code	Description	Trade Balance in 2014 (US$ Million)	Trade Balance in 2018 (US$ Million)
HS 3808	Insecticides, rodenticides, fungicides, herbicides, anti-sprouting products and plant-growth regulators, disinfectants and similar products, put up for retail sale or as preparations or articles, e.g. Sulphur-treated bands, wicks and candles, and fly-papers	949.7	1,618.9
HS 32	Tanning or dyeing extracts; tannins and their derivatives; dyes, pigments and other coloring matter; paints and varnishes; putty and other mastics; inks	1,271.8	1,054.9

HS 28	Inorganic chemicals; organic or inorganic compounds of precious metals, of ra-re-earth metals, of radioactive elements or of isotopes	-3,566.8	-5,229.6
HS 29	Organic chemicals	-6,203.7	-4,836.0
	Total Trade Balance	**-7,549.1**	**-7,391.8**

Source: Data accessed from ITC Trade Map, January 2020; EXIM Bank Research

This indicates that growth in exports have not kept pace with the growth in imports – a clear reason for the industry to focus on exports by adopting a market-specific and product-specific approach – contours of which this study would try to draw. The trade deficit for the chemical industry was mostly driven by China, the USA and Germany, while a trade surplus was registered with Pakistan, Brazil and UAE.

Foreign Direct Investments in the Chemical Industry

Chemicals industry in India is increasingly becoming a globalized industry. Foreign direct investment (FDI) in the chemical industry and trade between parent firms and their subsidiaries is increasingly becoming significant for the sector. FDI has had a positive impact on growth, development, productivity and competitiveness for the Indian chemical industry. The country has benefited from the transfer and use of technology and the associated benefits of FDI inflows, which has increased over the last few years due to the several incentives that have been provided by the Government of India. The policy now allows for 100% FDI in chemicals under the automatic route.

In the last few years, chemical sector has been one of the top ten sectors receiving the FDI equity inflows in India. During April 2000-September 2019, the chemical sector in India (excluding fertilizers) received FDI equity inflows worth US$ 17.2 billion[8]. It is important to note that the growth of FDI equity inflows in the sector has been rather uneven. This is evident from the fact that while the FDI equity inflows recorded an AAGR of 33% during FY 12 to FY 19, a negative CAGR of (-) 8.3% was registered during the same period for the industry.

Exhibit 7: FDI Equity Inflows in India's Chemical sector (excluding Fertilizers)

Source: Data accessed from DIPP FDI Statistics, January 2020; EXIM Bank Research

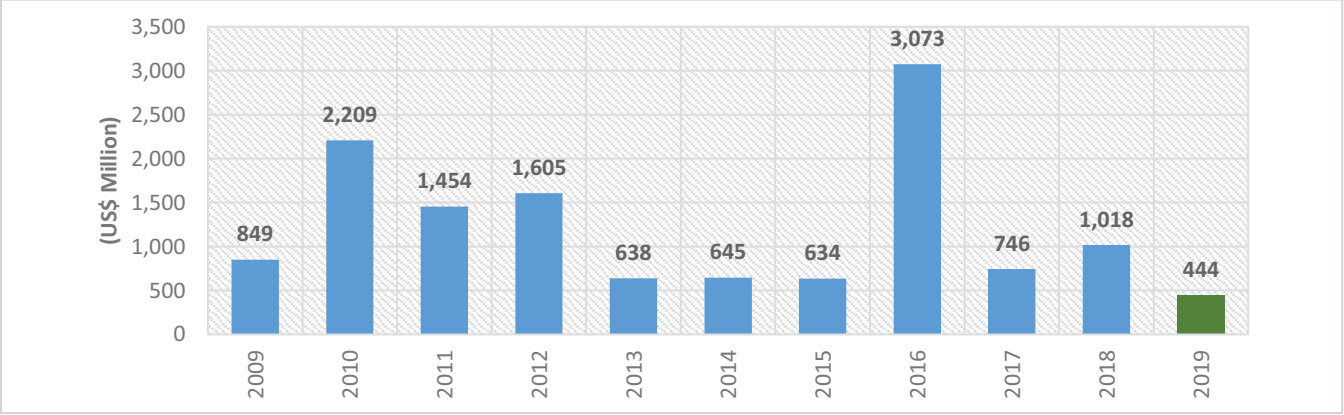
[8] DPIIT

The total FDI equity inflows across the entire chemical sector (including pharmaceuticals) in India stood at US$ 2.2 billion in FY 19, US$ 71 million lesser from the previous fiscal. Even though the sector's share in total FDI inflows in the country has remained relatively low at 9%, it has grown remarkably in the last few years. During FY11 – FY 19, excluding fertilizers, the total FDI inflows in the sector grew at an AAGR of 20%, with FDI in Drugs and Pharmaceuticals, despite being uneven, registering an AAGR of 165% during the same period.

In the upcoming years, the FDI inflows in the Indian chemical sector are expected to go further up, given the fact that in order to increase the share of manufacturing in GDP to at least 25% by 2025 (from the current 16%), investments in chemical industry are crucial to propel the growth across both the industry and the manufacturing sector.

While the data sourced from the Department for Promotion of Industry and Internal Trade (DPIIT), Government of India gives the cumulative numbers on the FDI inflow in the chemical sector, it does not specify the direction of the flow. In order to bring out a holistic picture of the FDI inflows in the sector covering the dimensions not touched upon by the DPIIT data, the analysis is supplemented by data sourced from fDi Markets database of the Financial Times, which provides disaggregated data not only at the sub-sectoral level but also breaks it up on the basis of source and destination of the envisaged capex.

Exhibit 8: Envisaged Capex in the Indian Chemical Sector (US$ Million)



Note: FDI Markets tracks cross-border investment in a new physical project or expansion of an existing investment which creates new jobs and capital investment. This data differs from official data on FDI flows as company can raise capital locally, phase their investment over a period of time, and can channel their investment through different countries for tax efficiency.

Source: Data accessed from fDi Markets, January 2020; EXIM Bank Research

According to the fDi Markets, during FY 11 – FY 19, the total envisaged capex in the Indian Chemical sector stood at US$ 9.5 billion. It is to be noted that 27% (US$ 2.6 billion) of the total envisaged capex in the sector came from the USA during this time, followed by 18% (US$ 1.6 billion) from Malaysia and 11% (US$ 1 billion) from Germany. The investing companies that incurred the major part of total envisaged capex in the sector during FY 11 to FY 19 were Isomeric Holdings (Malaysia), Stonetek Energy (USA) and LG Chem (South Korea) accounting for 16%, 10% and 9% shares in the total envisaged capex respectively.

With regards destination states, approximately 27% (US$ 2.5 billion) of the total envisaged capex was estimated to be in Maharashtra, followed by 21% (US$ 2 billion) in Andhra Pradesh and 16% (US$ 1.5 billion) in Gujarat. It is to be noted that across cities, Krishnapatnam in Andhra Pradesh received the maximum envisaged capex of US$ 1.5 during FY11-FY19.

CHAPTER

EXPORT COMPETITIVENESS OF THE INDIAN CHEMICAL INDUSTRY

It is important to note that chemicals have been a major component of India's top export items contributing to around 8% of total merchandize exports. This chapter seeks to analyze in detail India's cross-border trade of chemicals in the last five years and ascertain the growth potential of the industry.

Granular analysis of India's trade in Chemicals

India's total exports from the chemicals industry stood at US$ 26 billion in 2018, up by US$ 5.5 billion from 2017. During 2014-2018, collectively, the exports of HS 28, HS 29, HS 32 and HS 3808 (total chemical industry) witnessed an AAGR of 10%.

The overall exports from the Indian Chemicals and Dye industry have been largely dominated by "Organic Chemicals" (HS 29), constituting around 50% of total exports, followed by "Tanning or dyeing extracts; tannins and their derivatives; dyes, pigments and other coloring matter; paints and varnishes; putty and other mastics; inks" (HS 32) with a share of 38%.

Table 6 : Chemicals Exports from India (US$ billion)

HS Code	Description	2014	2015	2016	2017	2018	AAGR (2014-18)
	World Chemical and Dye Exports	674.6	577.9	549.7	603.7	698	1.6%
	India's Chemical and Dye Exports	33.2	30.7	30.7	36.7	46.9	9.9%
29	Organic chemicals	12.0	11.3	11.3	13.6	17.7	11.9%
32	Tanning or dyeing extracts; tannins and their derivatives; dyes, pigments and other coloring matter; paints and varnishes; putty and other mastics; inks	2.9	2.5	2.5	2.8	3.2	3.4%
3808	Insecticides, rodenticides, fungicides, herbicides, anti-sprouting products and plant-growth regulators, disinfectants and similar products, put up for retail sale or as preparations or articles, e.g. Sulphur-treated bands, wicks and candles, and fly-papers	1.9	1.9	2.1	2.4	3.0	11.5%

28	Inorganic chemicals; organic or inorganic compounds of precious metals, of rare-earth metals, of radioactive elements or of isotopes	1.4	1.3	1.2	1.6	2.0	10.7%

Source: Data accessed from ITC Trade Map, January 2020; EXIM Bank Research

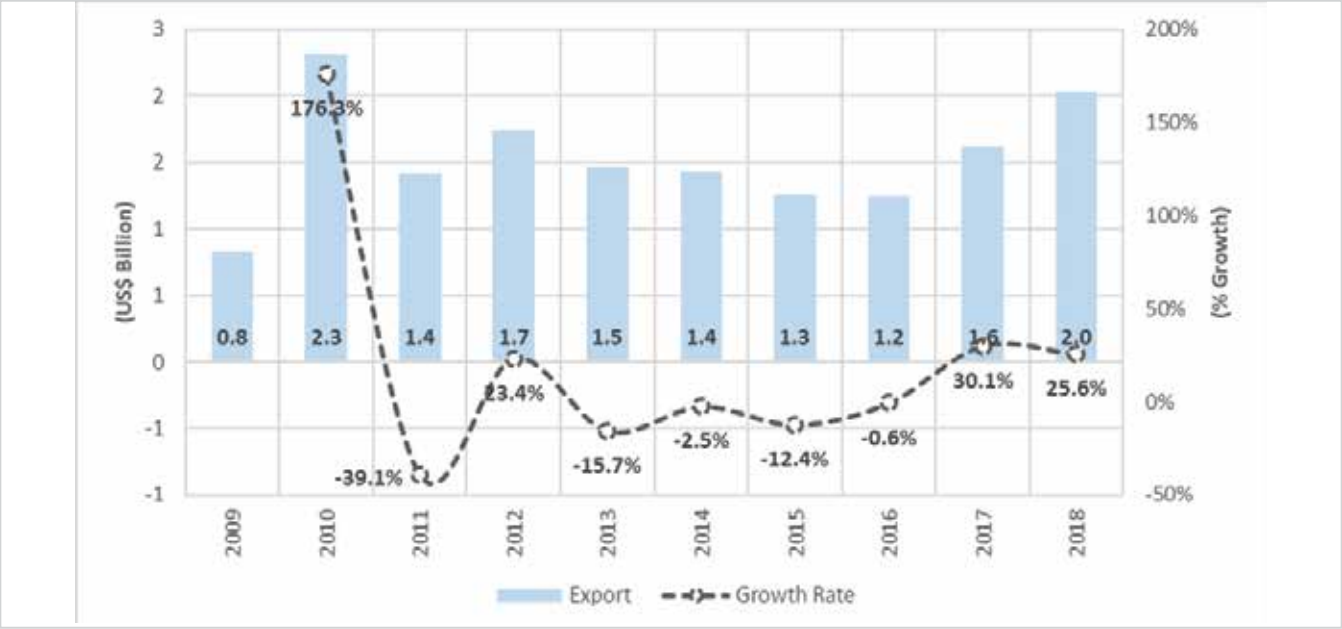
Across the sub-groups, the highest AAGR in exports during 2014-18 was noted for HS 3808 "Insecticides, rodenticides, fungicides, herbicides, anti-sprouting products and plant-growth regulators, disinfectants and similar products, put up for retail sale or as preparations or articles, e.g. Sulphur-treated bands, wicks and candles, and fly-papers" at 11.5%, driven by the exports of HS 380893 "Herbicides, anti-sprouting products and plant-growth regulators (excluding goods of subheading 3808.50)" and HS 380894 "Disinfectants (excluding goods of subheading 3808.50)", which registered an average annual growth of 28% and 11.6%, respectively.

HS 28: Inorganic chemicals; organic or inorganic compounds of precious metals, of rare-earth metals, of radioactive elements or of isotopes

Inorganic chemicals are substances of mineral origin that do not contain any carbon atom (e.g. include nitrate, fluoride and metals). They are mostly used in detergents, soaps, and fertilizers. Major inorganic chemicals produced in India are carbon black, titanium dioxide and calcium carbide.

Exports of HS 28 from India in 2018 amounted to US$ 2 billion, up by US$ 414 million from 2017. During 2009 – 2018, the exports of HS 28 registered an AAGR of 20.6%. However, India remains a major net importer of inorganic chemicals. Imports amounted to US$ 7.3 billion during 2018, thereby resulting in a trade deficit of US$ 5.2 billion, mostly with China (US$ 986 million); Australia (US$ 637 million); and Morocco (US$ 572 million).

Exhibit 9 : Exports of HS 28 from India (2009 – 2018)



Source: Data accessed from ITC Trade Map, January 2020; EXIM Bank Research

The Asian region forms the main market for India's inorganic chemicals. Of the top ten major export destinations in 2018, as many as eight were from Asia. India's major export market for inorganic chemicals included UAE (17.7%), Egypt (6.9%), the USA (5.5%), Iran (4.3%), and China (3.6%).

It may be noted that most of the India's major export destinations for inorganic chemicals except Iran, and to a lesser extent Indonesia, have shown great dynamism registering average annual growths of over 20% during the 2009-2018 period. Within this, Switzerland and the Netherlands have emerged as the most dynamic markets for India's exports of inorganic chemicals, registering average annual growths of 222.4% and 103.7%, respectively. Consequently, their shares as markets for India's exports of inorganic chemicals have increased from 0.2% and 0.9% in 2011 to 3.4% and 3% in 2018, respectively.

