



F R O S T & S U L L I V A N

50 Years of Growth, Innovation and Leadership

INDEPENDENT MARKET REPORT
Indian Chemicals and Specialty Chemicals Market Report

A Frost & Sullivan
Report

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I. Disclaimer

The market research process for this study has been undertaken thorough secondary / desktop research as well as primary research, which involves discussing the status of the market with leading participants and experts. The research methodology used is the Expert Opinion Methodology. Quantitative market information was sourced from interviews by way of primary research as well as from trusted portals, and therefore, the information is subject to fluctuations due to possible changes in the business and market climate. Frost & Sullivan's estimates and assumptions are based on varying levels of quantitative and qualitative analyses, including industry journals, company reports and information in the public domain.

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II. Abbreviations

APAC: Asia Pacific

Bn: Billion

CAGR: Compound Annual Growth Rate

COP: Conference of the Parties

EODB: Ease of Doing Business

EU: Europe

EUR: Euro

INR: Indian Rupees

LATAM: Latin America

MEA: Middle East and Africa

Mn: Million

NA: North America

USD: United States Dollar

MT: Metric Ton

IBEF: India Brand Equity Foundation

YoY: year on year

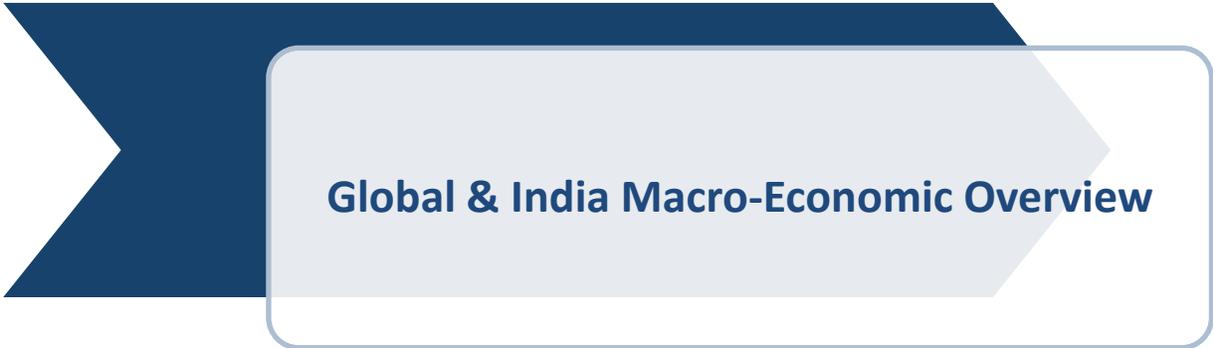
Tn: Trillion

Kg/kg: Consumption in kilograms per kilograms

Note: All the CAGR mentioned in the report, are calculated using the formula; ((Final Value/Initial Value) ^ (1/No. of years)) - 1

Foreign Exchange Assumptions for 2021: USD TO INR: 72.95, EUR to USD: 1.21

Section 1: Global & India Macro-Economic Overview



1.1. Macroeconomic Overview – Global

1.1.1. Gross Domestic Product (GDP) Growth

A year and a half since the onset of the COVID-19 pandemic, the global economy is poised to stage its most robust post-recession recovery in 80 years in 2021. But the rebound is expected to be uneven across countries, as major economies look set to register strong growth even as many developing economies lag. While IMF suggested the economic growth to bounce back at 6%, the United Nations on responded to the rebounding Chinese and US economies by revising its global economic forecast upward to 5.4% growth for 2021, but it warned that surging COVID-19 cases and inadequate availability of vaccines in many countries threaten a broad-based recovery. With successful pandemic control and a faster vaccination process, the global growth could accelerate to above 5% is what the World Bank suggests.

The global economy is going through the most robust post-recession recovery in 80 years in 2021, a year and a half since the onset of the COVID-19 pandemic. With successful pandemic control and a faster vaccination process, the global growth could accelerate; IMF expects the global economic growth to bounce back to 6.0% in 2021 and 4.4% in 2022, with emerging markets and developing economies growing at 6.7% in 2021 and 5.0% in 2022.

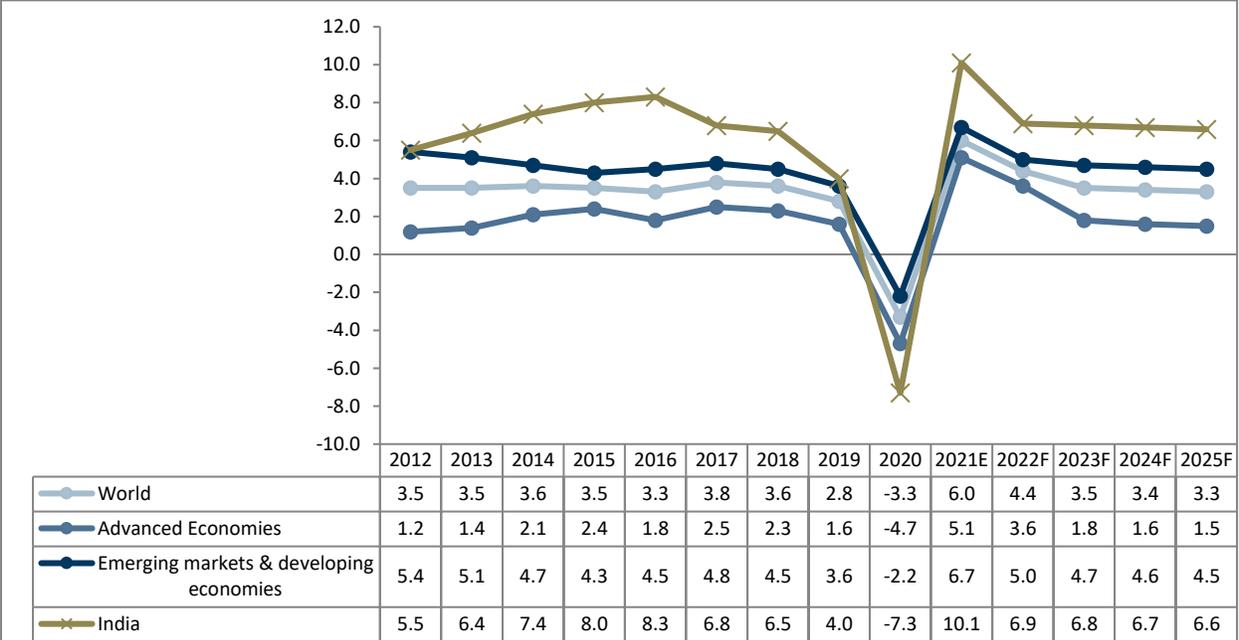
In raising its projection from January 2021 of 4.7% growth, the U.N.'s mid-2021 World Economic Situation and Prospects report pointed to the rapid vaccine rollout in a few large economies led by the US and China and an increase in global trade in merchandise and manufactured goods that has already reached its pre-pandemic level. But the U.N. cautioned that this will unlikely be sufficient to lift the rest of the world's economies.

Compared with the synchronized nature of the global economic slowdown in the first half of 2020, the global economy showed signs of a two-track recovery that began in the third quarter of 2020 with developed economies experiencing a nascent recovery, but economic growth in developing economies lagging behind. A resurgence in infectious cases in Europe, Russia, the United States, Japan, Brazil, India, and various developing economies renewed calls for lockdowns and curfews and threatened to weaken or delay a potential sustained economic recovery into mid to late 2021. Since the beginning of 2021, developed economies have made strides in vaccinating growing shares of their populations, raising prospects of a recovery in those economies and, in turn, the broader global economy. However, a surge in diagnosed cases in developing economies and resistance to vaccinations among some populations in developed economies might slow the speed and the strength of an economic recovery over the near term.

With the growth in the COVID-19 pandemic, the economic damage is already evident and represents the largest economic shock the world has experienced in decades. Prospects for the world economy have brightened, but the recovery is likely to remain uneven. Public health strategies, the speed of vaccine rollout, fiscal and monetary support, and the importance of hard-hit sectors, are driving the differences between countries. While advanced economies are expected to benefit from quicker access to vaccines and strong fiscal support, some countries with large tourism revenues like Iceland and Spain face a longer route to achieving recovery.

Asia-Pacific countries like China and Australia implemented effective containment measures and will continue to recover as they vaccinate. In Latin America, Chile’s rapid vaccine rollout and an increase in export prices are fuelling one of the fastest economic rebounds among emerging-markets, while high unemployment, stagnant wages and inflation are expected to prolong Argentina’s recovery. Emerging economies face the most challenges coping with COVID-19 outbreaks because of lower resource capacity and slower vaccine rollouts. As long as a large proportion of the world’s population is not vaccinated and the risk of new outbreaks remains, recovery will remain vulnerable to fresh setbacks.

Exhibit 1.1: Real GDP Growth (%) 2012- 2025F



Source: World Economic Outlook, International Monetary Fund Estimate, Moody’s Outlook, Frost & Sullivan

The baseline forecast envisions a ~6.0% growth in global GDP in 2021. 2020 experienced downfall of nearly -3.3% in Global GDP. Using market exchange rate weights—this has been the deepest global recession in decades, despite the extraordinary efforts of governments to counter the downturn with fiscal and monetary policy support. The collapse in global economic activity in 2020 is estimated to have been slightly less severe than previously projected, mainly due to shallower contractions in advanced economies and a more robust recovery in China. In contrast, disruptions to activity in the majority of other emerging market and developing economies were more acute than expected. The deep recession triggered by this pandemic is expected to have short-term repercussions like low investments with the erosion of human capital and fragmentation of the global trade linkages. However, the medium-long term health of the economy will be healthy, with the demand expected to soar back to its pre-COVID levels. This is expected to be driven by the increased government investments and incentive schemes.

The advanced economies are projected to recover slowly as compared to the global average. Every country is subject to a substantial downgrade growth of GDP in 2020. The United States of America and Canada witnessed a downward growth of -3.5% and -5.4% respectively. The European countries also

witnessed a slide of 6.1% and that of UK slide by -9.92%. In the Asian continent, Japan is experienced a downfall to -5.2%.

The emerging market and developing economies will be buffeted by the economic headwinds from multiple quarters: pressure on the weak health care systems, the loss of trade and tourism, dwindling remittances, the subdued capital flows, and the tight financial conditions amidst the mounting debt. The exporters of energy and industrial commodities were particularly hard hit. The pandemic and efforts to contain it have triggered an unprecedented collapse in oil demand and a crash in oil prices. The demand for metals and transport-related commodities such as rubber and polymers used in the manufacture of vehicle parts also tumbled. Trade restrictions and supply chain disruptions raised food security issues in some places in spite of growing agricultural markets.

Emerging market and developing economies are forecast to expand 6.7% this year, supported by higher demand and elevated commodity prices. However, the recovery in many countries is being held back by a resurgence of COVID-19 cases and lagging vaccination progress, as well as the withdrawal of policy support in some instances. China is expected to rebound by a more modest 8.4%. The recovery among emerging market and developing economies is forecast to moderate to 5.0% in 2022. Even so, gains in this group of economies are not sufficient to recoup losses experienced during the 2020 recession. Per capita income in many emerging market and developing economies is also expected to remain below pre-pandemic levels, and losses are anticipated to worsen deprivations associated with health, education and living standards. Major drivers of growth had been expected to lose momentum even before the COVID-19 crisis, and the trend is likely to be amplified by the scarring effects of the pandemic.

Growth in low-income economies this year is anticipated to be the slowest in the past 20 years other than 2020, partly reflecting the very slow pace of vaccination. Low-income economies are forecast to expand by 2.9-3.1% in 2021 before picking up to ~4.7% in 2022.

Despite a decline over the past 15 years, trade costs remain almost one-half higher in these countries than in advanced economies, in large part due to higher shipping and logistics costs. Efforts to streamline trade processes and clearance requirements, to enable better transport infrastructure and governance, encourage greater information sharing, and strengthen competition in domestic logistics, retail, and wholesale trade could yield considerable cost savings.

Another important feature of the current landscape is the historic collapse in oil demand and oil prices. In 2020, the oil price visited the negative territory when the yearly price dropping the lowest to -USD 19.78 in April 2020 while the average annual prices dropped to USD 41.96. However the prices have recovered following end of 2020 with The Brent crude oil prices averaged USD 65 per barrel (/b) in March 2021. The low oil prices are likely to provide an initial temporary support to the growth of the countries once the restrictions to economic activities have been lifted. The low oil prices offer an opportunity to oil producers to diversify their economies. In addition to this, the recent oil price plunge may provide further momentum to undertake the energy subsidy reforms and deepen them once the immediate health crisis subsides.

Although the global economy is growing again after a 3.3% contraction in 2020, the pandemic has caused a heavy toll of deaths and illness, plunged millions into poverty, and may depress economic activity and incomes for a prolonged period. Top near-term policy priorities are controlling the spread of COVID-19 and ensuring rapid and widespread vaccine deployment. To support economic recovery, authorities also need to facilitate a re-investment cycle aimed at sustainable growth that is less dependent on government debt.

The near-term outlook remains highly uncertain, and different growth outcomes are still possible, as a section of the report details. A downside scenario in which infections continue to rise and the rollout of a vaccine is delayed could limit the global expansion to 1.6% in 2021. Meanwhile, in an upside scenario with successful pandemic control and a faster vaccination process, global growth could accelerate to nearly 6%.

Policymakers need to continue to sustain the recovery, gradually shifting from income support to growth-enhancing policies. In the longer run, in emerging market and developing economies, policies to improve health and education services, digital infrastructure, climate resilience, and business and governance practices will help mitigate the economic damage caused by the pandemic, reduce poverty and advance shared prosperity. In the context of weak fiscal positions and elevated debt, institutional reforms to spur organic growth are particularly important. In the past, the growth dividends from reform efforts were recognized by investors in upgrades to their long-term growth expectations and increased investment flows.

Central banks in some emerging market and developing economies have employed asset purchase programs in response to pandemic-induced financial market pressures, in many cases for the first time. When targeted to market failures, these programs appear to have helped stabilize financial markets during the initial stages of the crisis. However, in economies where asset purchases continue to expand and are perceived to finance fiscal deficits, these programs may erode central bank operational independence, risk currency weakness that de-anchors inflation expectations, and increase worries about debt sustainability.

Having said this, several sectors have witnessed a growth during the pandemic and have successfully weathered the storm over this duration. Sectors like ITeS, E-Commerce, pharmaceuticals, chemicals, diagnostics, consumer goods and durables, agrochemical and fertilizers have benefited owing to the pandemic. The crisis has increased the demand in medical supplies and care.

India, which has been a leader in supplying affordable drugs to the world, and has now, deployed its capacities in the field of vaccines to help fight the global COVID-19 pandemic. Besides the neighbouring countries, Brazil and South Africa too have reached out to India seeking vaccines to deal with the COVID-19 crisis in their countries. The Serum Institute of India (SII) which is considered to be the world's largest vaccine manufacturer and the drug major AstraZeneca vaccine have partnered for the supply of the vaccine to India and other countries; the vaccine has been developed with the University of Oxford less than a week after launching the world's largest inoculation drive, India - shipped tens of thousands of free doses of Covid-19 vaccines to neighbouring countries in what is being widely described as "**vaccine diplomacy**". **Similar to SII there are other Indian companies that are involved in manufacturing of vaccine such as Bharat Biotech that is producing COVAXIN®. Recently the company announced**

Capacity Expansion to Support vaccination campaigns in India and Worldwide. Capacity expansion has been implemented across multiple facilities in Hyderabad and Bangalore, to reach ~ 700 million doses / year, one of the largest production capacities for Inactivated viral vaccines worldwide. Currently 4 vaccines have been approved for use in India; Oxford/AstraZeneca's AZD1222, Gamaleya's Sputnik, SII's Covishield, and Bharat Biotech's Covaxin. India also has 13 vaccines under clinical trials. EU had not made Covishield eligible for EU's digital green certificate. India put pressure on EU that it will not recognise an EU vaccine pass for travellers unless the bloc does the same for India's own vaccine certificate. So far, Austria, Germany, Slovenia, Greece, Iceland, Ireland, Spain and Estonia have confirmed accepting Covishield. Switzerland also allows Covishield for Schengen state.

1.1.2. Medium - Long term: Robust Recovery Expected

Given the nature of the COVID-19 shock, a self-imposed reduction in social mobility has been designed to contain the spread of a virus, generating dramatic effects on the economic activities. The short-term economic growth is expected to be comparatively muted. However, given the series of steps taken by the governments and industries across the globe, the medium and long term global economy is expected to remain robust.