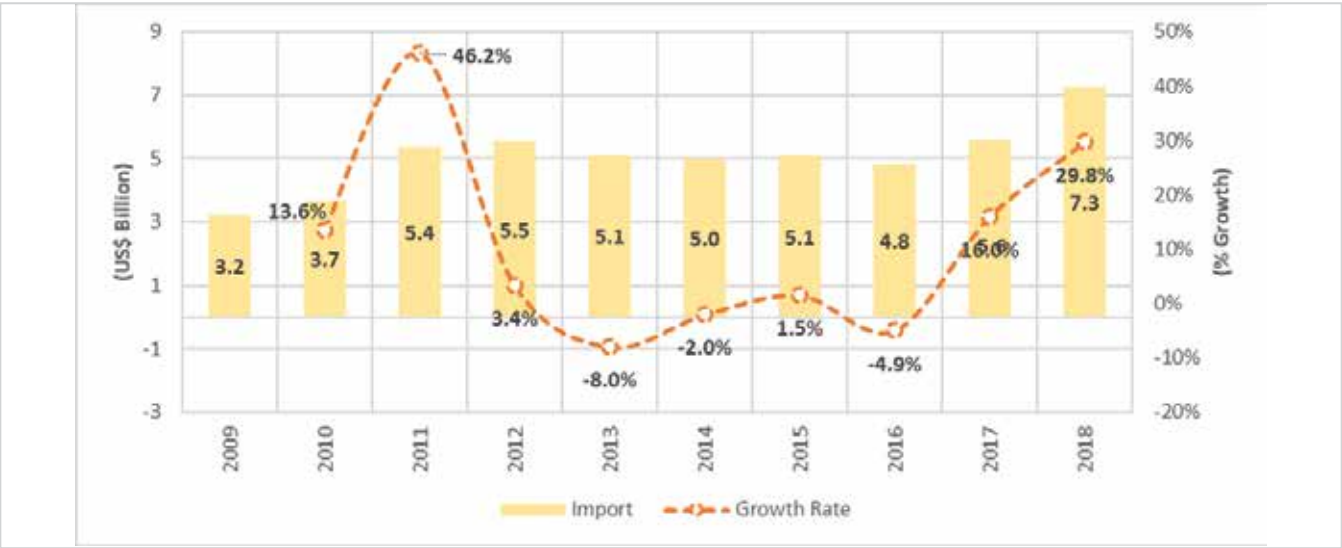
Table 7 : Major Exports of HS 28 from India

HS Code	Description	India's exports in 2018 (US$ million)	AAGR of India's exports (2014-18)	India's share in world exports: 2018
281820	Aluminum oxide (excluding artificial corundum)	686.6	9.7%	3.9%
280300	Carbon (carbon blacks and other forms of carbon	131.6	3.6%	2.4%
281511	Sodium hydroxide "caustic soda" solid	110.8	56.0%	11.9%
284390	Inorganic or organic compounds of precious metals, whether or not chemically defined (excluding silver and gold); amalgams of precious metals	70.8	767.3%	1.6%
283329	Sulphates (excluding of sodium, magnesium, aluminum, nickel, copper, barium and mercury)	60.3	20.2%	4.8%
282300	Titanium oxides	50.8	6.3%	6.2%
282749	Chloride oxides and chloride hydroxides (excluding copper and mercury)	50.4	21.8%	15.8%
281700	Zinc oxide; zinc peroxide	41.8	9.3%	2.3%
281830	Aluminum hydroxide	38.8	1.5%	2.2%
283110	Dithionite and sulfoxylate of sodium	37.9	8.9%	13.5%
Top Ten		**1279.8**	**12.8%**	**3.7%**
Total		**2,032.7**	**10.7%**	**1.5%**

Source: Data accessed from ITC Trade Map, January 2020; EXIM Bank Research

On the other hand, imports of HS 28 from India in 2018 amounted to US$ 7.2 billion, up by US$ 1.6 billion from 2017. During 2009 – 2018, the imports of HS 28 registered an AAGR of 10.6%, significantly lower than the 20.6% AAGR of exports witnessed during the same time.

Exhibit 10 : Imports of HS 28 by India (2009 – 2018)



Source: Data accessed from ITC Trade Map, January 2020; EXIM Bank Research

The major markets from which India imported HS 28, in 2018, were China (15%), Australia (9%) and Morocco (8%). It is to be noted that while China's share in India's total imports remained largely within 13%-15%, Australia's share went up from 2.3% in 2009 to 9.1% in 2018. The imports from Australia were only US$ 74.1 million in 2009 and reached US$ 660.9 million in 2018. The rising imports from Australia were mostly driven by HS 281820[9] registering an AAGR of over 40% during 2009-2018. Australia also happens to be India's largest exporter for HS 281820.

During the same time, the share of Morocco, which was also India's largest import source of HS 28 in 2009, in India's total imports almost halved from 15.2% to 7.9%. It is important to note that 99% of India's imports of HS 28 from Morocco is due to import of HS 280920[10].

Table 8 : Major Imports of HS 28 by India

HS Code	Description	India's imports in 2018 (US$ million)	AAGR of India's imports (2014-18)	India's share in world imports: 2018
280920	Phosphoric acid; polyphosphoric acids, whether or not chemically defined	1861.8	10.9%	40.0%
281820	Aluminum oxide (excluding artificial corundum)	1408.8	47.1%	8.2%
281410	Anhydrous ammonia	909.9	-3.1%	14.0%
280300	Carbon (carbon blacks and other forms of carbon)	379.9	31.9%	6.7%
284390	Inorganic or organic compounds of precious metals, whether or not chemically defined (excluding silver and gold); amalgams of precious metals	208.6	24.8%	7.5%

[9] Aluminium oxide (excluding artificial corundum)
[10] Phosphoric acid; polyphosphoric acids, whether or not chemically defined

283620	Disodium carbonate	206.0	6.7%	5.1%
281512	Sodium hydroxide "caustic soda" in aqueous solution "soda lye or liquid soda"	147.0	7.8%	2.8%
280469	Silicon containing < 99,99% by weight of silicon	131.9	875.6%	3.4%
283650	Calcium carbonate	119.4	10.2%	13.5%
280470	Phosphorus	105.8	8.2%	16.8%
Top Ten		**5748.9**	**13%**	**10.7%**
Total Imports		**7262.3**	**10.6%**	**5.2%**

Source: Data accessed from ITC Trade Map, January 2020; EXIM Bank Research

It is to be noted that in 2018, three items (HS 281820, HS 280300, and HS 284390)[11] featured both in the top ten exports as well as top ten imports of HS 28. Further, in the last ten years, composition of India's import basket has transformed substantially. Even though HS 280920 remained the highest imported item in the group, its share in total HS 28 imports declined gradually from 53% in 2009 to 37% in 2018, as other items like HS 281820 gained prominence.

Table 9: Composition of Top Ten Imports of HS 28 from India – 2009 vs 2018

HS Code	Description	% Share in total HS 28 imports : 2009	HS Code	Description	% Share in total HS 28 Imports : 2018
280920	Phosphoric acid; polyphosphoric acids, whether or not chemically defined	53%	**280920**	Phosphoric acid; polyphosphoric acids, whether or not chemically defined	37%
281410	Aluminium oxide (excluding artificial corundum)	18%	**281820**	Anhydrous ammonia	28%
283620	Anhydrous ammonia	5%	**281410**	Disodium carbonate	18%
281820	Carbon (carbon blacks and other forms of carbon)	4%	**280300**	Aluminum oxide (excluding artificial corundum)	7%
281512	Inorganic or organic compounds of precious metals, whether or not chemically defined (excluding silver and gold); amalgams of precious metals	4%	**284390**	Sodium hydroxide "caustic soda" in aqueous solution "soda lye or liquid soda"	4%
280120	Disodium carbonate	3%	**283620**	Iodine	4%
280300	Sodium hydroxide "caustic soda" in aqueous solution "soda lye or liquid soda"	2%	**281512**	Carbon (carbon blacks and other forms of carbon)	3%

[11] HS 281820- Aluminum oxide (excluding artificial corundum)
HS 280300- Carbon (carbon blacks and other forms of carbon, n.e.s.)
HS 284390- Inorganic or organic compounds of precious metals, whether or not chemically defined (excluding silver and gold); amalgams of precious metals

284390	Silicon containing < 99,99% by weight of silicon	2%	**280469**	Inorganic or organic compounds of precious metals, whether or not chemically defined (excluding silver and gold); amalgams of precious metals	3%
280470	Calcium carbonate	1%	**283650**	Phosphorus	2%
284910	Phosphorus	1%	**280470**	Carbides of calcium, whether or not chemically defined	2%

Source: Data accessed from ITC Trade Map, January 2020; EXIM Bank Research

HS 29: Organic Chemicals

Organic chemicals and intermediates are one of the most important segments of the Indian chemical industry. Major organic chemicals produced in India include acetic acid, acetic anhydride, acetone, phenol, methanol, formaldehyde, nitro benzene, citric acid, maleicanhydride, pentaerythrytol, aniline, orthonitrochlorobenzene, acetaldehyde, ethanolamine, and ethyl acetate. Used in many household products like paints, varnishes and products of cleaning and disinfecting, this segment has been playing a significant role in providing vital chemicals and intermediates to associated sectors of the Indian chemical industry (like drugs and pharmaceuticals, dye stuffs and dye intermediates, leather chemicals, paints, and pesticides).

With respect to the trade, the exports of HS 29 from India in 2018 amounted to US$ 17.7 billion, up by US$ 4.1 billion from 2017. During 2009-2018, the exports of HS 28 registered an AAGR of 11.9%.

Exhibit 11 : Exports of HS 29 from India (2009 – 2018)

Source: Data accessed from ITC Trade Map, January 2020; EXIM Bank Research

With regards export markets, China (17.2%), the USA (10.1%), and Germany (4%) were the top destinations for India's organic chemical exports, together accounting for nearly one-third of the country's total exports of HS 29 in 2018. These markets have shown dynamism during 2014-19, particularly China, which recorded a double digit average annual growth rate of 44%. During the same time (2014-18), India's imports of major chemicals grew at an average of 7.7% from US$ 25.8 billion in 2014 to US$ 33.3 billion in 2018. More than 50% of this import demand was met by supplies from China. Around 70% of India's total chemical imports comprised of organic chemicals, aggregating to US$ 22.5 billion in 2018, registering an AAGR of 6.8% during 2014-18.

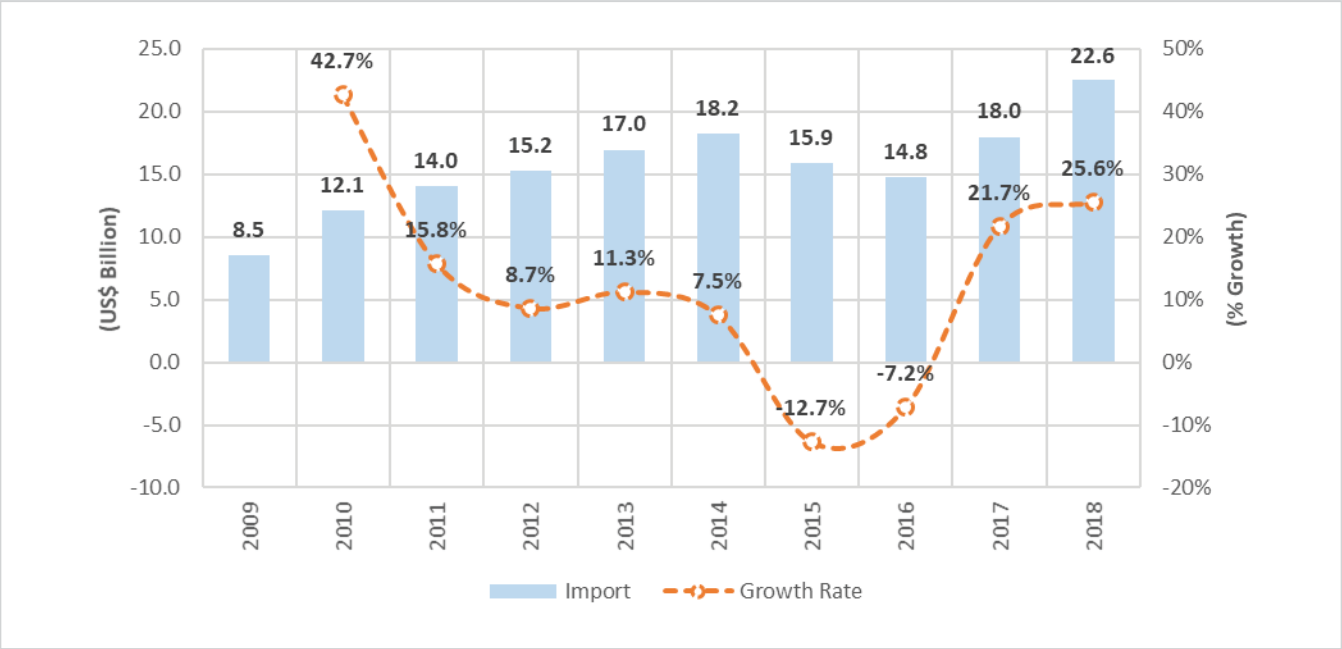
Table 10 : Major Exports of HS 29 from India

HS Code	Description	India's exports in 2018 (US$ million)	AAGR of India's exports (2014-18)	India's share in world exports: 2018
290243	P-Xylene	2626.2	53.5%	12.1%
290220	Benzene	1313.0	28.9%	15.4%
294200	Separate chemically defined organic compounds	1127.2	-1.3%	61.5%
293399	Heterocyclic compounds with nitrogen hetero-atom[s] only	773.2	15.8%	5.4%
293339	Heterocyclic compounds with nitrogen hetero-atom[s] only, containing an unfused pyridine ring, whether or not hydrogenated, in the structure	529.0	13.2%	4.5%
294190	Antibiotics	527.1	-2.2%	7.2%
293499	Nucleic acids and their salts, whether or not chemically defined; heterocyclic compounds	492.7	6.6%	3.5%
290611	Menthol	358.3	19.4%	42.6%
293359	Heterocyclic compounds with nitrogen hetero-atom[s] only, containing a pyrimidine ring, whether or not hydrogenated, or piperazine ring in the structure	342.7	18.1%	1.8%
292419	Acyclic amides, incl. acyclic carbamates, and their derivatives, and salts thereof	306.1	24.4%	15.5%
Top Ten		**8395.7**	**15.2%**	**15.5%**
Total		**17742.5**	**11.2%**	**4.0%**

Source: Data accessed from ITC Trade Map, January 2020; EXIM Bank Research

On the other hand, imports of HS 29 from India in 2018 amounted to US$ 22.6 billion, up by US$ 4.6 billion from 2017. During 2009 – 2018, the imports of HS 29 registered an AAGR of 12.6%, higher than the 11.9% AAGR of exports during the same time.

Exhibit 12 : Imports of HS 29 by India (2009 – 2018)



Source: Data accessed from ITC Trade Map, January 2020; EXIM Bank Research

The major markets from where India imported HS 29 in 2018 were China (38%), Singapore (8%) and the USA (8%). While India's total imports of HS 29 grew by almost three times since 2009, China continued to be the top import source for India in 2019.

A decline in Saudi Arabia's share from 7.2% in 2009 to 5.4% in 2018, in India's total imports was noted during the analysed period. During the same time, Singapore's share in total imports rose from 6.3% to 8.3%. This change in share of Singapore and Saudi Arabia in India's total imports during 2009-2018 is largely explained by the significant rise in imports of HS 290250 (Styrene) from Singapore and a relatively lesser increase of the same from Saudi Arabia.

Widely used in production of high-quality plastics used to manufacture automobile body panels, optical fibres, food containers and insulation material, HS 290250 was also the highest imported item from the HS 29 group in 2018. While its imports from Saudi Arabia grew at an AAGR of just 2.5% during 2009-2018, its imports from Singapore registered an AAGR of 19.2% during the same period

Table 11 : Major imports of HS 29 by India

HS Code	Description	India's exports in 2018 (US$ million)	AAGR of India's Imports (2014-18)	India's share in world Imports: 2018
290250	Styrene	1156.6	5.4%	9.0%
290243	P-Xylene	925.6	5.0%	3.9%
290511	Methanol "methyl alcohol"	777.6	13.6%	6.0%
290110	Saturated acyclic hydrocarbons	752.2	169.3%	15.6%
291521	Acetic acid	529.0	21.0%	25.3%
293399	Heterocyclic compounds with nitrogen hetero-atom[s] only	645.7	31.9%	4.1%
294110	Penicillins and their derivatives with a penicillanic acid structure; salts thereof	636.4	17.3%	30.2%
290531	Ethylene glycol "ethanediol"	606.8	-6.9%	4.0%
294190	Antibiotics (excluding penicillins and their derivatives with a penicillanic acid structure, salts thereof, streptomycins, tetracyclines, chloramphenicol and erythromycin, their derivatives and salts thereof)	559.9	3.6%	6.4%
291736	Terephthalic acid and its salts	553.4	2.6%	9.1%
Top Ten		**7267.5**	**7.2%**	**6.9%**
Total		**22578.5**	**6.8%**	**4.7%**

Source: Data accessed from ITC Trade Map, January 2020; EXIM Bank Research

It is to be noted that in 2018, three items (HS 290243, HS 293399, and HS 294110)[4] featured both in the list of top ten exports as well as in the list of top ten imports of HS 29. Further, in the last ten years, composition of India's import basket for HS 29 has transformed substantially. During these years, as HS 290250 and HS 290243 gained prominence in the import basket, contributing to 23% and 18% of the total HS 29 imports, HS 294200 registered a significant decline in its share of the total HS 29 imports from 26% in 2009 to just 8% in 2018.