US: The infection rates have been declining in the states hit first, however, they continue to rise in the south and the west. All the states have reopened their economies beginning with construction, manufacturing, and limited retail, although at differing speeds. In the labour market, jobs increased in May and the unemployment rate became better (13.3% from 14.8%). Owing to the on-going labour market and small and medium enterprises (SME) stress, in addition to the pressure on the state budgets an additional fiscal support is expected. The GDP is expected to rise sharply to ~5.1% by 2021 and gradually showcase a stable growth of ~3% over the next few years.

Europe: With the virus curve flattening across the continent, Europe has embarked toward a steady recovery. The 19 countries European countries that share the euro currency will collectively register 4.2% growth in 2021 after seeing economic output crater 6.1% in 2020. The rollout of Covid vaccines in European Union (EU) countries is picking up speed, with more than 300 million jabs administered. As of 20 June 2021, nearly half of the EU's adult population have had at least one dose, while 28% have been fully vaccinated. Earlier this year, the rollout was hit by delays in production and distribution and vaccine hesitancy in some countries. In the week to 20 June 2021, Germany administered an average of 1 dose per 100 people a day, with Italy and France close behind on 0.9 doses per 100 people - all higher than the UK's 0.6 per 100. Hungary - which is using Russian and Chinese vaccines as well as the EU-approved ones - has fully vaccinated 46% of its population, the same proportion as the UK. In France, children who are 12 and over can be vaccinated, with parental consent. The government is hoping to avoid class closures when schools reopen after the summer holidays. The EU authorised the use of the Pfizer vaccine in children aged 12-15 at the end of May. Germany said it would give it to those aged 12-17 with pre-existing conditions while a number of other EU countries said they would vaccinate children before the start of the next academic year.

A range of indicators from traffic patterns to health stringencies show the activities are normalizing faster in Germany as compared to nations like Spain which is bouncing back slowly. The financial conditions show a V-shaped recovery with the liquidity normalizing accompanied by a strong increase in

loans to corporations, driving a strong credit impulse. The governments have launched a series of actions to support SMEs, the labour market (over one-quarter of the Eurozone labour force has been benefitting from the short-term working scheme) and the most-hit sectors like tourism and the automotive industry. Liquidity has normalized and there is a strong increase in loans to corporations, driving a strong credit impulse. These relaxations and improvements were possible following the flattened curve in May 2020. However European nations witnessed the second wave of COVID-19 infections in October 2020 and most countries tightened curbs.

Asia Pacific: China was infected first with the virus; however, it has also been the first to recover from the pandemic. In general, the infection curves have remained flat and the policy support is working for China. China has proved to have recovered faster with their technology and manufacturing sectors performing better than services. The SME sector, however, has been a little slow to respond. It is estimated that the situation has been nearly back to the pre-COVID-19 level. China is expected to experience a growth of 8.1% in 2021 and around 5% in 2022-2023 after eking out a 2.3% increase in 2020. The forecast for Japan has been lowered to -5.1% in 2020; however the country will rebound to 3.1% in 2021 and ~5% by 2022 driven by its robust domestic demand growth.

India: India went through an early lockdown in March which led to the slowdown of many sectors; however, the chemical industry was comparatively less affected. India also started manufacturing PPE kits and in a span of less than 2 months became the world's largest producer. India is slowly opening up with most sectors coming back to normalcy. Although India witnessed a significant downturn in 2020, it is expected to rebound to ~10.1% according to IMF (after it had previously suggested India to recover at 12.5%); however, Oxford Economics and RBI suggest the growth rate in the range of 10-11% for India in 2021. IMF gave India a huge upgrade due to the fast recoveries at its factories and farms. India is expected to experience the fastest recovery among major countries with a huge turnaround from 2020's decline of ~10%. Despite lock down there are several economic indicators which brings good news, in terms of e-way bills, electricity, and registrations of cars and two-wheelers, container traffic have risen up. Moreover, the capacity utilisation at factories has increased to over 70% as migrant labourers return. April 2020's GST collection was at 28% of that collected in April 2019 which progressed to August 2020 collection at 88% of the August 2019 levels. The GST collections touched a new high of nearly INR 1.2 lakh crores in January 2021, indicating a sharp recovery post lockdown and better compliance manifested in record returns of INR 90 lakh. The numbers based on December sales, with returns filed in January show that revenue from imports went up by 16%. The country's GST collection is growing gradually indicating that economy recovery is in sight.

India is strengthening the entire ecosystem to achieve Prime Minister Narendra Modi's dream of becoming a USD 5 trillion economy by 2025 through rapid structural reforms. Addressing the Pravasi Bharatiya Diwas conference, the Commerce and Industry Minister said: "We are working simultaneously to bring about a quantum leap in our quality, in our productivity, in our efficiency, so that Indian Industry can truly expand our export basket, making it bigger, better and broader." New markets are being explored aggressively to enhance the reach of Indian products globally. The Indian diaspora living abroad have more familiarity with consumer markets as India has insights into consumer behaviour and can guide Indian Industry to develop customised products for foreign markets.

The government has taken credit for the growth of India's personal protective equipment (PPE) sector and for research, development and manufacture of COVID-19 vaccinations – "Made in India vaccines are a symbol of Atmanirbhar Bharat". Like many other countries India also fast-tracked regulatory clearance conveying the impression that Covishield and Covaxin reflect the country's manufacturing success. However, the real glitch was that even as the Modi government projected India as the world's vaccine factory, it erred in its strategy on rapidly mass producing Covishield and Covaxin. The government failed to pre-order the right quantities to expeditiously vaccinate its population. Now even the private sector is asking the government for adequate vaccine supply to vaccinate their staff as stocks run dry. At the current rate of vaccination, the country will take at least two years to vaccinate 70% of its population. Economists have said that mass vaccination is the biggest economic stimulus. Domestic mass vaccination is a major component of economic revival. And its focus on exports is also botched up. India exported more than 66 million doses of COVID-19 vaccines worldwide in the past year but it failed to anticipate the scale of the coronavirus. The government should have halted the exports of pharmaceuticals and oxygen, rather than prematurely declaring a victory over COVID-19. Against the backdrop of a massive increase in the number of critically impacted COVID-19 patients the demand for oxygen has shot up across India. While this is the need of the hour, the large-scale diversion of oxygen from industrial units to hospitals poses more challenges to the already struggling manufacturing sectors like steel, cement and mining, which stand dependent on oxygen for moulding, fabrication, etc.

Recently Maruti Suzuki shut down its factories in Haryana to make oxygen available for medical needs. During the first wave of COVID-19 last year, the overall demand for medical oxygen in India had increased four times, making it amply clear that oxygen was critical for COVID-19 patients. Despite this, tenders floated for oxygen generation plants by the central government are yet to be realised.

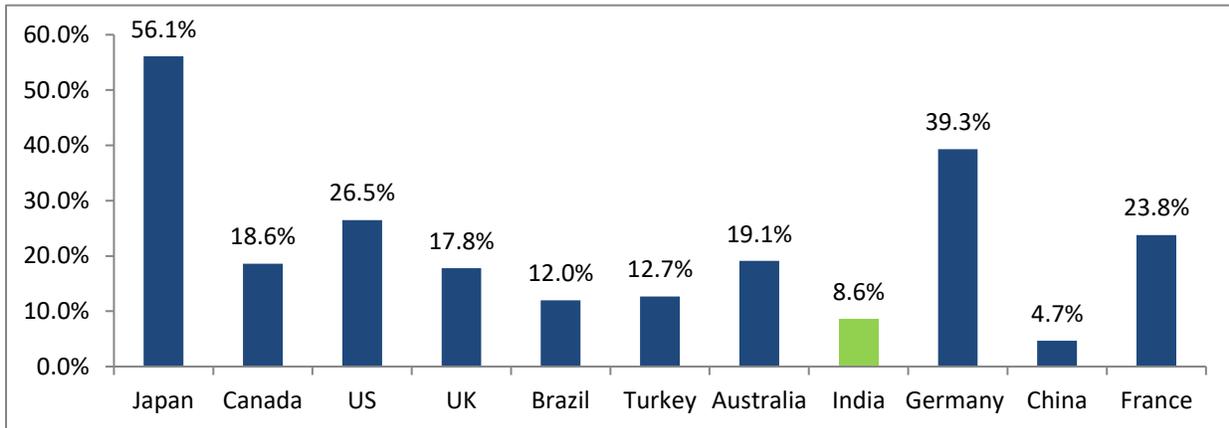
COVID-19 will remain for several months now, with projections of a third wave in India. Meanwhile, retail outlets selling non-essentials are temporarily closed and seller and buyer mood is bleak as they grapple with uncertainty. For the manufacturing sector, especially, there is an even higher degree of uncertainty. It will take a massive effort and huge financial incentives on the part of the government, industry, and all key stakeholders to ensure that the manufacturing recovers on operational mode. COVID-19 fiscal stimulus packages in G20 countries.

In order to address these issues, most of the large global economies have announced several stimulus packages to revive demand.

1.1.3. COVID-19 fiscal stimulus packages in G20 countries

In order to address these issues, most of the large global economies have announced several stimulus packages to revive demand.

Exhibit 1.2: COVID-19 fiscal stimulus packages in G20 countries, % of Real GDP as on May 2021



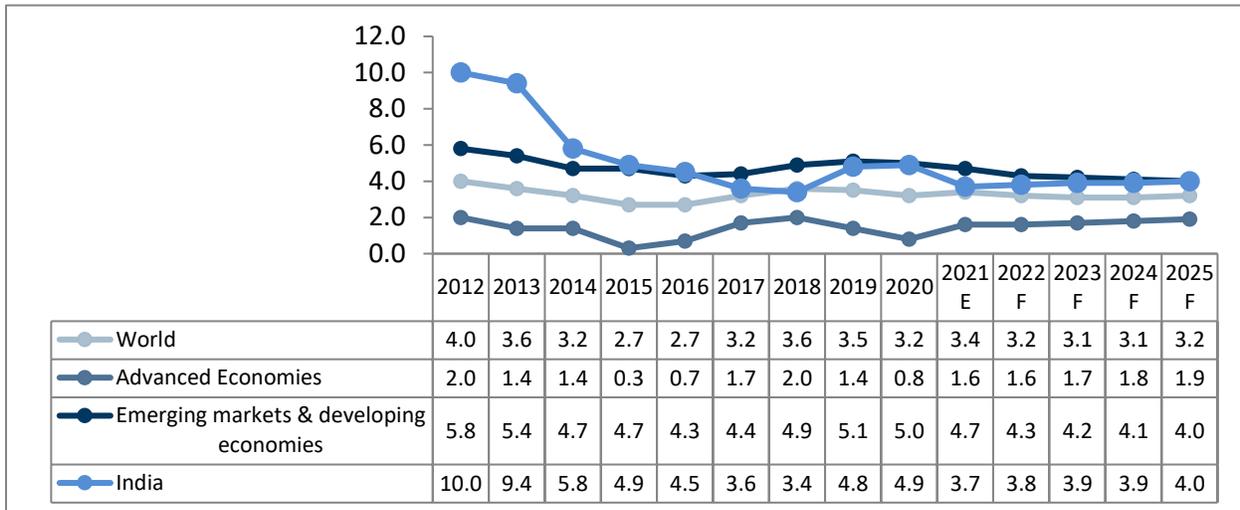
Source: IMF

1.1.4. Inflation Rate Growth in India vs World

The consumer price pressures appeared to ease down starting May 2020 with both food and beverages, and fuel and light becoming cheaper month-on-month. The Reserve Bank of India's (RBI) target range for CPI inflation is 2.0% to 6.0% for 2021. The consumer price inflation is expected to average at 3.7% in 2021.

The global inflation curve has by large been on the downward curve since 2012 this is largely because the global commodity prices. Commodity prices fell sharply in this period following fall in prices of Brent crude by ~18%. The fall in the prices of the commodities came as a result of slackening demand from China, the single largest commodity consuming country. At the start of this decade, data shows GDP growth and industrial productions have fallen to 3-year lows in China. Another factor affecting global commodity prices was uncertainty in the Euro zone. Business confidence in Germany had dropped to a two-year low, US manufacturing declined and China's factory sector contracted. As a result crude oil and copper post their biggest declines. Following these factors, growth in early start of this decade, in the global economy remained very bleak which resulted in reduced commodity prices thereby lowering inflation.

Exhibit 1.3: Inflation Rate (end of period consumer prices) (%) 2012 – 2025F



Source: World Economic Outlook, International Monetary Fund Estimate-April 2021, Frost & Sullivan

Inflation rate in India was in the range of 4.9% as of 2020, as per the Indian Ministry of Statistics and Programme Implementation. This represented a modest reduction from the previous half decade. Inflation rates in India are usually quoted as changes in the Wholesale Price Index (WPI), for all commodities. Many developing countries use changes in the consumer price index (CPI) as their central measure of inflation. In India, CPI (combined) is declared as the new standard for measuring inflation (April 2014).

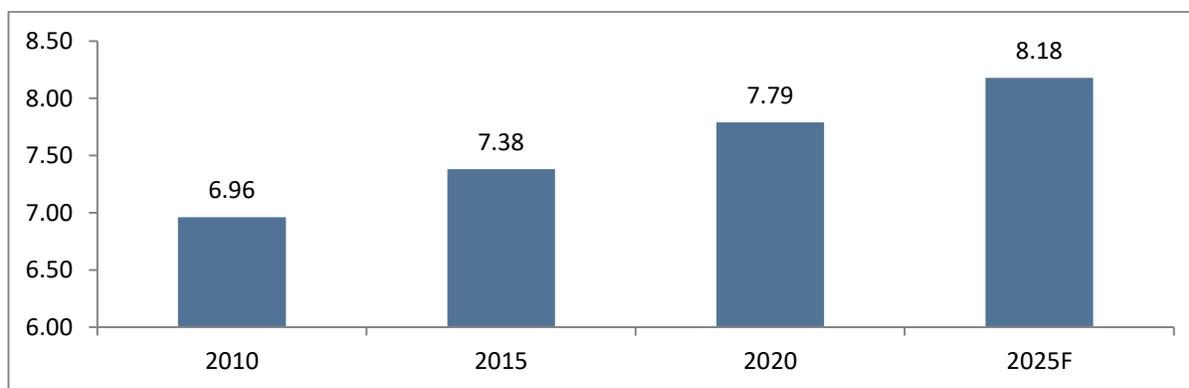
Many economists believe that the inflation-targeting regime had been instrumental in lowering India's inflation rate but India being an open economy its inflation trajectory is really driven largely by global commodity price movements. Back in 1990s when India was a more autarchic country, domestic factors — especially food-related supply shocks — drove inflation. But since India liberalised, inflation is largely driven by global commodity prices. The decline in inflation came about because global commodity prices fell in 2014-15, and had very little to do with the introduction of inflation targeting. Inflation has risen again in 2019 because global commodity prices rose in 2017/2018, and we are seeing them pass through into domestic prices. The availability of covid-19 vaccine, could now unleash a pent-up demand, bringing along inflation. A return to pre-pandemic lives may bring a surge in spending, which may poise inflation for a comeback. Even in United States, with a Republican-led Senate, Biden will get a stimulus bill, though smaller, passed early next year. Unlike the Global financial crisis where new money creation went to banks and financial institutions, this time the massive monetary policy easing and never seen before government relief packages seems to be trickling fast to the real economy. The monetary inflation is resulting in a weaker dollar. A weaker dollar and high liquidity could result in higher commodity prices as well and therefore could be inflationary. The Federal Reserve has announced that it will adopt an average inflation target going forward that will allow inflation to run above 2% post vaccine announcement, to support the pandemic-struck economy.

Rising chemical prices around the world may be helping to stoke inflation in downstream industrial production and consumer goods. Since the pandemic hit in early 2020, a series of events have disrupted supply of chemicals to global markets amid strong demand, leading to record prices in some value

chains. Demand has also surprised on the upside, driven initially by products to fight the coronavirus as well as plastics for packaging. Since the second half of 2020 there has also been a strong rebound in demand from big end use sectors such as automotive and construction, battered by lockdowns in the early months of the pandemic. China led the recovery, followed by the US and Europe. Demand for chemicals is booming globally, led by a recovery in industrial production. In markets starved of material, there has been panic buying by downstream industries desperate to maintain security of supply. In these circumstances, availability has become more important than price, leading to record prices in many products. Increase in commodity and chemical prices globally has the potential to feed into CPI/WPI.