[12] HS 290243- P-Xylene
HS 293399- Heterocyclic compounds with nitrogen hetero-atom[s] only
HS 294110- Penicillins and their derivatives with a penicillanic acid structure; salts thereof

Table 12 : Composition of Top Ten Imports of HS 29 by India – 2009 vs 2018

HS Code	Description	% Share in total HS 29 imports	HS Code	Description	% Share in total HS 29 Imports
294200	Separate chemically defined organic compounds, n.e.s.	26%	**290250**	Styrene	23%
290250	Styrene	16%	**290243**	P-Xylene	18%
290531	Antibiotics	16%	**290511**	Methanol "methyl alcohol"	15%
294190	Terephthalic acid and its	12%	**290110**	Saturated acyclic hydrocarbons	15%
291736	Penicillins and their derivatives with a penicillanic acid structure; salts thereof	10%	**291521**	Acetic acid	13%
294110	P-Xylene	9%	**293399**	Heterocyclic compounds with nitrogen hetero-atom[s] only	13%
290243	Isocyanates	9%	**294110**	Penicillins and their derivatives with a penicillanic acid structure; salts thereof	13%
292910	Methanol "methyl alcohol"	7%	**290531**	Ethylene glycol " ethanediol"	12%
290511	Acetic acid	7%	**294190**	Antibiotics (excluding penicillins and their derivatives with a penicillanic acid structure, salts thereof, streptomycins, tetracyclines, chloramphenicol and erythromycin, their derivatives and salts thereof)	11%
291521	Toluene	6%	**291736**	Terephthalic acid and its salts	11%

Source: Data accessed from ITC Trade Map, January 2020; EXIM Bank Research

HS 32: Tanning or dyeing extracts; tannins and their derivatives; dyes, pigments and other colouring matter; paints and varnishes; putty and other mastics; inks

The Indian dyestuff industry primarily caters to the needs of the domestic textile industry, although the segment has also been catering to exports simultaneously. Today, India exports dyes and dye intermediates to the very same countries, on which it was dependent for imports till about a decade ago. The country produces a range of dyes, such as disperse dyes, reactive dyes, vat dyes, pigments and leather dyes. This segment forms an important link in the value chain of other industries using chemicals such as textiles, leather, plastic, paper, packaging, printing inks, paints and polymers. Textile sector is a major consumer of dyestuffs and accounts for 70% of dyestuff consumption in India.

Exhibit 13 : Exports of HS 32 from India (2009 – 2018)

Source: Data accessed from ITC Trade Map, January 2020; EXIM Bank Research

The exports of HS 32 increased from US$ 1.2 billion in 2009 to US$ 3.2 billion in 2018, recording an AAGR of 12.7%, during this period. The export destinations for this category of chemicals are quite diversified with the top ten export destinations accounting for 50% of the total exports of HS 32. Major destinations include the USA, China, Bangladesh, Turkey, and Germany.

Table 13 : Major exports of HS 32 from India

HS Code	Description	India's exports in 2018 (US$ million)	AAGR of India's exports (2014-18)	India's share in world exports: 2018
320416	Synthetic organic reactive dyes; preparations based on synthetic organic reactive dyes of a kind used to dye fabrics or produce colorant preparations	719.3	2.7%	41.4%
320417	Synthetic organic pigments; preparations based on synthetic organic pigments of a kind used	709.3	4.0%	14.0%
320412	Synthetic organic acid dyes, whether or not metallized, and synthetic organic mordant dyes; preparations based on synthetic organic acid or mordant dyes of a kind used to dye fabrics or produce colorant preparations	284.5	-0.3%	28.5%

320419	Synthetic organic coloring matter (excluding disperse dyes, acid dyes, mordant dyes, basic dyes, direct dyes, vat dyes and reactive dyes and organic pigments); preparations of the kind used for coloring any materials or for the production of prepared colors, based thereon	263.9	7.0%	15.6%
320411	Synthetic organic disperse dyes; preparations based on synthetic organic disperse dyes of a kind used to dye fabrics or produce colorant preparations (excluding preparations of heading 3207, 3208, 3209, 3210, 3213 and 3215)	142.7	20.5%	9.5%
321519	Printing ink, whether or not concentrated or solid (excluding black ink)	126.1	2.8%	2.3%
320414	Direct synthetic organic dyes; preparations based on direct synthetic organic dyes of a kind used to dye fabrics or produce colorant preparations (excluding preparations of heading 3207, 3208, 3209, 3210, 3213 and 3215)	113.8	0.5%	28.2%
320420	Synthetic organic products of a kind used as fluorescent brightening agents, whether or not chemically defined	94.8	2.9%	13.1%
321290	Pigments, incl. metallic powders and flakes, dispersed in non-aqueous media, in liquid or paste form, of a kind used in the manufacture of paints; colorants and other coloring matter, n.e.s. put up for retail sale	86.1	11.2%	5.8%
320649	Inorganic or mineral colouring matter, n.e.s.; preparations based on inorganic or mineral colouring matter of a kind used for colouring any material or produce colorant preparations	64.2	49.1%	2.0%
Top Ten		**2604.7**	**3.1%**	**11.6%**
Total		**3230.6**	**3.4%**	**3.8%**

Source: Data accessed from ITC Trade Map, January 2020; EXIM Bank Research

On the other hand, imports of HS 32 by India in 2018 amounted to US$ 2.2 billion, up from US$ 0.9 billion in 2009. During 2009 - 2018, the imports of HS 32 registered an AAGR of 11.5%, higher than the 3.4% AAGR of exports during the same time.

Exhibit 14 : Imports of HS 32 from India (2009 – 2018)

Source: Data accessed from ITC Trade Map, January 2020; EXIM Bank Research

The major markets in 2018, from where India imported HS 32 were China (24%), the USA (7%) and Germany (6%). While the total imports of HS 32 have increased substantially over the last decade, share of imports from Germany and the USA declined, while that of China went up.

In this regard, it may be noted that a notable increase was witnessed in the share of Spain in India's imports of HS 32 . The share rose from 1.9% in 2009 to 5.3% in 2018. India's imports of HS 3207105 and HS 3207306 from Spain in particular, increased the most during this time, making Spain the largest supplier for both the items. This is in sync with the growth of glass industry in India across all segments, during the same period, primarily driven by government schemes.

Table 14 : Major Imports of HS 32 by India

HS Code	Description	India's imports in 2018 (US$ million)	AAGR of India's imports (2014-18)	India's share in world imports: 2018
320611	Pigments and preparations based on titanium dioxide of a kind used for coloring any material or produce colorant preparations, containing >= 80% by weight of titanium dioxide calculated on the dry matter	674.3	23.8%	32.2%
321519	Printing ink, whether or not concentrated or solid (excluding black ink)	141.8	12.2%	17.5%

320890	Paints and varnishes based, incl. enamels and lacquers, on synthetic polymers or chemically modified natural polymers, dispersed or dissolved in a non-aqueous medium, and solutions of products of headings 3901 to 3913 in volatile organic solvents, containing > 50% solvent by weight	118.8	6.5%	1.5%
320710	Prepared pigments, prepared opacifiers, prepared colours and similar preparations of a kind used in the ceramic, enamelling or glass industry	108.4	33.7%	6.6%
320415	Synthetic organic vat dyes, incl. those usable in that state as pigments; preparations based on synthetic organic vat dyes of a kind used to dye fabrics or produce colorant preparations	107.6	12.0%	1.8%
320417	Synthetic organic pigments; preparations based on synthetic organic pigments of a kind used to dye fabrics or produce colorant preparations	85.5	1.7%	10.0%
321410	Glaziers' putty, grafting putty, resin cements, caulking compounds and other mastics; painters' fillings	78.9	16.9%	1.6%
321590	Ink, whether or not concentrated or solid (excluding printing ink)	64.0	2.0%	1.2%
320649	Inorganic or mineral colouring matter, n.e.s.; preparations based on inorganic or mineral colouring matter of a kind used for colouring any material or produce colorant preparations	60.1	4.1%	2.3%
320190	Tanning extracts of vegetable origin (excluding quebracho extract and wattle extract); tannins and their salts, ethers, esters and other derivatives	58.9	18.9%	1.1%
Top Ten		**1498.2**	**13.8%**	**0.3%**
Total		**2,175.7**	**7.9%**	**2.5%**

Source: Data accessed from ITC Trade Map, January 2020; EXIM Bank Research

It is to be noted that in 2018, three items (HS 321519, HS 320417, and HS 320649)[13] featured both in the top ten exports as well as top ten imports of HS 32.

Further, in the last ten years, composition of India's import basket for HS 32 has not transformed substantially. During this period, while HS 320611[14] gained prominence, the share of other items, at HS 6-digit level, in India's total HS 32 imports largely remained unchanged.

[13] HS 321519- Printing ink, whether or not concentrated or solid (excluding black ink)

[14] HS 320611 - Pigments and preparations based on titanium dioxide of a kind used for colouring any material or produce colorant preparations, containing >= 80% by weight of titanium dioxide calculated on the dry matter (excluding preparations of heading 3207, 3208, 3209, 3210, 3212, 3213 and 3215)

As can be seen from the Table, India's imports of HS 32 at 6-digit level is largely not concentrated, except for HS 320611, which has continued to be the highest import item during 2009-2018.

Widely used across industries like pharmaceutical, cosmetics and manufacture of paints, the import demand for HS 320611 has mostly risen on account of its unique qualities of being resistant to discoloration under UV light in exposed locations, underscoring its importance in the construction sector as well. India's increased import demand for HS 320611 in the recent years has mostly been catered by China.

Table 15 : Composition of Top Ten Imports of HS 32 by India – 2009 vs 2018

2009			2018		
HS Code	**Description**	**% Share in total HS 32 imports**	**HS Code**	**Description**	**% Share in total HS 32 Imports**
320611	Pigments and preparations based on titanium dioxide of a kind used for coloring any material or produce colorant preparations, containing >= 80% by weight of titanium dioxide calculated on the dry matter	6%	**320611**	Pigments and preparations based on titanium dioxide of a kind used for coloring any material or produce colorant preparations, containing >= 80% by weight of titanium dioxide calculated on the dry matter	13%
321519	Printing ink, whether or not concentrated or solid (excluding black ink)	3%	**321519**	Printing ink, whether or not concentrated or solid	3%
320890	Paints and varnishes based, incl. enamels and lacquers, on synthetic polymers or chemically modified natural polymers, dispersed or dissolved in a non-aqueous medium, and solutions of products of headings 3901 to 3913 in volatile organic solvents, containing > 50% solvent by weight	2%	**320890**	Paints and varnishes based, incl. enamels and lacquers, on synthetic polymers or chemically modified natural polymers, dispersed or dissolved in a non-aqueous medium, and solutions of products of headings 3901 to 3913 in volatile organic solvents, containing > 50% solvent by weight	2%
320417	Synthetic organic pigments; preparations based on synthetic organic pigments of a kind used to dye fabrics or produce colorant preparations	2%	**320710**	Prepared pigments, prepared opacifiers, prepared colours and similar preparations of a kind used in the ceramic, enamelling or glass industry	2%
320190	Pigments and preparations based on titanium dioxide of a kind used for colouring any material or produce colorant preparations, containing < 80% by weight of titanium dioxide calculated on the dry matter	1%	**320417**	Synthetic organic pigments; preparations based on synthetic organic pigments of a kind used to dye fabrics or produce colorant preparations	2%

320990	Paints and varnishes, incl. enamels and lacquers, based on synthetic or chemically modified natural polymers, dispersed or dissolved in an aqueous medium	1%	**321410**	Glaziers' putty, grafting putty, resin cements, caulking compounds and other mastics; painters' fillings	2%
320649	Inorganic or mineral colouring matter, n.e.s.; preparations based on inorganic or mineral colouring matter of a kind used for colouring any material or produce	1%	**321590**	Ink, whether or not concentrated or solid (excluding printing ink)	1%
320411	Synthetic organic disperse dyes; preparations based on synthetic organic disperse dyes of a kind used to dye fabrics or produce colorant preparations	1%	**320649**	Inorganic or mineral colouring matter, n.e.s.; preparations based on inorganic or mineral colouring matter of a kind used for colouring any material or produce colorant preparations, n.e.s.	1%
321210	Stamping foils of a kind used in the printing of book bindings or hatband leather	1%	**320190**	Tanning extracts of vegetable origin	1%

Source: Data accessed from ITC Trade Map, January 2020; EXIM Bank Research

HS 3808: Insecticides, rodenticides, fungicides, herbicides, anti-sprouting products and plant growth regulators, disinfectants and similar products, put up for retail sale or as preparations or articles, e.g. Sulphur-treated bands, wicks and candles, and fly-papers

India is one of the most dynamic generic pesticide manufacturers in the world with more than 60 technical grade pesticides being manufactured indigenously by over 125 producers comprising large and medium scale enterprises (including about 10 multinational companies), and more than 500 pesticide formulators spread all over the country. India is the 4th largest producer of agrochemicals after the USA, Japan and China and has emerged as the 13th largest exporter of pesticides globally.

The exports of HS 32 from India in 2018 amounted to US$ 2.9 billion, up by US$ 530 million from 2017. During 2009 – 2018, the exports of HS 3808 registered an AAGR of 13.0%.

Exhibit 15 : Exports of HS 3808 from India (2009 – 2018)

Source: Data accessed from ITC Trade Map, January 2020; EXIM Bank Research

India has been a net exporter of insecticides with imports in 2018 at US$ 1.6 billion being less than India's total exports. China was the major source of India's imports of HS 3808, with imports from the country aggregating to US$ 757 million in 2018. Other major countries exporting to India included the USA (US$ 116 million) and Germany (US$ 93 million). Together, these three countries accounted for nearly two-third of India's total imports of HS 3808 in 2018. India's imports primarily comprised Insecticides (HS 380891) and Rodenticides (HS 380899).

In terms of exports, the USA continues to be India's major export destination with exports to the US increasing from US$ 120 million in 2009 to US$ 552 million in 2018, thereby recording an average annual growth of 19.8%. The other major export markets for insecticides etc. included Brazil, France, Vietnam, and Belgium.