1.1.5. Global Population Growth Trend

Exhibit 1.4: Global Population Growth Trend : 2010-2025F, Billion



Source: World Bank, UNICEF

The total population has more than doubled since the 1950s, and continues to increase. Populous middle-income countries account for a considerable share of the growth in the world population between 2010-25. Just five nations – China, India, Indonesia, Pakistan and Nigeria – are expected to account for around 859 Mn births till 2025 from 2010. If the current trend continues, the majority of the next billion is destined to be born in low- and middle income countries. A lot of pressure is thus on key sectors and care industries like Agriculture, Pharmaceuticals, Healthcare etc. to support this growing population.

1.2. Macroeconomic Overview of India

1.2.1. Gross Domestic Product (GDP) Growth and Outlook

An already-slipping Indian economy has been derailed from its growth track after a stringent shutdown was imposed in March 2020 to halt the spread of Covid-19. India's GDP contracted to 7.3% in 2020 – the first time in four decades.

The health shock of COVID 2.0 seems to be seeping into the economic domain and attenuating the pace of our V-shaped recovery. After coping with the first wave of the pandemic, the economy finally showed some signs of recovery from Q3 FY-21. The second COVID-19 wave has now hit the country hard, pushing more than half of the Indian states into lockdown. This brings major headwinds to the economic recovery and downside risks to the possible green shoots. The Indian economy turned a corner this month and began regaining momentum in June 2021, ultra-high frequency data indicate, though subdued consumer sentiment is expected to limit the pace of recovery in Asia's third largest economy. This comes as states gradually ease curbs on business activity, keeping in mind the decline in the number of fresh Covid cases. The week ended June 13 was at least the third consecutive week in which economic activity sequentially gained momentum, according to three data trackers by research agencies using a range of data available on daily or weekly basis. Economically, in June, India will see activities pick up signalling recovery during the gradual unlocking process. The NCAER report has stressed on a strong positive push to restore the growth process after the Covid-19 waves India has seen. This, combined with a strong expansionary macroeconomic policy thrust, could help revive normal growth.

Economists are now speculating about how India will dig itself out of that hole once the second wave's economic damage is fully realized. They estimate that the latest outbreak has pushed back India's economic recovery by three to six months, depending on the virus's trajectory and the nation's preparedness for a possible third wave. Since hitting a peak above 400,000 daily cases in early May, the infection rate has dropped to 152,734 per day, and the number of deaths has fallen to around a four-week low of 3,128 daily. Economists believe that the delay in economic recovery would be limited to just about a quarter, provided the COVID's second wave is not allowed to last much beyond June. The economic recovery would depend on the pace of vaccination and government policy interventions in the coming weeks and months.

With industries, transport, shops, and malls shut, the economic activity came to a grinding halt in India toward the end of March 2020. The domestic consumption, which makes up around 57% of GDP, was almost wiped out. Pay cuts and layoffs across the country completely eroded the demand. The Indian government's decision to remove most of the restrictions has provided the much-needed relief to the large as well as the small businesses. Despite this, the demand scenario remained weak in 2020. The revival in consumption, meanwhile, will be driven by discretionary as well as non-discretionary spending. The non-discretionary spending refers to groceries and other essential items. Expectedly, this category remained largely unscathed during the lockdown. The recovery in 2021 is expected to be in double digit following a better start to the year as compared to 2020. Near-term prospects are favourable but second covid wave is a risk to recovery.

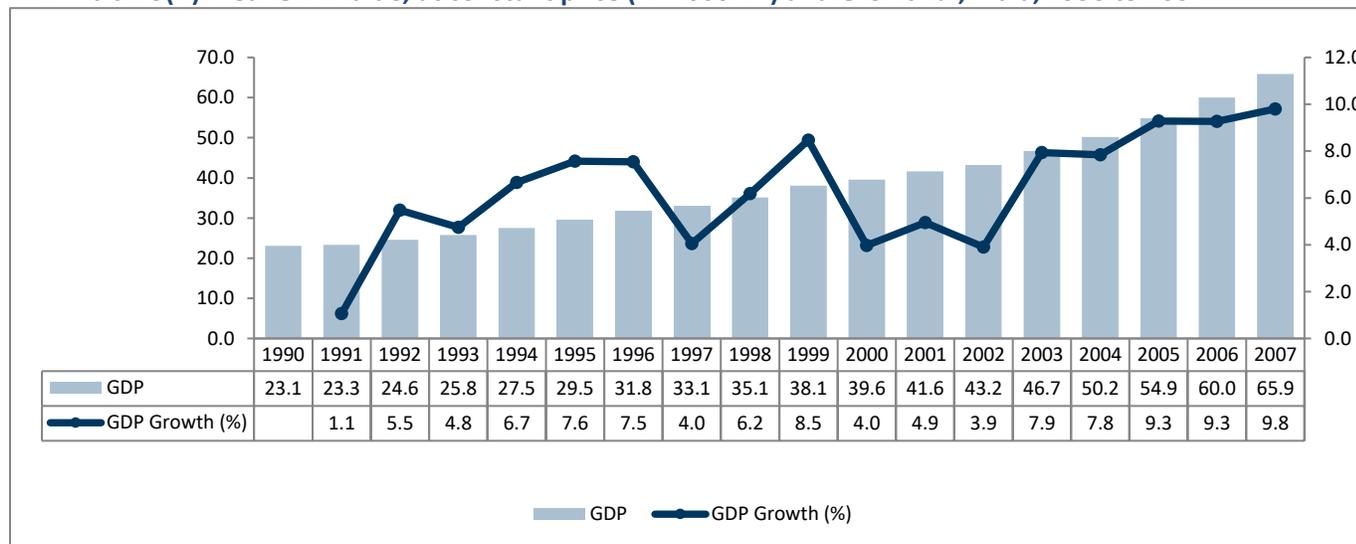
However, the medium term growth outlook is expected to improve and record a growth rate of ~6.6% by 2025F, on an account of the strong macroeconomic fundamentals which include moderate inflation, the implementation of key structural reforms and the improved fiscal and monetary policies. Meanwhile, the recent moves by the government to improve balance sheets of state-owned banks, through an augmented re-capitalization plan worth INR 2,110 Bn for public sector banks spread over two years, is expected to support the capital shortages of the public sector banks that have hindered the bank's lending capacity.

From 2012 to 2016, the market-friendly policies safeguarded India from the subdued global economy; the improved macroeconomic fundamentals and robust capital inflow strengthened the economic growth from 5.5% in 2012 to 8.2% in 2016. However, in 2017 the GDP declined to 6.8% from 8.2% in 2016 due to the external vulnerabilities such as global slowdown, impact of demonetization and the transitory effect of goods and services tax (GST) implementation.

The economic growth of India slipped further in 2019 as a result of the lingering effect of demonetization and the other political reforms. The growth has remained relatively slow due to the prolonged on-going stress among non-bank financial institutions (NBFIs), obstructing the overall credit provision of the financial system.

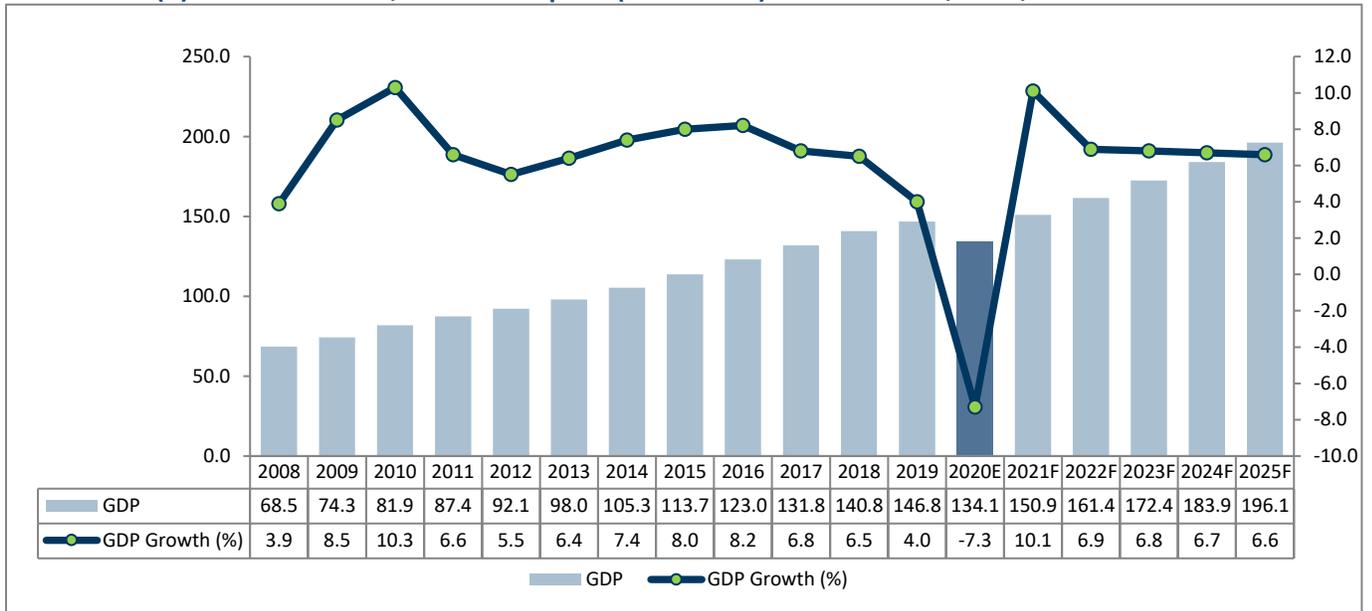
Due to Covid-19, the GDP of FY21 declined by 8.0% at INR 1,34,08,882 Cr as compared to INR 1,45,69,268 Cr for the same period last year. The Private Final Consumption declined by 9.0% in FY21 to INR 75,74,812 Cr. as compared to INR 83,21,701 Cr.

Exhibit 1.5(A): Real GDP Value, at constant price (INR 000'Bn) and Growth %, India, 1990 to 2007



Source: Moody's Outlook, Moody's press release 2020, International Monetary Fund Estimate, Dun and Bradstreet, Frost & Sullivan

Exhibit 1.5(B): Real GDP Value, at constant price (INR 000'Bn) and Growth %, India, 2008 to 2025F



Source: Moody's Outlook, Moody's press release 2020, International Monetary Fund Estimate, Dun and Bradstreet, Frost & Sullivan

Exchange Rate Trends

Over the long term, the rupee's overvaluation and structurally higher inflation relative to the US would exert downside pressure on the currency. Most analysts have revised forecasts for the rupee to average INR 75.00/USD in 2020 and INR 77.00/USD in 2021, versus INR 73.00/USD and INR 75.00/USD previously.

Indian rupee being an emerging market currency with structural fundamental vulnerabilities such as its twin deficit (current account and fiscal account), make the currency susceptible to sell-off during periods of risk-offs. The extended lockdown in 2020 also added to the woes of the rupee, ensuring a slide in the first quarter of the new financial year.

However, the rupee has witnessed an uptick recently driven by –

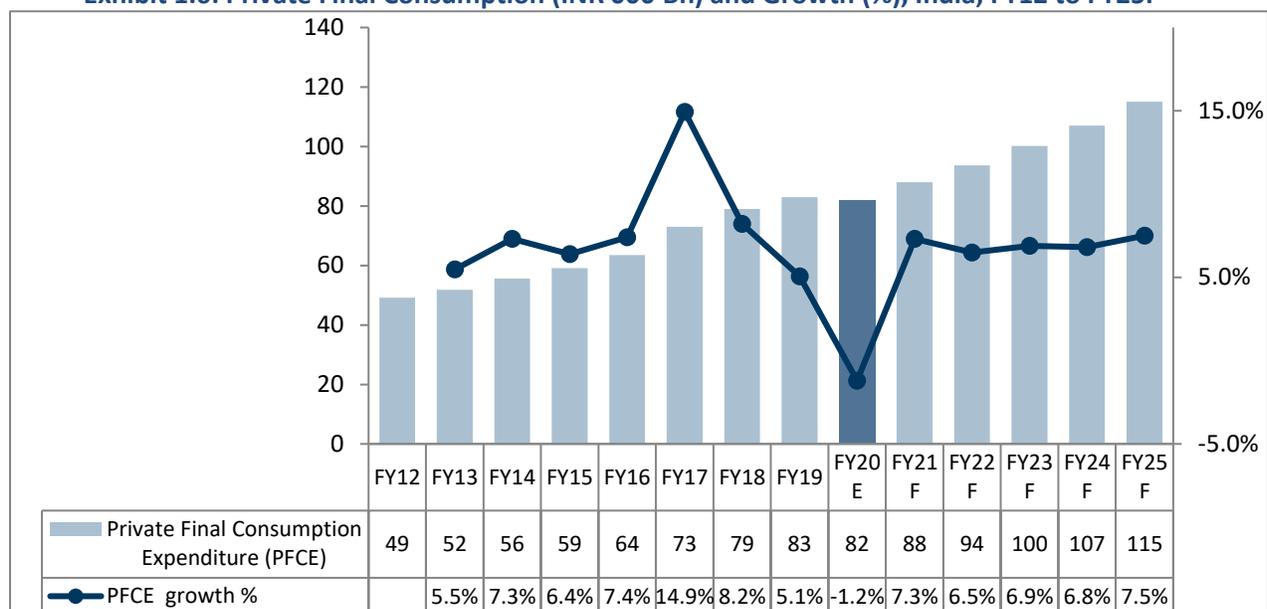
- FPI Inflows:** The foreign portfolio investors have purchased over INR 1.6 lakh crores in India equities in 2020. In 2020, India was the only country that had significant inflows from foreign investors, while other emerging markets saw major outflow this year. As per National Securities Depository (NSDL) data, FPIs invested a record INR 150,000 crores in Indian markets in the last three months of 2020.
- Weak Dollar:** The Indian rupee was seen recovering against a weak dollar overseas and optimism of higher growth projection. However, a concern surrounding fiscal deficit will likely keep a check on the local unit. Also, the rupee is trading in a narrow range as traders remained cautious ahead of the Reserve Bank of India (RBI) monetary policy that was scheduled in February. Besides, continued faith by foreign investors into the domestic market is also supporting the Indian currency.

1.2.2. Private Final Consumption Expenditure (PFCE) growth in India

The Private Final Consumption Expenditure has been showing a subdued growth over past couple of years. However, the PFCE growth decelerated in 2019 due to the reduced rural and urban income growth, the waning Pay Commission effect and the NBFC (Non-Banking Financial Company) crunch.

In 2019-20, Private Final Consumption Expenditure (PFCE) had a share of ~57% in India's real GDP. PFCE growth collapsed to 2.7% in the March 2020 quarter, with the year average estimated to be as low as -1.2% - the lowest since June 2006. Real private final consumption expenditure (PFCE) is expected to decline by 1.2% owing to the impact of covid-19 pandemic during 2020-21 but likely to record 7.3% growth during FY21. Going ahead, PFCE is expected to stabilize between 6.9% - 7.5% through 2023-25.