Table 16 : Major exports of HS 3808 from India

HS Code	Description	India's exports in 2018 (US$ million)	AAGR of India's exports (2014-18)	India's share in world exports: 2018
380891	Insecticides (excluding goods of subheading 3808.50)	948.8	8.1%	10.4%
380893	Herbicides, anti-sprouting products and plant-growth regulators (excluding goods of subheading 3808.50)	888.0	27.9%	6.6%
380892	Fungicides (excluding goods of subheading 3808.50)	588.6	14.1%	6.6%
380899	Rodenticides and other plant protection products put up for retail sale or as preparations or articles (excluding insecticides, fungicides, herbicides, disinfectants, and goods of subheading 3808.50)	514.9	3.7%	25.6%
380894	Disinfectants (excluding goods of subheading 3808.50)	18.7	11.5%	0.7%

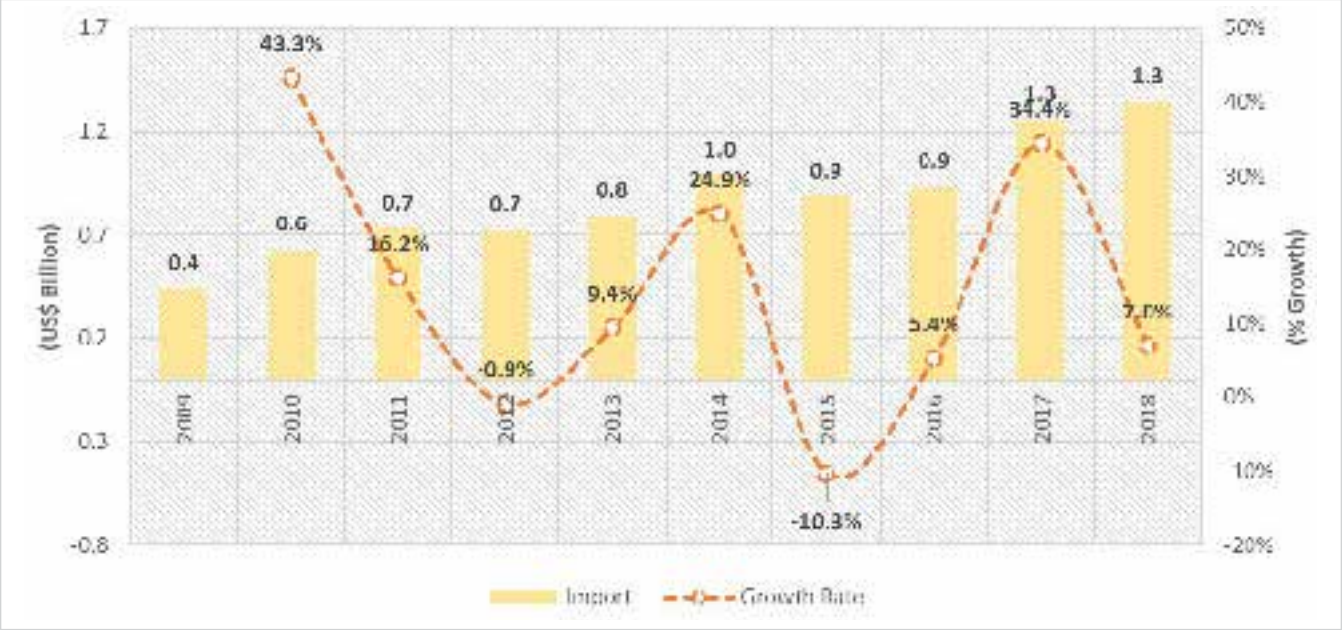
380859	Goods of heading 3808 containing one or more of the following substances: alachlor (ISO); aldicarb (ISO); aldrin (ISO); azinphos-methyl (ISO); binapacryl (ISO); camphechlor (ISO) (toxaphene); captafol (ISO); chlordane (ISO); chlordimeform (ISO); chlorobenzilate (ISO); dieldrin (ISO, INN); 4,6-dinitro-o-cresol (DNOC (ISO)) or its salts; dinoseb (ISO), its salts or its esters; endosulfan (ISO); ethylene dibromide (ISO) (1,2-dibromoethane); ethylene dichloride (ISO) (1,2-dichloroethane); fluoroacetamide (ISO); heptachlor (ISO); hexachlorobenzene (ISO); 1,2,3,4,5,6-hexachlorocyclohexane (HCH (ISO)), including lindane (ISO, INN); mercury compounds; methamidophos (ISO); monocrotophos (ISO); oxirane (ethylene oxide); parathion (ISO); parathion-methyl (ISO) (methyl-parathion); penta- and-octabromodiphenyl ethers; pentachlorophenol (ISO), its salts or its esters; perfluorooctane sulphonic acid and its salts; perfluorooctane sulphonamides; perfluorooctane sulphonyl fluoride; phosphamidon (ISO); 2	4.0	1108.7%	1.8%
380869	Goods of heading 3808, containing alpha-cypermethrin “ISO”, bendiocarb “ISO”, bifenthrin “ISO”, chlorfenapyr “ISO”, cyfluthrin “ISO”, deltamethrin “INN, ISO”, etofenprox “INN”, fenitrothion “ISO”, lambda-cyhalothrin “ISO”, malathion “ISO”, pirimiphos-methyl “ISO” or propoxur “ISO” (excl. in packings of a net weight content <= 7,5 kg)	1.4	502.9%	0.4%
380852	DDT “ISO” “clofenotane “INN””, in packings of a net weight content <= 300 g	0.0	4300.0%	0.3%
380861	Goods of heading 3808, containing alpha-cypermethrin "ISO", bendiocarb "ISO", bifenthrin "ISO", chlorfenapyr "ISO", cyfluthrin "ISO", deltamethrin "INN, ISO", etofenprox "INN", fenitrothion "ISO", lambda-cyhalothrin "ISO", malathion "ISO", pirimiphos-methyl "ISO" or propoxur "ISO", in packings of a net weight content <= 300 g	0.0	-60.0%	0.0%

380862	Goods of heading 3808, containing alpha-cypermethrin "ISO", bendiocarb "ISO", bifenthrin "ISO", chlorfenapyr "ISO", cyfluthrin "ISO", deltamethrin "INN, ISO", etofenprox "INN", fenitrothion "ISO", lambda-cyhalothrin "ISO", malathion "ISO", pirimiphos-methyl "ISO" or propoxur "ISO", in packings of a net weight content > 300 g but <= 7,5 kg	0.0	100.0%	0.0%
Top Ten		**2964.4**	**11.5%**	**8.1%**
Total		**2964.8**	**11.5%**	**8.1%**

Source: Data accessed from ITC Trade Map, January 2020; EXIM Bank Research

On the other hand, imports of HS 3808 from India in 2018 amounted to US$ 1.3 billion, up by US$ 87 million in 2017. During 2009 – 2018, the imports of HS 3808 registered an AAGR of 14.4%, higher than the 13.0% AAGR of exports witnessed during the same period.

Exhibit 16 : Imports of HS 3808 by India (2009 – 2018)



Source: Data accessed from ITC Trade Map, January 2020; EXIM Bank Research

The major source countries for India's imports, in 2018, were China (57%), the USA (9%) and Germany (7%). It is to be noted that in the last ten years, while the share of China in India's import of HS 3808 increased from 40% to 57%, that of the USA fell from 18% in 2009 to 9% in 2018.

At a granular level, the increase in imports of HS 3808 from China is explained largely through the increased imports of HS 3808999 and HS 38089110, which registered an AAGR of 9.7% and 9.9% respectively, during 2009-2018. Given that the demand for both HS 380899 and HS 380891 moves in line with the agricultural output, there is opportunity for the domestic manufacturers to expand their production lines and reduce the reliance on imports from China.

Table 17 : Major imports of HS 3808 from India

HS Code	Description	India's Import in 2018 (US$ million)	AAGR of India's Imports (2014-18)	India's Share in World Imports
380899	Rodenticides and other plant protection products put up for retail sale or as preparations or articles (excluding insecticides, fungicides, herbicides, disinfectants, and goods of subheading 3808.50)	1156.6	19.1%	6.2%
380891	Insecticides (excluding goods of subheading 3808.50)	925.6	2.1%	24.5%
380893	Herbicides, anti-sprouting products and plant-growth regulators (excluding goods of subheading 3808.50)	777.6	6.8%	34.9%
380892	Fungicides (excluding goods of subheading 3808.50)	752.2	7.8%	24.8%
380894	Disinfectants (excluding goods of subheading 3808.50)	653.3	22.8%	6.7%
380859	Goods of heading 3808 containing one or more of the following substances: alachlor (ISO); aldicarb (ISO); aldrin (ISO); azinphos-methyl (ISO); binapacryl (ISO); camphechlor (ISO) (toxaphene); captafol (ISO); chlordane (ISO); chlordimeform (ISO); chlorobenzilate (ISO); dieldrin (ISO, INN); 4,6-dinitro-o-cresol (DNOC (ISO)) or its salts; dinoseb (ISO), its salts or its esters; endosulfan (ISO); ethylene dibromide (ISO) (1,2-dibromoethane); ethylene dichloride (ISO) (1,2-dichloroethane); fluoroacetamide (ISO); heptachlor (ISO); hexachlorobenzene (ISO); 1,2,3,4,5,6-hexachlorocyclohexane (HCH (ISO)), including lindane (ISO, INN); mercury compounds; methamidophos (ISO); monocrotophos (ISO); oxirane (ethylene oxide); parathion (ISO); parathion-methyl (ISO) (methyl-parathion); penta-and-octabromodiphenyl ethers; pentachlorophenol (ISO), its salts or its esters; perfluorooctane sulphonic acid and its salts; perfluorooctane sulphonamides; perfluorooctane sulphonyl fluoride; phosphamidon (ISO); 2	645.7	0%	1.1%
380852	DDT "ISO" "clofenotane "INN"", in packings of a net weight content <= 300 g	606.8	0%	0.1%

380862	Goods of heading 3808, containing alpha-cypermethrin "ISO", bendiocarb "ISO", bifenthrin "ISO", chlorfenapyr "ISO", cyfluthrin "ISO", deltamethrin "INN, ISO", etofenprox "INN", fenitrothion "ISO", lambda-cyhalothrin "ISO", malathion "ISO", pirimiphos-methyl "ISO" or propoxur "ISO", in packings of a net weight content > 300 g but <= 7,5 kg	559.9	0%	0.5%
380810	Insecticides put up for retail sale or as preparations or articles	553.4	0%	0%
Top Ten		**7267.5**	**9.3%**	**3.6%**
Total		**1345.9**	**9.1%**	**3.6%**

Source: Data accessed from ITC Trade Map, January 2020; EXIM Bank Research

Revealed Comparative Advantage

Revealed Comparative Indices are used to identify categories of exports in which an economy has a comparative advantage by way of comparison of the country's trade scenario with the world scenario. The basic assumption underlying the concept of revealed comparative advantage is that the trade profile reflects the inter-country differences in terms of relative costs as well as non-price aspects. As per Balassa's (1965) measure, index for country 'i', commodity 'j' is:

$$RCA_{ij} = (x_{ij}/X_{it}) / (x_{wj}/X_{wt})$$

Where,
X_{ij}: exports of commodity j from country i
X_{it}: total exports from country i
X_{wj}: total exports of commodity j from world
X_{wt}: total exports from world

The RCA index ranges from 0 to infinity, with 1 as the break-even point. That is, an RCA value of less than 1 means that the product does not have a comparative advantage, while a value above 1 indicates that the product has a comparative advantage.

The Normalized Revealed Comparative Advantage (NRCA) index has been demonstrated capable of revealing the extent of comparative advantage that a country has in a commodity more precisely and consistently than other alternative RCA indices in the literature. NRCA can be defined in the following manner

$$NRCA_{ij} = (RCA_{ij} - 1)/ (RCA_{ij} + 1)$$

NRCA ranges from -1 to 1 with 0 as the breakeven point. That is, an NRCA value of less than 0 means that the product has no export comparative advantage, while a value above 0 indicates that the product has a comparative advantage. The extent of comparative advantage/disadvantage can be gauged from the proximity of the NRCA values to the extreme data points, viz. +1 and -1.

Broadly, the competitiveness indicators for the sub-groups of Chemicals industry in 2018 stood as below:

Table 18 : Chemicals Industry – Competitiveness Indicators

HS Code	Description	RCA	NRCA
29	Organic chemicals	2.38	0.41
32	Tanning or dyeing extracts; tannins and their derivatives; dyes, pigments and other coloring matter; paints and varnishes; putty and other mastics; inks	2.26	0.39
28	Inorganic chemicals; organic or inorganic compounds of precious metals, of rare-earth metals, of radioactive elements or of isotopes	0.92	-0.04
3808	Insecticides, rodenticides, fungicides, herbicides, anti-sprouting products and plant-growth regulators, disinfectants and similar products, put up for retail sale or as preparations or articles, e.g. Sulphur-treated bands, wicks and candles, and fly-papers	4.82	0.66

Source: Data accessed from ITC Trade Map, January 2020; EXIM Bank Research

Except HS 28 "Inorganic chemicals; organic or inorganic compounds of precious metals, of rare-earth metals, of radioactive elements or of isotopes", India's Chemicals and Dye Industry had a relative comparative advantage across all other sub-groups.

HS 28: Inorganic chemicals; organic or inorganic compounds of precious metals, of rare-earth metals, of radioactive elements or of isotopes

At the HS 6-digit level, out of the top ten export items from the HS 28 group, except for HS 284390 (Inorganic or organic compounds of precious metals, whether or not chemically defined (excluding silver and gold); amalgams of precious metals), India enjoyed a relative comparative advantage in other products among the top ten export items for HS 28 in 2018. The export growth was led by HS 281820 and was relatively concentrated in UAE and Egypt, the former being the third largest importer of the item. Widely used in the electrical and electronics industry, India's export of HS 281820 (Aluminum oxide) registered an AAGR of 76% during 2009-2018 against the AAGR of 40% in imports.

It is to be noted that, in 2018, while India was amongst the top ten exporters for HS 281820 globally, the trade deficit stood at US$ 722 million, up by US$ 380 million from the preceding year. Across the trading partners, the highest share of trade deficit was noted with Australia, Vietnam, and China.

Table 19 : Competitiveness of the major export Items under HS 28

HS Code	Description	Export (US$ Million) in 2018	% share in total HS 28 exports	NRCA	Major Export Destinations
281820	Aluminium oxide (excluding artificial corundum)	686.6	34%	0.40	UAE (43%), Egypt (20%), Iran (10%)
280300	Carbon (carbon blacks and other forms of carbon, n.e.s.)	131.6	6%	0.18	Sri Lanka (22%), South Korea (12%), Vietnam (10%)

281511	Sodium hydroxide "caustic soda" solid	110.8	5%	0.75	Tanzania (13%), Kenya (10%), Uganda (10%)
284390	Inorganic or organic compounds of precious metals, whether or not chemically defined (excluding silver and gold); amalgams of precious metals	70.8	3%	-0.01	Switzerland (94%), France (3%), USA (1%)
283329	Sulphates (excluding of sodium, magnesium, aluminium, nickel, copper, barium and mercury)	60.3	3%	0.49	USA (17%), Peru (7%), Indonesia (5%)
282300	Titanium oxides	50.8	2%	0.58	Japan (47%), USA (18%), Taipei (9%)
282749	Chloride oxides and chloride hydroxides (excluding copper and mercury)	50.4	2%	0.81	USA (30%), UK (13%), Mexico (11%)
281700	Zinc oxide; zinc peroxide	41.8	2%	0.17	Vietnam (19%), Australia (14%), Sri Lanka (9%)
281830	Aluminium hydroxide	38.8	2%	0.15	UAE (26%), Saudi Arabia (11%), Taipei (9%)
283110	Dithionite and sulfoxylate of sodium	37.9	2%	0.78	Pakistan (26%), Turkey (24%), Thailand (6%)

Source: Data accessed from ITC Trade Map, January 2020; EXIM Bank Research

Table 20 : Competitiveness of the major import Items under HS 28

HS Code	Description	Import (US$ Million) in 2018	% share in total HS 28 imports	NRCA	Major Suppliers
280920	Phosphoric acid; polyphosphoric acids, whether or not chemically defined	1861.8	25.6%	-0.99	Morocco (30.8%), Senegal (28.2%), Jordan (20.3%)
281820	Aluminium oxide (excluding artificial corundum)	1408.8	19.4%	0.40	Australia (46.1%), Vietnam (23.1%), China (15.4%)
281410	Anhydrous ammonia	909.9	12.5%	-0.99	Iran (26%), Qatar (20.5%), Saudi Arabia (20.5%)
280300	Carbon (carbon blacks and other forms of carbon, n.e.s.)	379.9	5.2%	0.18	China (37.4%), South Korea (18.2%), Russia (9.2%)
284390	Inorganic or organic compounds of precious metals, whether or not chemically defined (excluding silver and gold); amalgams of precious metals	208.6	2.9%	0.01	USA (41.2%), UK (37.5%), Japan (7.3%)

283620	Disodium carbonate	206.0	2.8%	0.42	Turkey (21.5%), Romania (17.5%), USA (13.1%)
281512	Sodium hydroxide "caustic soda" in aqueous solution "soda lye or liquid soda"	147.0	2.0%	0.96	Japan (63.6%), Iran (11.5%), Indonesia (7%)
280469	Silicon containing < 99,99% by weight of silicon	131.9	1.8%	0.98	China (80.8%), Hong Kong (11.5%), France (1.5%)
283650	Calcium carbonate	119.4	1.6%	0.21	Malaysia (47.5%), Vietnam (35.5%), Egypt (9.3%)
280470	Phosphorus	105.8	1.5%	0.51	Vietnam (74.4%), Russia (12.4%), Latvia (6.7%)

Source: Data accessed from ITC Trade Map, January 2020; EXIM Bank Research

HS 29: Organic chemicals

For the items at HS 6-digit level, under this category, HS 290243 and HS 290220 were the top two export items in terms of value, collectively contributing to 22% of total HS 29 exports. It may be noted from the analysis that India stands at a relative comparative disadvantage for both these items.

Despite the negative NRCA, widely used as a feedstock to manufacture other industrial chemicals, the export of HS 290243 (P-Xylene) witnessed a 100% y-o-y increase in 2018, over 2017. India also retained its position as the second largest exporter of this chemical globally in 2018.

A similar trend was noted for HS 290220 (Benzene), which is a major chemical found in crude oil and used in production of plastics, synthetic fiber, dyes and detergents. Even though India stood at a relative comparative disadvantage in export of this item, its exports increased by more than 60% on a y-o-y basis in 2018, making India its second largest exporter. It is important to note that despite the relative comparative disadvantage, the trade balance for HS 290220 has remained positive and witnessed a US$ 18 million increase in 2018, over 2017.

Table 21 : Competitiveness of the Top Ten Export Items for HS 29

HS Code	Description	Export (US$ Million) in 2018	% share in total HS 28 exports	NRCA	Major Export Destinations
290243	P-Xylene	2626.2	15%	-0.74	China (51%), Malaysia (16%), Indonesia (13%)
290220	Benzene	1313.0	7%	-0.86	Saudi Arabia (34%), China (19%), Spain (9%)
294200	Separate chemically defined organic compounds	1127.2	6%	0.94	USA (9%), Brazil (6%), Germany (4%)

293399	Heterocyclic compounds with nitrogen hetero-atom[s] only	773.2	4%	0.52	USA (10%), Italy (10%), Germany (6%)
293339	Heterocyclic compounds with nitrogen hetero-atom[s] only, containing an unfused pyridine ring, whether or not hydrogenated, in the structure	529.0	3%	0.45	USA (12%), China (9%), Germany (8%)
294190	Antibiotics	527.1	3%	0.62	Bangladesh (11%), Turkey (7%), Vietnam (6%)
293499	Nucleic acids and their salts, whether or not chemically defined; heterocyclic compounds	492.7	3%	0.35	South Africa (14%), Germany (8%), Japan (8%)
290611	Menthol	358.3	2%	0.92	China (59%), USA (10%), Singapore (7%)
293359	Heterocyclic compounds with nitrogen hetero-atom[s] only, containing a pyrimidine ring, whether or not hydrogenated, or piperazine ring in the structure	342.7	2%	0.02	USA (11%), Singapore (10%), Spain (7%)
292419	Acyclic amides, incl. acyclic carbamates, and their derivatives, and salts thereof	306.1	2%	0.80	Brazil (34%), USA (17%), Belgium (6%)

Source: Data accessed from ITC Trade Map, January 2020; EXIM Bank Research

Table 22 : Competitiveness of the Top Ten Import Items for HS 29

HS Code	Description	Import (US$ Million) in 2018	% share in total HS 29 imports	NRCA	Major Suppliers
290250	Styrene	1156.6	5.1%	-0.88	Singapore (37.9%), Kuwait (23.4%), Saudi Arabia (17.2%)
290243	P-Xylene	925.6	4.1%	0.76	Japan (34.3%), Singapore (31.4%), Kuwait (15.9%)
290511	Methanol "methyl alcohol"	777.6	3.4%	-0.95	Iran (62.3%), Saudi Arabia (16.9%), Qatar (10.5%)
290110	Saturated acyclic	752.2	3.3%	-0.74	USA (87.6%), Romania (3.3%), Thailand (2.7%)
291521	Acetic acid	653.3	2.9%	-0.44	China (32%), Malaysia (30%), Singapore (29.4%)

293399	Heterocyclic compounds with nitrogen hetero-atom[s] only (excluding those containing an unfused pyrazole, imidazole, pyridine or triazine ring, whether or not hydrogenated, a quinoline or isoquinoline ring-system, not further fused, whether or not hydrogenated, a pyrimidine ring, whether or not hydrogenated, or piperazine ring in the structure, and lactams, alprazolam "INN", camazepam "INN", chlordiazepoxide "INN", clonazepam "INN", clorazepate, delorazepam "INN", diazepam "INN", estazolam "INN", ethyl loflazepate "INN", fludiazepam "INN", flunitrazepam "INN", flurazepam "INN", halazepam "INN", lorazepam "INN", lormetazepam "INN", mazindol "INN", medazepam "INN", midazolam "INN", nimetazepam "INN", nitrazepam "INN", nordazepam "INN", oxazepam "INN", pinazepam "INN", prazepam "INN", pyrovalerone "INN", temazepam "INN", tetrazepam "INN" and triazolam "INN", and salts thereof)	645.7	2.9%	0.53	China (74.2%), USA (4.3%), Germany (3.3%)
294110	Penicillins and their derivatives with a penicillanic acid structure; salts thereof	636.4	2.8%	0.72	China (90%), UK (2%), Austria (1.4%)
290531	Ethylene glycol "ethanediol"	606.8	2.7%	0.29	China (73.2%), USA (10.9%), Mexico (3.8%)
294190	Antibiotics (excluding penicillins and their derivatives with a penicillanic acid structure, salts thereof, streptomycins, tetracyclines, chloramphenicol and erythromycin, their derivatives and salts thereof)	559.9	2.5%	0.62	Indonesia (29.9%), China (27.6%), Mexico (7.9%)
291736	Terephthalic acid and its salts	553.4	2.5%	-0.02	Pakistan (42.3%), Oman (22.1%), South Africa (14.6%)

Source: Data accessed from ITC Trade Map, January 2020; EXIM Bank Research

HS 32: Tanning or dyeing extracts; tannins and their derivatives; dyes, pigments and other coloring matter; paints and varnishes; putty and other mastics; inks

Among the items at HS 6-digit level, within this category, the top three export items - HS 320416, HS 320417 and HS 320412, collectively made up for more than half the exports in 2018. It is to be noted that for all the top ten export items of HS 32, India stood at a relative comparative advantage.

During the period 2009 and 2018, India's export of HS 320416 to Bangladesh, witnessed an AAGR of 28%, which was the fastest growth being registered in 2012, following which, even though the growth rate has remained positive, a decline in its trend has been observed.

Table 23 : Competitiveness of the Top Ten Export Items under HS 32

HS Code	Description	Export (US$ Million) in 2018	% share in total HS 32 exports	NRCA	Major Export Destinations
320416	Synthetic organic reactive dyes; preparations based on synthetic organic reactive dyes of a kind used to dye fabrics or produce colorant preparations (excluding preparations of heading 3207, 3208, 3209, 3210, 3213 and 3215)	719	22%	0.92	Turkey (16%), Bangladesh (14%), Singapore (8%)
320417	Synthetic organic pigments; preparations based on synthetic organic pigments of a kind used to dye fabrics or produce colorant preparations (excluding preparations of heading 3207, 3208, 3209, 3210, 3213 and 3215)	709	22%	0.79	USA (15%), Netherlands (8%), Germany (6%)
320412	Synthetic organic acid dyes, whether or not metallised, and synthetic organic mordant dyes; preparations based on synthetic organic acid or mordant dyes of a kind used to dye fabrics or produce colorant preparations (excluding preparations of heading 3207, 3208, 3209, 3210, 3213 and 3215)	284	9%	0.89	Italy (20%), China (11%), Spain (9%)
320419	Synthetic organic colouring matter (excluding disperse dyes, acid dyes, mordant dyes, basic dyes, direct dyes, vat dyes and reactive dyes and organic pigments); preparations of the kind used for colouring any materials or for the production of prepared colours, based thereon (excluding preparations in heading 3207, 3208, 3209, 3210, 3212, 3213 and 3215); mixtures of colouring matter in subheading 3204.11 to 3204.19	264	8%	-0.81	USA (12%), China (8%), UK (7%)

320411	Synthetic organic disperse dyes; preparations based on synthetic organic disperse dyes of a kind used to dye fabrics or produce colorant preparations (excluding preparations of heading 3207, 3208, 3209, 3210, 3213 and 3215)	142	4%	0.70	China (13%), Pakistan (11%), Honduras (10%)
321519	Printing ink, whether or not concentrated or solid (excluding black ink)	126	4%	0.15	Bangladesh (20%), Brazil (11%), UAE (9%)
320414	Direct synthetic organic dyes; preparations based on direct synthetic organic dyes of a kind used to dye fabrics or produce colorant preparations (excluding preparations of heading 3207, 3208, 3209, 3210, 3213 and 3215)	113	4%	0.89	Germany (13%), Italy (11%), China (9%
320420	Synthetic organic products of a kind used as fluorescent brightening agents, whether or not chemically defined	95	3%	0.77	USA (10%), Germany (9%), South Africa (7%)
321290	Pigments, incl. metallic powders and flakes, dispersed in non-aqueous media, in liquid or paste form, of a kind used in the manufacture of paints; colorants and other colouring matter, n.e.s. put up for retail sale	86	3%	0.55	Germany (62%), USA (13%), Poland (3%)
320649	Inorganic or mineral colouring matter, n.e.s.; preparations based on inorganic or mineral colouring matter of a kind used for colouring any material or produce colorant preparations, n.e.s. (excluding preparations of heading 3207, 3208, 3209, 3210, 3213 and 3215 and inorganic products of a kind used as liminophores)	64	2%	0.08	Bangladesh (5%), Kenya (5%), South Africa (4%)

Source: Data accessed from ITC Trade Map, January 2020; EXIM Bank Research

Table 24 : Competitiveness of the Top Ten Import Items for HS 32

HS Code	Description	Import (US$ Million) in 2018	% share in total HS 32 imports	NRCA	Major Suppliers
320611	Pigments and preparations based on titanium dioxide of a kind used for colouring any material or produce colorant preparations, containing >= 80% by weight of titanium dioxide calculated on the dry matter (excluding preparations of heading 3207, 3208, 3209, 3210, 3212, 3213 and 3215)	674.3	31.0%	-0.70	China (35.8%), Australia (13.8%), Mexico (12.3%)
321519	Printing ink, whether or not concentrated or solid (excluding black ink)	141.8	6.5%	0.15	Switzerland (87.6%), Netherlands (11.7%), Singapore (9.1%)
320890	Paints and varnishes based, incl. enamels and lacquers, on synthetic polymers or chemically modified natural polymers, dispersed or dissolved in a non-aqueous medium, and solutions of products of headings 3901 to 3913 in volatile organic solvents, containing > 50% solvent by weight (excluding those based on polyesters and acrylic or vinyl polymers and solutions of collodion)	118.8	5.5%	-0.62	USA (15.5%), Germany (13.2%), Thailand (12%)
320710	Prepared pigments, prepared opacifiers, prepared colours and similar preparations of a kind used in the ceramic, enamelling or glass industry	108.4	5.0%	-0.32	Spain (62%), China (15.3%), Italy (7.7%)
320415	Synthetic organic vat dyes, incl. those usable in that state as pigments; preparations based on synthetic organic vat dyes of a kind used to dye fabrics or produce colorant preparations (excluding preparations of heading 3207, 3208, 3209, 3210, 3213 and 3215)	107.6	4.9%	0.70	Singapore (47.2%), China (44.9%), Pakistan (5.9%)
320417	Synthetic organic pigments; preparations based on synthetic organic pigments of a kind used to dye fabrics or produce colorant preparations (excluding preparations of heading 3207, 3208, 3209, 3210, 3213 and 3215)	85.5	3.9%	0.79	China (36%), Germany (17.2%), USA (8.3%)

321410	Glaziers' putty, grafting putty, resin cements, caulking compounds and other mastics; painters' fillings	78.9	3.6%	-0.74	South Korea (27%), Netherlands (10.6%), Germany (10.1%)
321590	Ink, whether or not concentrated or solid (excluding printing ink)	64.0	2.9%	-0.61	Switzerland (22.8%), China (22.1%) Netherlands (13%)
320649	Inorganic or mineral colouring matter, n.e.s.; preparations based on inorganic or mineral colouring matter of a kind used for colouring any material or produce colorant preparations, n.e.s. (excluding preparations of heading 3207, 3208, 3209, 3210, 3213 and 3215 and inorganic products of a kind used as liminophores)	60.1	2.8%	0.08	Germany (16.8%), UAE (12%), Japan (11.9%)
320190	Tanning extracts of vegetable origin (excluding quebracho extract and wattle extract); tannins and their salts, ethers, esters and other derivatives (excluding organic or inorganic compounds of mercury whether or not chemically defined)	58.9	2.7%	0.20	Indonesia (90.4%), Singapore (3.8%), France (2.7%)

Source: Data accessed from ITC Trade Map, January 2020; EXIM Bank Research

HS 3808: Insecticides, rodenticides, fungicides, herbicides, anti-sprouting products and plant-growth regulators, disinfectants and similar products, put up for retail sale or as preparations or articles

Across the items at HS 6-digit level, the overall trade surplus in 2018 was led by HS 380893 and HS 380891 through their exports to the USA. It is to be noted that amongst the top ten export items of HS 3808, India stands at a relative comparative advantage in just five product sub-groups. Amongst the top ten exports, the highest NRCA index of 0.88 was recorded for HS 380899, exports of which have grown at an AAGR of 10% during 2009-2018.