Exhibit 1.6: Private Final Consumption (INR 000'Bn) and Growth (%), India, FY12 to FY25F



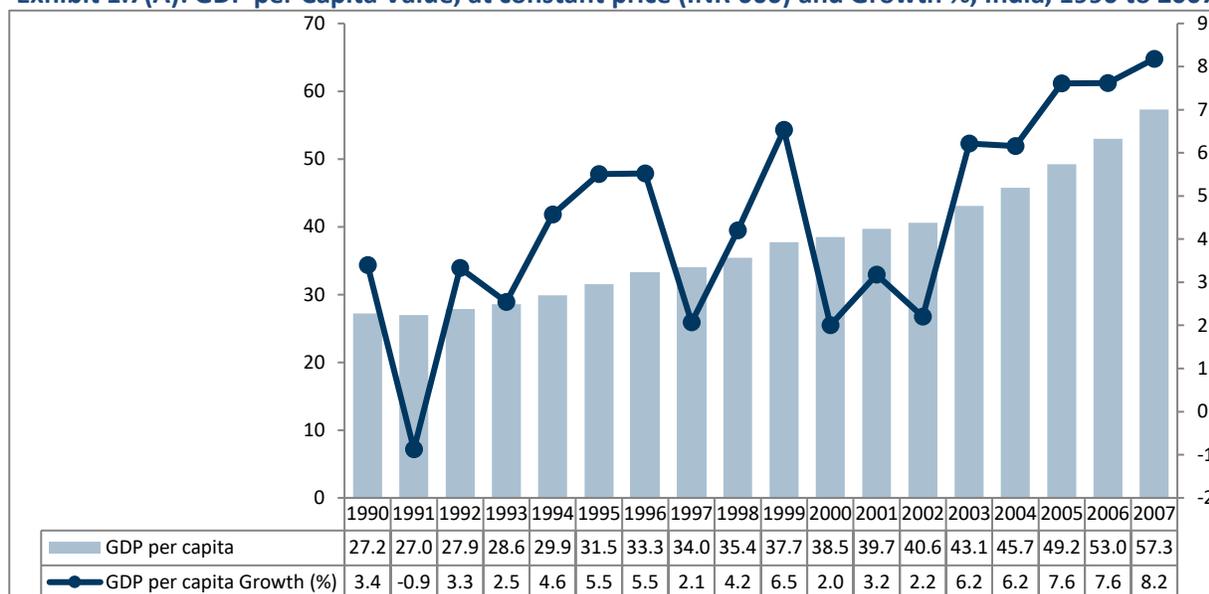
Source: MOSPI - Second Advance Estimates of National Income, 2019-20, at 2011-12 prices;; Revised outlook based on covid-19 not published by MOSPI

1.2.3. GDP Per Capita

The GDP per capita at constant prices in India remained low until 2012 during the economic downturn. Thereafter, the growth gradually picked up for GDP per capita till 2016 where it reached 6.8%. However, it slumped during 2017-2018 as a result of demonetization and implementation of GST.

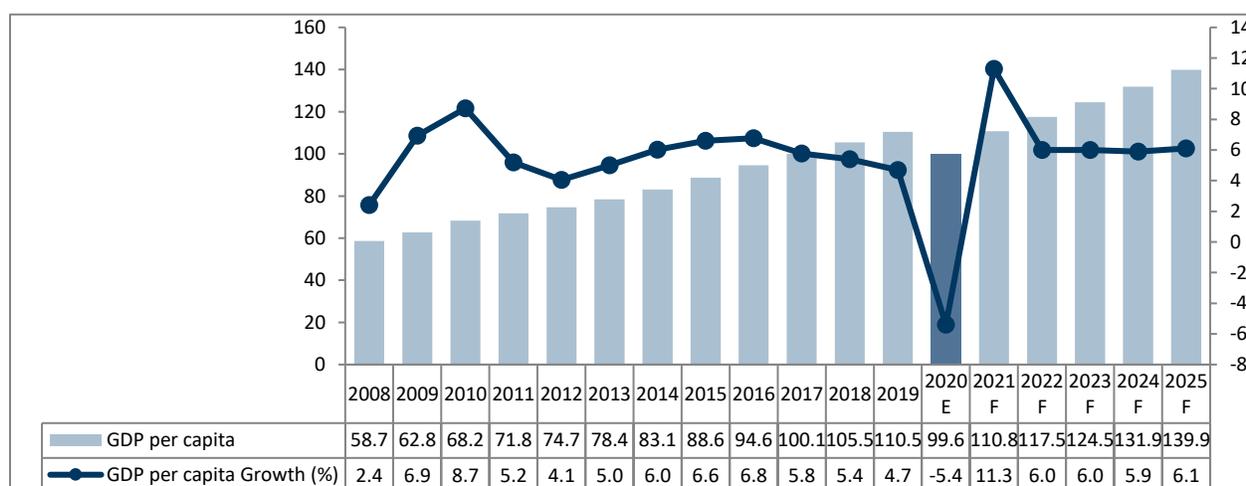
The GDP per capita in 2020 is expected witnessed its lowest growth rate since 1990 at -8.87%. However, with the economy getting back on track slowly, the GDP per capita growth is expected to increase and plateau at around 6.1% in 2025F.

Exhibit 1.7(A): GDP per Capita Value, at constant price (INR'000) and Growth %, India, 1990 to 2007



Source: World Economic Outlook, International Monetary Fund Estimates-April 2021, Frost & Sullivan

Exhibit 1.7(B): GDP per Capita Value, at constant price (INR'000) and Growth %, India, 2008 to 2025F

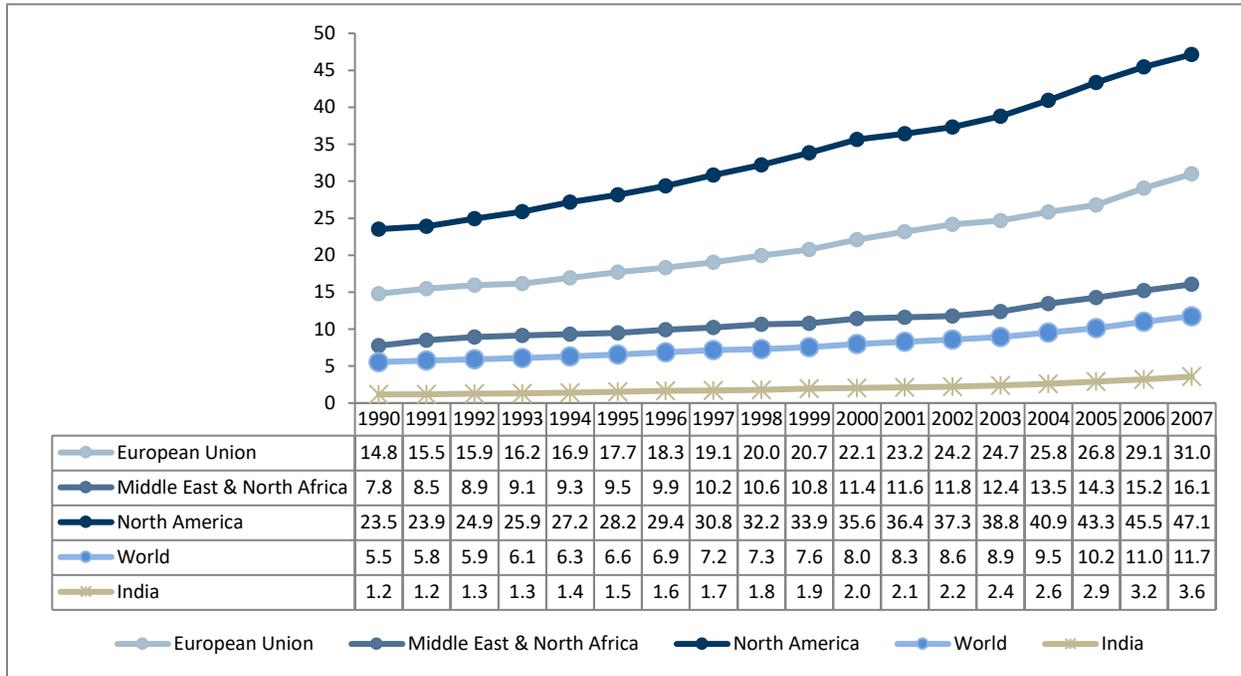


Source: World Economic Outlook, International Monetary Fund Estimates-April 2021, Frost & Sullivan; Outlook for 2021 and onwards is based on IMF data published in April 2020. Covid-19 impact not registered in the outlook 2021 onwards