Table 25 : Competitiveness of the Top Ten Export Items for HS 3808

HS Code	Description	Export (US$ Million) in 2018	% share in total HS 3808 exports	NRCA	Major Export Destinations
380891	Insecticides (excluding goods of subheading 3808.50)	949	32%	0.72	Brazil (26%), USA (11%), France (5%)
380893	Herbicides, anti-sprouting products and plant-growth regulators (excluding goods of subheading 3808.50)	888	30%	0.60	USA (19%), Brazil (19%), France (4%)

380892	Fungicides (excluding goods of subheading 3808.50)	589	20%	0.60	Brazil (17%), USA (6%), Bangladesh (5%)
380899	Rodenticides and other plant protection products put up for retail sale or as preparations or articles (excluding insecticides, fungicides, herbicides, disinfectants, and goods of subheading 3808.50)	515	17%	0.88	Brazil (27%), USA (9%), Netherlands (5%)
380894	Disinfectants (excluding goods of subheading 3808.50)	19	1%	-0.37	Vietnam (50%), Haiti (10%). Gabon (6%)
380859	Goods of heading 3808 containing one or more of the following substances: alachlor (ISO); aldicarb (ISO); aldrin (ISO); azinphos-methyl (ISO); binapacryl (ISO); camphechlor (ISO) (toxaphene); captafol (ISO); chlordane (ISO); chlordimeform (ISO); chlorobenzilate (ISO); dieldrin (ISO, INN); 4,6-dinitro-o-cresol (DNOC (ISO)) or its salts; dinoseb (ISO), its salts or its esters; endosulfan (ISO); ethylene dibromide (ISO) (1,2-dibromoethane); ethylene dichloride (ISO) (1,2-dichloroethane); fluoroacetamide (ISO); heptachlor (ISO); hexachlorobenzene (ISO); 1,2,3,4,5,6-hexachlorocyclohexane (HCH (ISO)), including lindane (ISO, INN); mercury compounds; methamidophos (ISO); monocrotophos (ISO); oxirane (ethylene oxide); parathion (ISO); parathion-methyl (ISO) (methyl-parathion); penta-and-octabromodiphenyl ethers; pentachlorophenol (ISO), its salts or its esters; perfluorooctane sulphonic acid and its salts; perfluorooctane sulphonamides; perfluorooctane sulphonyl fluoride; phosphamidon (ISO); 2	4	0%	0.06	Nepal (70%), China (18%), Bhutan (4%)
380869	Goods of heading 3808, containing alpha-cypermethrin "ISO", bendiocarb "ISO", bifenthrin "ISO", chlorfenapyr "ISO", cyfluthrin "ISO", deltamethrin "INN, ISO", etofenprox "INN", fenitrothion "ISO", lambda-cyhalothrin "ISO", malathion "ISO", pirimiphos-methyl "ISO" or propoxur "ISO"	1	0%	-0.59	Nepal (96%), Phillipines (2%), Côte d'Ivoire (1%)
380852	DDT "ISO" "clofenotane "INN"", in packings of a net weight content <= 300 g	0	0%	-0.66	Phillipines (65%), Nepal (33%)

380861	Goods of heading 3808, containing alpha-cypermethrin "ISO", bendiocarb "ISO", bifenthrin "ISO", chlorfenapyr "ISO", cyfluthrin "ISO", deltamethrin "INN, ISO", etofenprox "INN", fenitrothion "ISO", lambda-cyhalothrin "ISO", malathion "ISO", pirimiphos-methyl "ISO" or propoxur "ISO", in packings of a net weight content <= 300 g	0	0%	-0.99	Nepal (100%)
380810	Insecticides put up for retail sale or as preparations or articles	0	0%	-1.00	-

Source: Data accessed from ITC Trade Map, January 2020; EXIM Bank Research

Table 26 : Competitiveness of the Top Ten Export Items for HS 3808

HS Code	Description	Export (US$ Million) in 2018	% share in total HS 3808 exports	NRCA	Major Export Destinations
380899	Rodenticides and other plant protection products put up for retail sale or as preparations or articles (excluding insecticides, fungicides, herbicides, disinfectants, and goods of subheading 3808.50)	606.8	45.1%	0.88	China (79.4%), USA (6.3%), Japan (3.7%)
380891	Insecticides (excluding goods of subheading 3808.50)	348.2	25.9%	0.72	China (47.4%), USA (10.4%), South Korea (9.2%)
380893	Herbicides, anti-sprouting products and plant-growth regulators (excluding goods of subheading 3808.50)	233.8	17.4%	0.60	China (41.1%), Israel (17.3%), Japan (11.6%)
380892	Fungicides (excluding goods of subheading 3808.50)	140.5	10.4%	0.60	Germany (26.8%), Belgium (23.9%), USA (12.5%)
380894	Disinfectants (excluding goods of subheading 3808.50)	10.0	0.7%	-0.37	Germany (76.9%), Netherlands (7.4%), Malaysia (5.2%)
380869	Goods of heading 3808, containing alpha-cypermethrin "ISO", bendiocarb "ISO", bifenthrin "ISO", chlorfenapyr "ISO", cyfluthrin "ISO", deltamethrin "INN, ISO", etofenprox "INN", fenitrothion "ISO", lambda-cyhalothrin "ISO", malathion "ISO", pirimiphos-methyl "ISO" or propoxur "ISO" (excl. in packings of a net weight content <= 7,5 kg)	6.7	0.5%	-0.59	Belgium (59.5%), Switzerland (25.6%), Netherlands (14.9%)

380859	Goods of heading 3808 containing one or more of the following substances: alachlor (ISO); aldicarb (ISO); aldrin (ISO); azinphos-methyl (ISO); binapacryl (ISO); camphechlor (ISO) (toxaphene); captafol (ISO); chlordane (ISO); chlordimeform (ISO); chlorobenzilate (ISO); dieldrin (ISO, INN); 4,6-dinitro-o-cresol (DNOC (ISO)) or its salts; dinoseb (ISO), its salts or its esters; endosulfan (ISO); ethylene dibromide (ISO) (1,2-dibromoethane); ethylene dichloride (ISO) (1,2-dichloroethane); fluoroacetamide (ISO); heptachlor (ISO); hexachlorobenzene (ISO); 1,2,3,4,5,6-hexachlorocyclohexane (HCH (ISO)), including lindane (ISO, INN); mercury compounds; methamidophos (ISO); monocrotophos (ISO); oxirane (ethylene oxide); parathion (ISO); parathion-methyl (ISO) (methyl-parathion); penta-and-octabromodiphenyl ethers; pentachlorophenol (ISO), its salts or its esters; perfluorooctane sulphonic acid and its salts; perfluorooctane sulphonamides; perfluorooctane sulphonyl fluoride; phosphamidon (ISO); 2	0.0	0.0%	-	-
380852	DDT "ISO" "clofenotane "INN"", in packings of a net weight content <= 300 g	0.0	0.0%	-	-
380862	Goods of heading 3808, containing alpha-cypermethrin "ISO", bendiocarb "ISO", bifenthrin "ISO", chlorfenapyr "ISO", cyfluthrin "ISO", deltamethrin "INN, ISO", etofenprox "INN", fenitrothion "ISO", lambda-cyhalothrin "ISO", malathion "ISO", pirimiphos-methyl "ISO" or propoxur "ISO", in packings of a net weight content > 300 g but <= 7,5 kg	0.0	0.0%	-	-
380890	Rodenticides and other plant protection products put up for retail sale or as preparations or articles (excluding insecticides, fungicides, herbicides and disinfectants)	0.0	0.0%	-	-

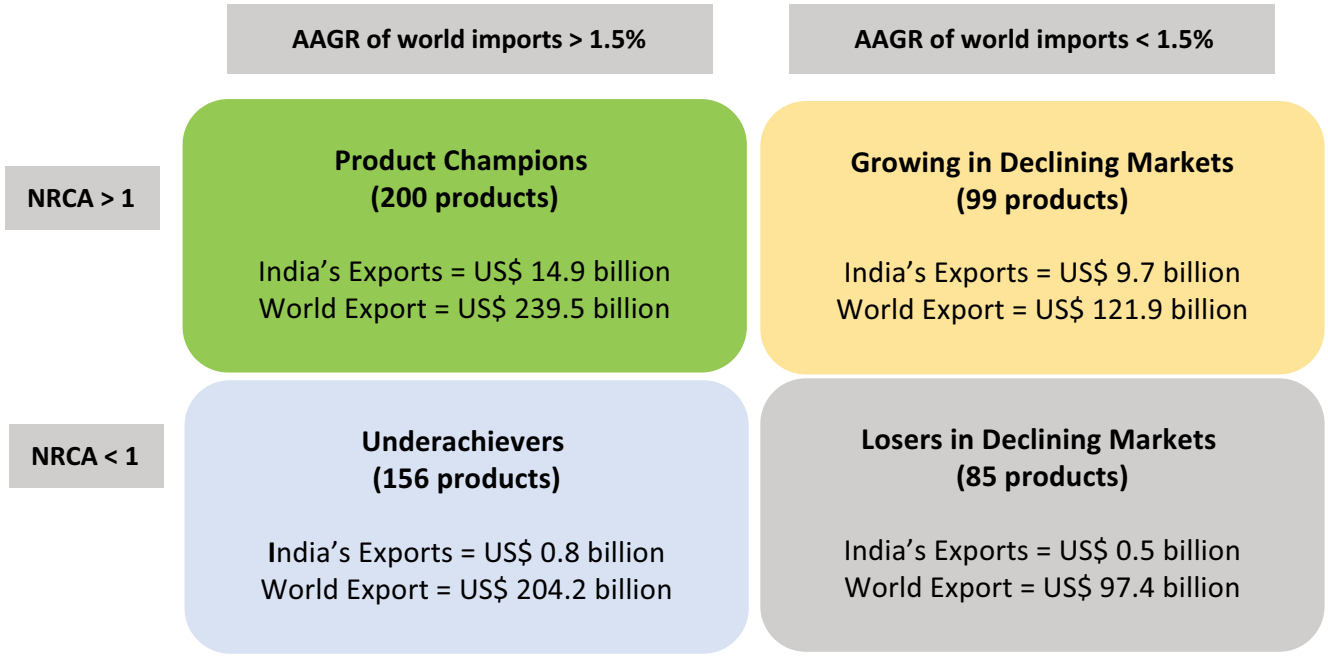
Source: Data accessed from ITC Trade Map, January 2020; EXIM Bank Research

Product Identification based on Competitiveness

In order to identify the products based on their competitiveness, the four-quadrant analysis has been undertaken based on the HS Code classifications at 6-digit level, whilst calculating their NRCA and mapping them against the AAGR of global imports of all products.

The analysis in this section considers three major determinants of the India's chemicals industry's performance in overseas markets at a granular level, namely the NRCA for products at the national level, Annual Average Growth Rate (AAGR) for global imports, and the AAGR of India's export of the product. Based on these three considerations, a four-quadrant matrix is prepared for focus product identification.

The quadrants are drawn by comparing the overall AAGR of global imports for all products during 2014-18 (which was 1.5%), to the NRCA of the products during the same period. This exercise aims to identify products whose imports over the period 2014-18 has performed better than the global average for all products during this period, implying that the share of such products in the world import basket has witnessed an increase, a reflection of their rising demand and dynamism.



Source: Data accessed from ITC Trade Map, January 2020; EXIM Bank Research

Out of the 540 items at the HS 6-digit level, taken into consideration for a broad classification within the chemical industry, a rather fair division regarding the four heads is obtained.

- These 540 items, across the four major groups – HS 28, HS 29, HS 32 and HS 3808 – include 172 items from HS 28, 317 items from HS 29, 44 items from HS 32 and remaining 7 items from HS 3808.

- While the majority of these belonged to the 'Product Champions' (both in terms of value and numbers), a closer look at the composition of these heads would help us to arrive at insights to reorient the volume and direction of foreign trade.

Table 27 : Export Value of Various Categories of Products

Category/ Exports (US$ Million)	HS 28	HS 29	HS 32	HS 3808
Product Champions	1404.9	12736.6	764.0	0.0
Growing in Declining Market	332.5	4182.6	2254.0	2072.6
Losers in Declining Market	150.0	319.4	53.8	892.1
Underachievers	144.8	503.7	158.6	0.0

Source: EXIM Bank Research

Focus Products

Product Champions [Product Import AAGR > World Import AAGR; Positive NRCA]:

- These products have the maximum potential, as the world import demand for these products has shown robust AAGR over the period 2014-18, while India's exports of these products to the world have also remained competitive, reflecting a positive NRCA values for such products.
- In the analysis, there are 200 products at HS 6-digit level which could be classified as Product Champions, out of which 34 products were from HS 28; 156 products from HS 29; and 10 products from HS 32.
- The total value of the exports of identified Product Champions stood at US$ 14.9 billion in 2018. It is to be noted that the top ten exports from this category made up for around 28% of India's total chemical exports, while the overall exports contributed to 57% of the country's total chemical exports.
- For this category, out of the 200 products, 78% by value belonged to HS 29 (Organic Chemicals), followed by 17% from HS 28 (Inorganic Chemicals). Within this, India had the highest world exports to the tune of US$ 21.7 billion of HS 290243 (P-Xylene), followed by HS 293359 at US$ 19.4 billion and HS 281820 at US$ 17.4 billion. India's exports within the Products Champions category were the highest for HS 290243 at US$ 2.6 billion (constituting 12% of world exports), followed by HS 294200 at US$ 1.1 billion. It may be noted that eight out of the top ten items in this category, which contributed to almost 50% of India's total chemical exports in 2018 belonged to HS 29.

Underachievers [Product Import AAGR > World Import AAGR; Negative NRCA]:

- Underachievers are those set of products where India has the potential but have not been competitive enough to tap it. The global import demand of these identified products has exhibited significant growth over the period under consideration, while NRCA of these products appears negative.
- In the analysis, 156 products came under this category at the HS 6-digit level, out of which 55 products were from HS 28; 90 products from HS 29; and 11 products from HS 32. The industry can strive towards increasing competitiveness in these markets for the identified products.

- The Underachievers category was relatively less at US$ 807 million, 3% of India's total chemical exports in 2018. Out of the 156 items, 57% belonged to HS 29, and the next 35% to HS 28.
- The total exports from this category contributed to around 5% of India's total chemical exports in 2018, with the top ten exports mostly belonging to HS 29.

Diversifiable Products

Growers in Declining Markets [Product Import AAGR < World Import AAGR; Positive NRCA]:

- Products falling under this category are those which are showing growth, but in a declining market where demand is waning. Here, the identified products have a positive NRCA for India.
- In the analysis, 99 products came under this category at the HS 6-digit level, out of which 35 products were from HS 28; 46 products from HS 29; 13 products from HS 32 and 5 products from HS 3808.
- The total identified exports of 'Growers in Declining Markets' however is substantial at US$ 8.84 billion, that is 30% of India's total chemical exports, which could be diverted to potential growth markets like the Middle East and Latin America.
- It is worth noting that five out of the seven products taken into consideration from HS 3808, belonged to the 'Growing in Declining Markets' category. Further, the top five export products of HS 3808 – HS 380891, HS 380892, HS 380893, HS 380894 and HS 380899 – which make up for 99% of the total HS 3808 exports, have largely been concentrated in markets like Brazil (19%) and the USA (19%). During 2014-18, even though the collective world imports of these five products grew at an AAGR of 1%, India's exports of the same grew by 11.5%.

Losers in Declining Markets [Product Import AAGR < World Import AAGR; Negative NRCA]:

- India's Chemical and Dye Industry does not exhibit competitiveness in these products, and they also register weak global import growth during the period under consideration.
- In the analysis, 85 products came under this category at the HS 6-digit level, out of which 48 products were from HS 28, 25 products from HS 29, 10 products from HS 32 and 2 products from HS 3808.
- The total value under this category stood at US$ 1.41 billion in 2018, contributing to 5% of India's total chemical exports. Indian companies involved in exporting products under this segment may like to consider a review.
- It is to be noted that this category largely comprised of products from HS 28. The top ten exports from this category were mostly concentrated to the USA and registered an AAGR of 29.5% during 2014 and 2018.
- Exports of HS 380893 (Herbicides, anti-sprouting products and plant-growth regulators), alone, constituted for over 60% of the total exports from the category and were mostly directed to the USA (42%), followed by Brazil (8%).

CHAPTER

4

IMPERATIVES TO REALIZE EXPORT POTENTIAL IN CHEMICALS

The chemical industry directly or indirectly touches over 95% of all manufactured products. While the industry has registered phenomenal growth in the last two decades, it may be noted that the sector's growth has largely been a result of growth in the FMCG sector. However, delivering profitable growth in a hypercompetitive market, low-growth world has become a bigger challenge today. In the global context, the industry is increasingly moving eastwards in line with the shift of key consumer industries (for example, automotive, electronics and so on) to leverage greater manufacturing competitiveness therein.

As has previously been noted, the low per capita consumption and low penetration levels for the user industries resulting in low per capita consumption for chemicals in India represents huge untapped opportunity for chemical companies in the long term. In 2018, the per capita consumption of the chemical industry in India stood at US$ 100[15], which was just one-tenth of the world average, indicating that the potential demand is yet to be realized.

Further, with total chemical imports registering an AAGR of 7.7%, an opportunity to substitute imports by developing technology & knowhow, and operating at economies of scale arises. It is recommended that the chemical sector should secure at least 10% of the total national inclusive innovation fund to invest in ventures/ innovations for the chemical industry.

Under the Business as Usual scenario, the chemical exports will touch US$ 55.55 billion by 2024-25, should it continue to grow at a CAGR of 4.08% during 2018-19 and 2024-25. Further, under an optimistic scenario, adhering to the 9% sectoral growth target set by the Government, the chemical exports would reach US$ 73.29 billion by 2024-25, during the same period.

Table 28 : India's Chemical Industry[16] – Export Target 2025

	Year	Scenario	Export (US$ Billion)	Required CAGR
Export Target	2017-18	Observed	43.7	-
	2024-25	Business as Usual	55.55	4.08%
	2024-25	Optimistic Case	73.29	9.00%

Source: Data accessed from Ministry of Commerce and Industry, January 2020; EXIM Bank Research

[15] Credit Suisse
[16] Data sourced for financial year for Organic, Inorganic, Dyes and Pigments, Insecticides & Pesticides (previous chapter data is calendar year)

In order to achieve the envisaged goals for India's total exports to reach US$ 1 trillion by 2024 and to keep the chemical sector stimulated domestically as well, following are a few action points that could be worked upon.

Exploring New Markets

Leading chemical manufacturers are entering markets through joint ventures or acquisitions (mainly in the Middle East to gain access to feedstocks, and in China and India to develop a local market presence). The most successful chemical producers soon are likely to be those that embrace the changing dynamics in the global chemical industry and effectively position themselves in emerging markets.

It's also important to consider regional differences - mature products in one region may be innovative products in another. At the same time, there may be a need to explore a new business model, packaging, or a delivery method, for example, to successfully deploying a product line in a certain region, and all these can be ascertained by enhancing customer relationships.

Table 29 : India's Top Chemical Exports (2018)

HS Code	Product label	Export (US$ Million)	India's Top Export Destinations	World's Top Importing Markets	India's Share in World Exports
290243	P-Xylene	2626.3	China (51%), Malaysia (16%), Indonesia (13%), Pakistan (8%)	China (71%), Taipei (7%), Mexico (4%), Indonesia (4%)	12%
290220	Benzene	1313.0	Saudi Arabia (34%), China (19%), Spain (9%), Netherlands (8%)	China (26%), USA (16%), Belgium (9%), Taipei (8%)	15%
294200	Separate chemically defined organic compounds	1127.2	USA (9%), Brazil (6%), Germany (4%), Ireland (4%)	India (29%), Iran (6%), USA (6%), Jordan (4%)	61%
293399	Heterocyclic compounds with nitrogen hetero-atom[s] only	773.2	USA (10%), Italy (10%), Germany (6%), Brazil (6%)	Spain (11%), China (11%), Switzerland (11%), USA (10%)	6%
320416	Synthetic organic reactive dyes; preparations based on synthetic organic reactive dyes of a kind used to dye fabrics or produce colorant preparations (excluding preparations of heading 3207, 3208, 3209, 3210, 3213 and 3215)	719.3	Turkey (16%), Bangladesh (14%), Singapore (8%), Pakistan (6%)	Bangladesh (15%), Turkey (12%), China (9%), Singapore (5%)	41%

320417	Synthetic organic pigments; preparations based on synthetic organic pigments of a kind used to dye fabrics or produce colorant preparations (excluding preparations of heading 3207, 3208, 3209, 3210, 3213 and 3215)	709.4	USA (15%), Netherlands (8%), Germany (6%), China (5%)	Germany (9%), USA (9%), China (6%), South Korea (6%)	14%
281820	Aluminum oxide (excluding artificial corundum)	686.6	UAE (43%), Egypt (19%), Iran (10%), Qatar (6%)	Russia (13%), Canada (12%), UAE (10%), India (8%)	4%
293339	Heterocyclic compounds with nitrogen hetero-atom[s] only, containing an unfused pyridine ring, whether or not hydrogenated, in the structure	529.0	USA (11%), China (9%), Germany (8%), Spain (5%)	Germany (23%), Belgium (13%), USA (10%), France (6%)	5%
294190	Antibiotics (excluding penicillins and their derivatives with a penicillanic acid structure, salts thereof, streptomycins, tetracyclines, chloramphenicol and erythromycin, their derivatives and salts thereof)	527.1	Bangladesh (11%), Turkey (7%), Vietnam (7%), Italy (5%)	Italy (13%), Germany (10%), France (8%), USA (7%)	7%
293499	Nucleic acids and their salts, whether or not chemically defined; heterocyclic compounds	492.7	South Africa (13%), Germany (8%), Japan (7%), USA (7%)	USA (26%), Japan (9%), Germany (8%), Belgium (6%)	3%

Source: Data accessed from ITC Trade Map, January 2020; EXIM Bank Research

The Indian chemical industry, which has largely concentrated in the domestic market, needs to explore the tremendous opportunities it has abroad. This can be undertaken by either acquiring companies abroad or through Greenfield projects (which will have a certain gestation period). The other option is exploring markets through better networks, making up channel sales force, making business associates, making assignment-based agents, and enhanced marketing in the various regions.

As per the data sourced from fDi Markets, during 2010-2019, Indian companies had a total envisaged capex of US$ 10.8 billion abroad. UAE (18%), followed by Ghana (14%) and Nigeria (13%) were the top players of this envisaged capex and collectively made up for about 45% of India's total capex in the overseas markets. On the investing side, the top companies were Rashtriya Chemicals & Fertilizers, Indian Farmers Fertiliser Cooperative (IFFCO) and Nagarjuna Fertilizers and Chemicals, contributing to 14%, 11% and 10% to the total envisaged capex respectively.

As can be seen, even though India's exports of HS 290243 (P-Xylene) have performed reasonably well in the last decade, exporters have insufficiently catered to the global import demand for other chemicals that they export the most. This holds true particularly in the case of HS 281820 (Aluminium oxide (excluding artificial corundum)), for which exports to the world's largest importer, the UAE, have remained low. Majorly used across pharmaceutical and ceramics industry, more than 70% of UAE's import demand for HS 281820 was met by Australia in 2018. It is to be noted that while India's share in UAE's total imports of HS 281820 reduced from 14% in 2017 to 10% in 2018, Vietnam's share increased from 3% in 2017 to 8% in 2018.

It is to be noted that out of the 542 items[17] at the HS-6 digit level within the purview of this Study, 148 were classified 'underachievers', i.e. the items in which the Indian chemical industry does not have competitiveness, although their global demand has grown significantly over the last five years. This essentially reflects that the share of such products in world imports has increased, reflecting their growing demand. Should India improve its competitiveness in these products, the players need to give a significant push to the overall chemical exports.

This is in a stark contrast to the items categorised as 'Product Champions' in the earlier chapter that would make a natural choice for attracting FDI in the sector. For the items in the 'Underachiever' category to realise their untapped potential, it is suggested that equal focus be laid on increasing capacity utilisation as well as exploring the right markets for exports.

The Indian chemical industry needs to be internationally competitive in order to make its presence felt in the world market. This competitive edge can broadly be captured in either being cost effective (price competitiveness) or being of a better quality. In this regard, India has been found to lag its competitors in terms of key parameters like cost of input materials and utilities, costs of labour, labour productivity, logistics and operating surplus.

Need for greater integration into the Global Value Chains (GVCs)

Manufacturing in the 21st century is a lot more globalized with production, trade, and investment being increasingly organized, with in the GVCs, where different stages of production are located across different economies of the world. In the current global scenario, countries are specializing at various stages of the value chains, rather than establishing a whole new production plant. A commodity in the current times, changes many hands before it reaches to the final consumers. Hence, there is a strong trend towards the international dispersion of value chain activities such as design, production, marketing, distribution, etc. In short, a GVC essentially is a sequence of all functional activities required in the process of value creation, involving more than one country.

However, it is to be noted that while GVCs are source of gains for many economies, gains from GVC participation are not automatic. The benefits of GVC depend on the level of operations that any economy is undertaking.

As has already been noted in the Economic Survey of India 2019-20, China's remarkable export

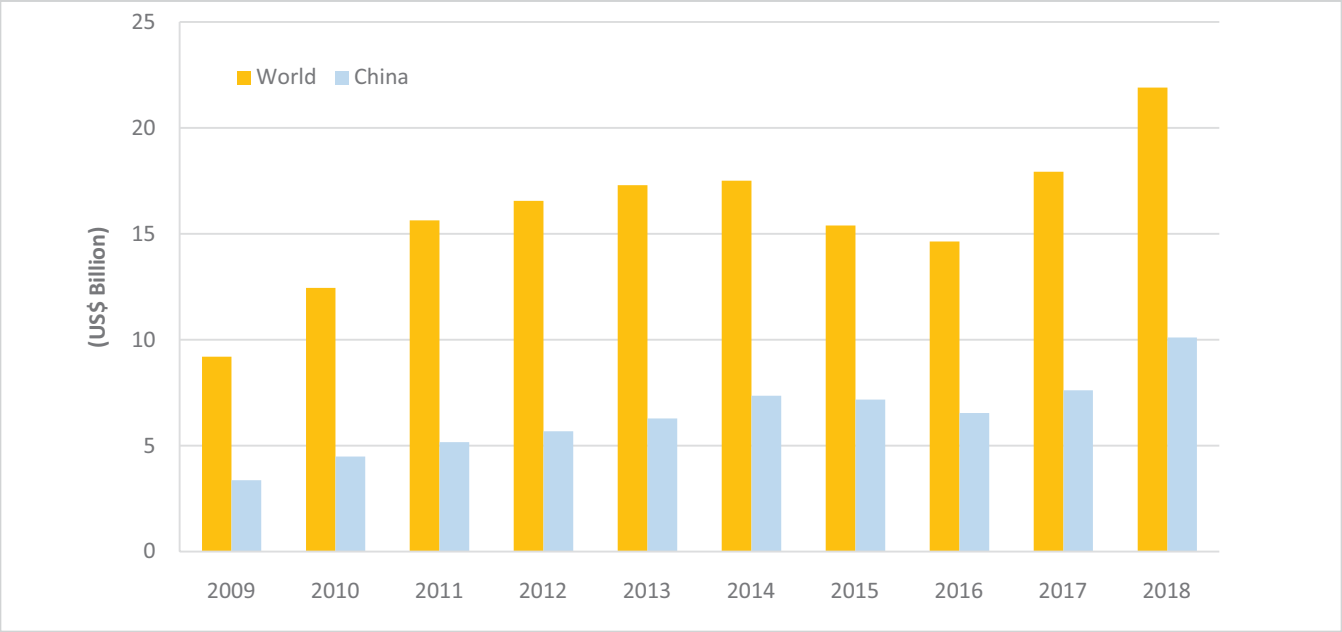
[17] 640 items fall under 6 digit HS codes, of which 542 items are exported from India

performance vis-à-vis India is driven primarily by deliberate specialization at large scale in labour-intensive activities, especially "network products", where production occurs across Global Value Chains (GVCs) operated by multi-national corporations. The Survey hints at laser-like focus to enable assembling operations at mammoth scale in network products.

A comparison of India's and China's backward linkages[18] and forward linkages[19] shows wide difference. It is to be noted that situations when forward linkages are greater than the backward linkages, there exist net value-added gains from integrating into GVCs.

Backward linkage in the case of India have shown a steady decline from 34.2% in 2012 to 21.9% in 2015 signifying relatively lower dependence on imports of intermediates for exports. During the same time, forward linkages – estimated as the domestic value-added in exports of intermediate products as a share of total gross exports, increased from 35.5% in 2012 to 44.8% in 2015. On the contrary, China's position was at a relatively better levels with lower backward linkages at 14.4% and significantly higher forward linkages at 62.8% in 2015.

Exhibit 17: Indias Chemical Import Dependance on China



Source: Data accessed from ITC Trade Map, February 2020; EXIM Bank Research

In the aforesaid context, it may be observed that India has been having aincreased dependence (backward linkage) on China for some critical inputs used by the chemical and pharmaceutical industry. During 2009-2018, while India's import of chemicals from the rest of the world increased at an AAGR of 11.1%, the imports from China grew at an AAGR of 13.7%, making up for about 46% of India's total chemical imports in 2018. It is recommended that in order to reduce the import dependence from China and boost the chemical exports from India, greater focus should be laid on enhancing India's integration into the GVCs, enabling domestic manufacturers to specialize across various stages of production.

[18] Estimated as the foreign value-added share of Gross Exports
[19] Estimated as the domestic value-added in exports of intermediate products as a share of total gross exports

Import substitution through Capacity Additions

Exporting a product in reasonable quantity corroborates that India does have the capacity to produce the same, but due to some reasons India is unable to fulfil its domestic demand, due to which it has to rely on imports of the same commodity. This holds true, in particular, for HS 290243, HS 293399, HS 281820, HS 294190, HS 293499 and HS 290531, collective imports of which constituted around 13% of total imports and at the same time, collective exports of these items were 21% of the total exports by the chemical industry in 2018. A situation like this is reflected directly with the rising GL-Index. This essentially indicates how the domestically produced chemicals do not belong to the grade/quality that is required for consumption, thereby explaining the imports of the same set of products that are exported in large quantities.

The analysis undertaken in the previous chapter indicates that while India's export of chemicals has been gradually increasing, the country still has a deficit in chemical sector on the trade account. India's exports of chemicals in 2018 stood at US$ 25.9 billion whereas imports had touched US$ 33.3 billion, an indication of strong domestic demand for chemical products. However, there are chemical products which India is both exporting and importing, as indicated by the Intra-Industry Trade (IIT) or the GL-Index.

It is argued that the rising index for inter-industry trade, implies reallocation of productive resources from import competing industries to those industries in the domestic country that have the comparative cost advantage. While in the context of IIT, it is more likely that reallocation of resources takes place from inefficient to efficient product lines within an industry.

$$\text{GL-Index} = \{(X_i + M_i) - |X_i - M_i|\}/ (X_i + M_i)\}$$

The GL-index takes values between 0 and 1, where 0 means that all trade is inter-industry while 1 means that all trade is intra-industry. Since the GL-index is calculated as IIT divided by total trade, the GL-index is interpreted as IIT's share in total trade.

Table 30 : GL-Index for India's Chemical Industry

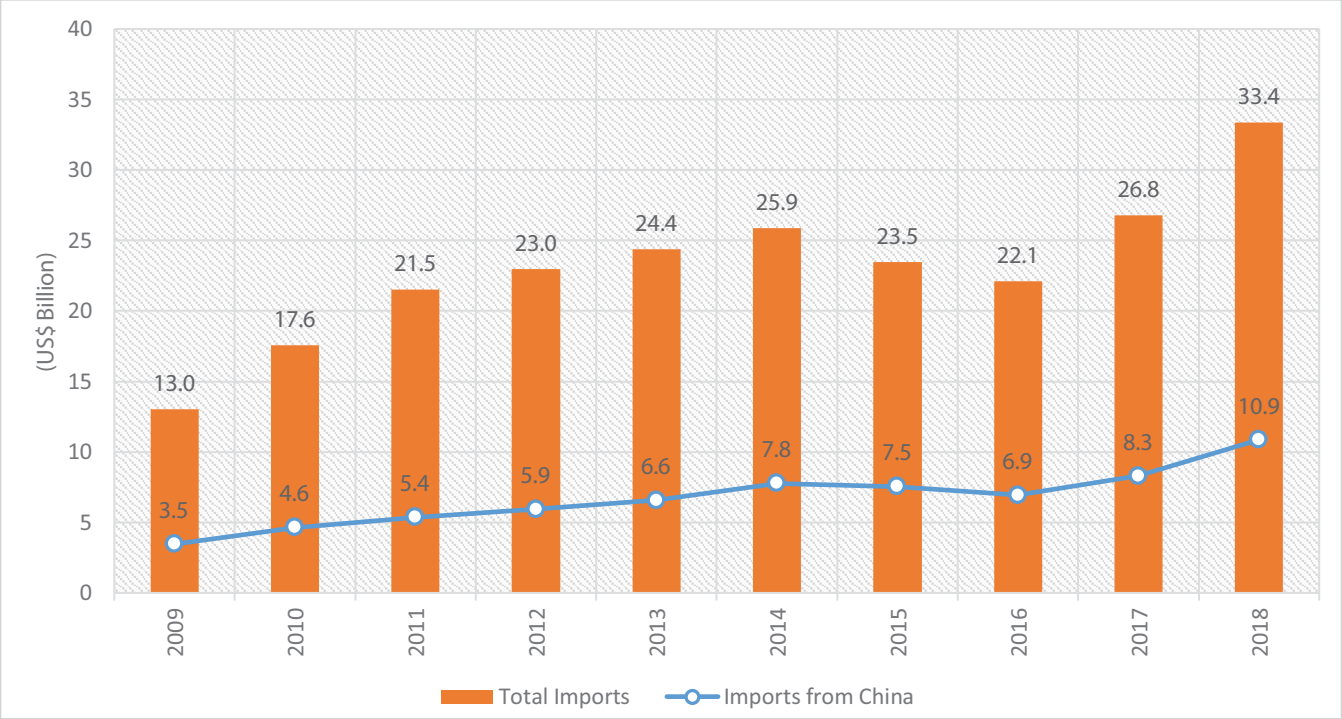
HS Code	Description	2014	2015	2016	2017	2018
28	Inorganic Chemicals	0.44	0.40	0.41	0.45	0.44
29	Organic Chemicals	0.80	0.83	0.86	0.86	0.88
32	Tanning or dyeing extracts	0.72	0.78	0.78	0.83	0.80
3808	Insecticides, rodenticides	0.68	0.63	0.62	0.68	0.62
	Total	**0.83**	**0.84**	**0.87**	**0.86**	**0.88**

Source: Data accessed from ITC Trade Map, January 2020; EXIM Bank Research

As can be seen, the GL-Index for the chemical sector as a whole stood at 0.88 in 2018 and has shown an upward trend in the last five years. Even though the level of intra-industry trade has improved steadily, the widening of overall trade in 2018 highlights the need for import substitution through capacity additions.

It is important to note that the need for capacity additions is felt strongly, particularly with reference to the rising chemical imports from China in the last ten years. Total imports of HS 28, HS 29, HS 32 and HS 3808 stood at US$ 33.3 billion in 2018, out of which US$ 10.8 billion (approximately 33%) were from China.

Exhibit 18 : Imports of HS 29 by India (2009 – 2018)



Source: Data accessed from ITC Trade Map, January 2020; EXIM Bank Research

As can be seen, China's share in India's chemical imports has increased from 26% in 2009 to 33% in 2018. The increase can largely be explained by the growth in imports of Organic Chemicals, which roughly constituted for 78% of India's total chemical imports from China and registered an AAGR of 14% during 2009-2018.

At the HS-6 digit level, the key drivers of India's chemical imports from China were HS 294110, HS 380899, HS 293399, HS 294190 and HS 293499, that collectively entailed a trade deficit of US$ 2.1 billion in 2018. The numbers are a clear indication of India's heavy reliance on chemical imports from China – particularly for APIs, bulk drugs and insecticides. Even though the demand for these chemicals is expected to go further up as the Indian chemical industry advances and to cater well to the domestic manufacturing sector, it is recommended that capacity additions be made to substitute imports from China.

It is to be noted that such heavy dependence on China for imports of chemicals, that are key inputs

for both the pharmaceutical and the manufacturing sectors, could adversely impact the domestic markets even if the prices are increased slightly. Import substitution, in this regard, is not only required to make India self-reliant in end-to-end indigenous chemical manufacturing but more importantly, to make the sector globally competitive.

Investments

The high value-added products of the chemicals industry continuously open up new fields of application, paving the way to progress and innovation in other industries. Typical examples are health, food, consumer goods, aerospace and car manufacturing, telecommunications, electrical engineering and electronics. While the industry's R&D efforts are typically aimed at commercialization of research results, societal benefits typically outweigh the private financial returns from innovation. This fact highlights the need for investments across R&D and innovative practices like Green Chemistry to go together.

It may to be noted that the total R&D investments in the chemical sector stood merely at 0.3% of total sales in FY 19[20]. Apart from sustaining growth in the domestic market, R&D activities are equally crucial for the home-grown players to have a larger pie of the global markets as well.

For the investments across R&D and innovative practices in the chemical industry to be beneficial, it is important that it is supported by protection of intellectual property rights. For instance, in the US, the basic chemicals industry is characterized by above-average patent intensity. This builds a valid case-in-point for the protection of intellectual property rights in India's chemical sector as well. It should be noted that chemical products also fuel innovations and patents in other industries, i.e. photovoltaic cells for electricity production, lightweight vehicle parts, germ-resistant coatings for medical instruments and more.

As has previously been noted, the total FDI in chemical sector in FY 19 remained uneven and subdued at US$ 2 billion, despite the policy allowing for 100% FDI in the sector under the automatic route. The FDI inflows to the chemical sector in FY 19, even though showed a slight improvement over the previous year, were significantly lower than the US$ 4 billion in FY 12.

Investments in the Indian chemical industry assumes greater importance on the two fronts – technology and innovation. Technological development may be achieved by the chemical industry at two levels. In the bulk products segment, the chemical industry should undertake process innovation with the objective of reduction in cost of production. In addition, the industry needs to invest in technological resources that would lead to specialized product development. Liberalization process has already increased the possibility of intra-firm transfer of technology and management practices in the form of consolidation within the economy as also from developed countries through foreign direct investment.

In order to increase innovation, three dedicated regional clusters for chemical industry should be created in regions with a large share of chemical industries (e.g. Gujarat, Maharashtra, Tamil Nadu,

[20] Chemexcil 56th Annual Report 2018-19

Andhra Pradesh) and similarly, two universities focused on chemical engineering (e.g. ICT, IIT Mumbai) should be shortlisted to develop innovation hubs for the chemical industry.

Setting up of Chemical Parks

In order to address the issue of capacity expansion and for creation of common infrastructure, the chemical industry, in association with the Government may establish exclusive Chemical Parks – a concept like the one set up in Germany. Each of the German chemical parks and sites has its particular strengths which are reflected in its individual portfolio of services. The object of these initiatives is to support the chemical sites in their respective regions and to make them better known internationally. To this end, they work in an ecosystem which constitutes governments, municipalities, universities and the private sector. In such parks, the industry may be encouraged to set up mega chemical plants that could contribute to increased production as well as employment generation while simultaneously engaging these plants with the local infrastructure in the region on similar lines prevailing in Germany. The chemical park model, where producers share a site and become vertically integrated with other companies, sharing infrastructure, services and facilities, is becoming increasingly relevant against the backdrop of the current recession, fluctuating energy prices and wayward margins. Through these synergies, the resulting efficiencies can be significant and far more economical than running a standalone plant.

Fund for SMEs in Chemical Industry

India's chemical industry is one of the largest and most diversified industries in the country and it consists of several small industries that cover hundreds of segments. However, given the paucity of funds available with them they are unable to upgrade themselves. They face not only technical constraints, but also feels challenged due to lack of quality manpower. With a significant market potential abroad, these SMEs needs to move up the value chain so as to exploit the opportunities in overseas markets. The SMEs also needs to conform by the various rules, regulations and good practices prevalent abroad.

A suitable fund may be constituted by the Government on the lines of the Technology Upgradation Fund as available to the textile industry, or provision of accelerated depreciation as available to the solar energy sector. The fund can also be utilized to access designs, patents, processes and technology. Such an initiative will make the industry, particularly the SMEs more robust and self-reliant.

It is to be noted that chemical products that have also been identified[21] in the domain of product groups whose exports serve less than 5% of the corresponding world imports and need a greater focus of export promotion efforts.

Moving towards Sustainability and Green Chemistry in India

Over the past century, even though chemistry has constantly improved the general quality of life by enabling the production of a wide range of items, this achievement has come at a price - collective

[21] High Level Advisory Group set up the Government of India

human health and a threat to the global environment. Relevant across the life cycle of chemical products, green chemistry is an approach that could be considered towards manufacturing chemical products to reduce or eliminate chemical perils. The goal of green chemistry is to create better and safer chemicals while identifying the safest and most efficient ways to manufacture them and to mitigate wastes.

It has been noted that the usual chemical production is typically energy intensive, inefficient, and toxic-resulting in significant energy use, and generation of hazardous waste. One of the principles of green chemistry is to prioritize the use of alternative and renewable materials including the use of agricultural waste or biomass and non-food-related bio-products. In general, chemical reactions with these materials are significantly less hazardous than when conducted with petroleum products. A transformation to green chemistry techniques would result in safer workplaces for industry workers, greatly reduced risks to fence line communities and safer products for consumers. Since green chemistry processes are more efficient, companies would consume less raw materials and energy as well as save money on waste disposal.

In order to accelerate the uptake of green chemistry, it is important to enhance market dynamics by continuing to build a comprehensive, ongoing understanding of green chemistry enablers, market drivers and obstacles. It is equally important to support conducive policies by designing and advocating for innovative state and federal policies that increase the supply of and demand for green chemistry solutions. These policies could address the problems across broad domains of funding, training and streamlining the permit for green chemistry products.

Box 1: Uses of Green Chemistry

Green chemistry builds on conventional chemistry and engineering by applying 12 fundamental principles that guide the molecular design of sustainable chemical products and processes. Adhering to these principles prevents pollution and waste, leads to synthesis of chemicals in less hazardous and more efficient ways, promotes the use of renewable feedstocks and leads to the design of safer chemicals. Widely applicable across areas like pharmaceuticals, cleaning products and other household items, the three most notable examples include – computer chips, biodegradable plastics and paints.

Computer Chips

Many chemicals, and much water and energy are needed to manufacture computer chips. A study estimated a ratio of 630:1 in terms of chemicals and fossil fuels required to make one computer chip – i.e. it takes 630 times the weight of the chip in source materials to make one chip (in comparison, the ratio for manufacturing a vehicle is 2:1). Advances in Green Chemistry include:

A new process that uses supercritical carbon dioxide in one of the steps of chip preparation, significantly reducing the chemicals, energy and water needed in the production process.

Innovation using chicken feathers to make computer chips

The protein, keratin, in the feathers is used to make a fiber form that is both light and tough enough to withstand mechanical and thermal stresses. The result is a feather-based printed circuit board that works at twice the speed of traditional circuit boards. While this technology is still in the works for commercial purposes, the research has led to other uses of feathers as source material, including for biofuel.

Biodegradable Plastics

Industry players are developing plastics made from renewable, biodegradable sources. Successes include:

• New food containers made from a method where microorganisms convert corn starch into a resin that is just as strong as the rigid petroleum-based plastic used for containers such as water bottles and yogurt pots.

• Fully biodegradable bags made of a compostable polyester film with cassava starch and calcium carbonate. The bags are tear-resistant, puncture-resistant, waterproof, printable and elastic; as well as able to disintegrate into water, CO2, and biomass in industrial composting systems.

Paints

Oil-based paints containing synthetic resin made from dicarboxylic acid (known as alkyd paints), give off organic compounds. These volatile compounds evaporate from the paint as it dries and have environmental impacts. Improvements in this area include:

Replacing fossil-fuel-derived paint resins and solvents with a mixture of soya oil and sugar cuts hazardous volatiles by half. These bio-based oils are used to replace petroleum-based solvents, creating safer paints with less toxic waste.

Water-based acrylic alkyd paints with low volatile organic compounds that can be made from recycled soda bottle plastic, acrylics, and soybean oil. In 2010, enough of these paints were manufactured to eliminate more than 362,874 kg of volatile organic compounds.

Emerging New Segments in Chemical Business

As the traditional chemical industry progresses there are new areas of chemical businesses that are emerging. This ranges from speciality chemicals to high end nanotechnology, to further value added chemical products. The key will be to define a formula that enables an organization to determine what constitutes an opportunity and whether it is worth pursuing, based on possible effectiveness. Although specialty chemical companies were hard hit by the recent economic downturn, many of the US and European chemical companies are still focused on this sector, as specialty products are more profitable than commodity chemicals in the longer term. In India, it has been seen that specialty chemicals has increased considerably during the past few years in construction, automotive,

electronics and water treatment industries. This positive growth is expected to accelerate in the years to come given the boom in these industries.

Another emerging area in the chemical industry is rubber chemicals which are showing tremendous signs of growth. The boom in the automobile industry and rising demand for industrial products like belts, hoses, etc. are expected to trigger the requirements for rubber chemicals. The need for high performance tyres is on the rise and that augurs well for the specialty rubber chemicals industry. In fact innovation in rubber chemicals is adding immense value to tyres. Today, radial tyres are in great demand, as these offers higher mileage and lower rolling resistance as compared to basic tyres. This in turns lowers the fuel consumption significantly, and hence gives greater return on investment for transporters in the long run thereby reducing carbon footprint. While the tyre industry is a major demand driver, the non-tyre components like window profiles, seals, belts, hoses and various other moulded products also form a sizeable chunk.

Way Ahead

As has previously been noted, India's chemical industry is one of the fastest growing in the world, ranked the third largest in Asia and sixth globally with respect to output after the US, China, Germany, Japan and Korea. The industry is expected to grow at around 9% per annum to reach US$ 304 billion by FY 25, from US$ 163 billion in FY 18[22]. The growth is likely to be driven by rising demand in end-use segments for specialty chemicals and petrochemicals intermediates.

The domestic chemical industry's growth is largely driven by the magnitude of country's consumption growth. There is significant headroom for growth as far as per capita consumption of chemicals is concerned, which makes India a very attractive destination to invest and grow.

Further, the Indian chemical companies have started focusing on global markets for investments. The significantly growing domestic market and the upheaval in international markets, particularly with respect to China, augur well with opportunities for the Indian chemical industry to rapidly grow in size and capability.

Globally, with the Chinese chemical industry stagnating due to stricter pollution control norms and rising labour costs, there's greater potential for Indian chemical industry to grow in the Asia-Pacific markets, being the closest international surrogate for chemical products.

With regards foreign trade, exports are expected to grow at a rate of 8.6% to reach US$ 4.2 billion by 2025[23]. The Government of India through its 'Make in India' initiative has been inviting various national and international companies to manufacture and expand operations in India. Even though, traditionally, Indian chemical exports have mostly been directed to the US, Europe and some Latin American countries, there exists tremendous export potential in the emerging markets across Africa, Middle East and East Asia.

[22] Chemexcil 56th Annual Report 2018-19
[23] Chemexcil 56th Annual Report 2018-19

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