1.2.4. GDP per capita PPP in India

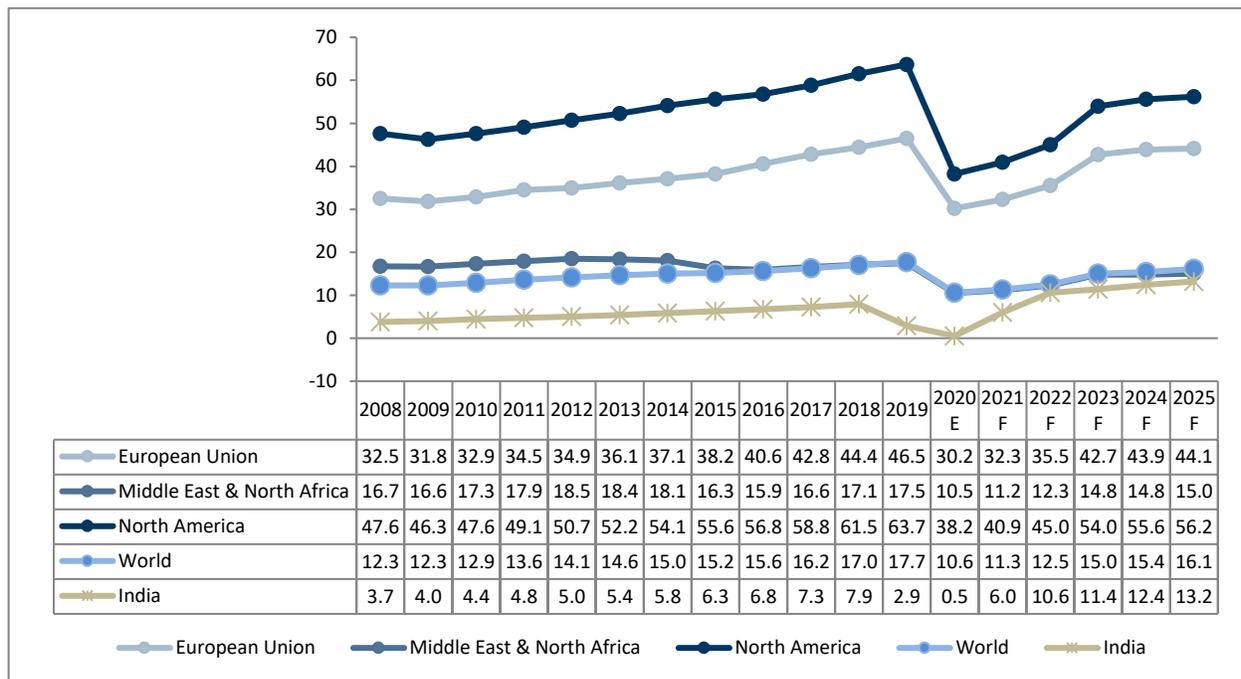
India is projected to become fourth-largest economy of the world by 2026. Due to its large population, India is at the 145th position in term of GDP (nominal) per capita.

Exhibit 1.8(A): GDP per capita, current prices ('000 USD)(PPP; international dollars per capita) 1990 - 2007



Source: World Economic Outlook, International Monetary Fund Estimate-June 2020, World Bank, Frost & Sullivan
Forecasts are pre-covid and haven't been updated post Covid from World Bank

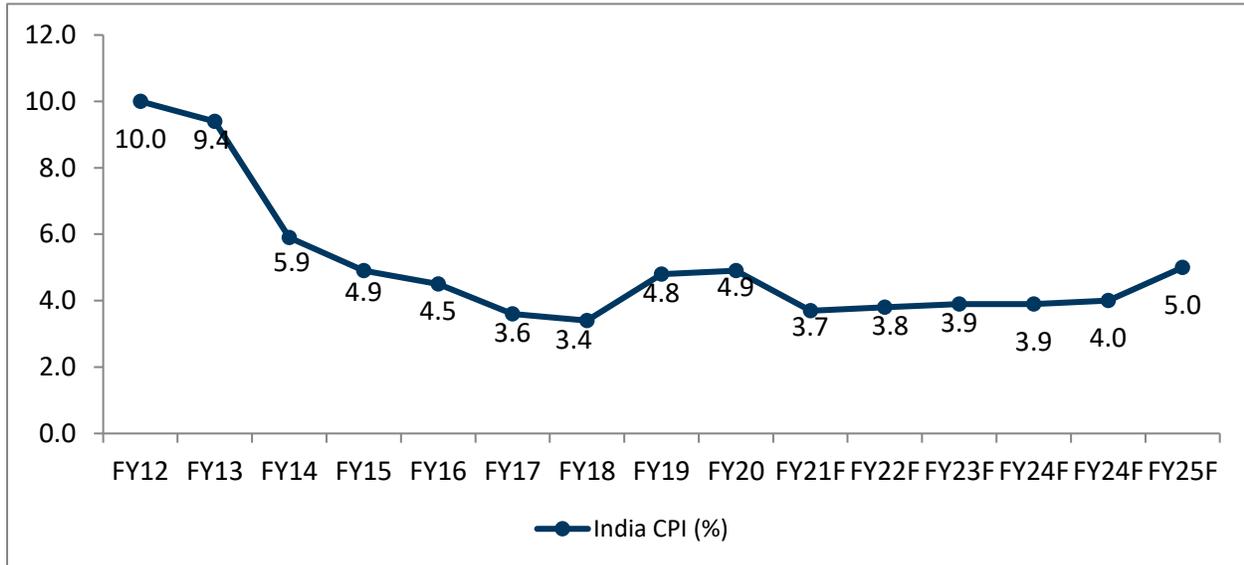
Exhibit 1.8(B): GDP per capita, current prices ('000 USD) (PPP; international dollars per capita) 2008 – 2025F



Source: World Economic Outlook, International Monetary Fund Estimate-June 2020, World Bank, Frost & Sullivan
Forecasts are pre-covid and haven't been updated post Covid from World Bank

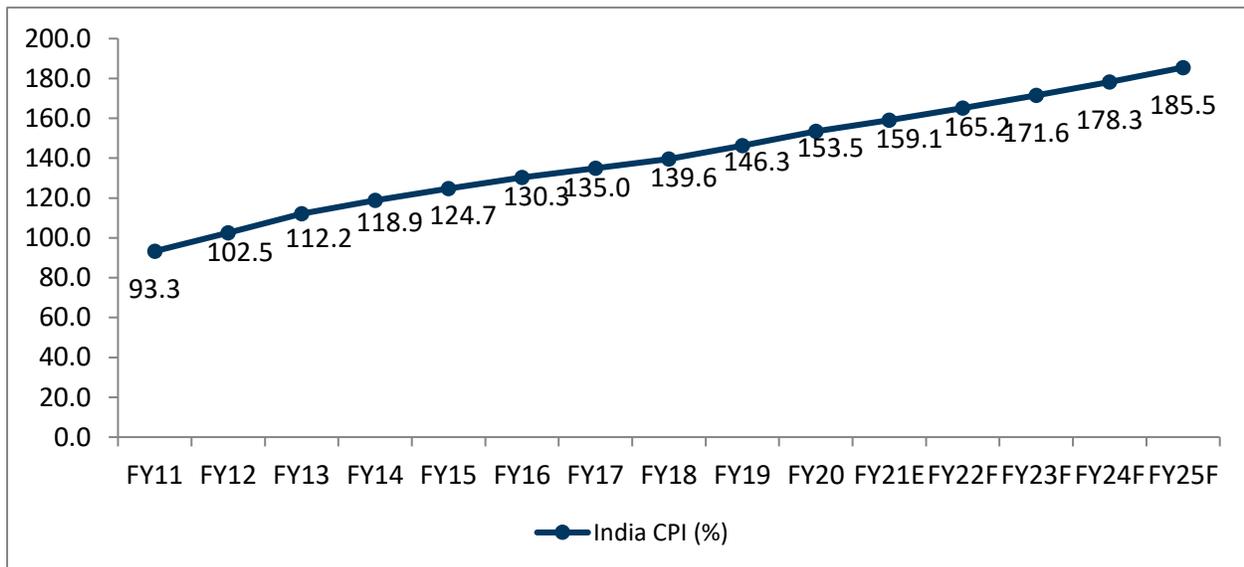
India's per capita income is approximately ~2.5 times lower than the world's average. This figure is over 50 times lower than the richest country of the world and ~10 times greater than the poorest country. India stands at the 33rd position in the list of Asian countries.

Exhibit 1.9(A): Inflation (end of period consumer prices) (%) FY2012 – FY2025F



Source: World Economic Outlook, International Monetary Fund Estimate-June 2020

Exhibit 1.9(B): Inflation (end of period consumer prices – index value annual) FY2011 – FY2025F



Source: MOSPI, IMA

Persistent supply chain disruptions seem to have more than offset the impact of weak demand. Food cargo movement was restricted owing to re-instatement of lockdowns in many cities and heavy rains in agrarian states.

While food inflation remained the dominant factor, rising transport costs due to higher domestic taxes on petroleum products also contributed to the inflationary trends. A more favourable food inflation outlook may emerge in the coming months with bumper Rabi harvest and improving food surplus management possibly easing prices of cereals. Price stabilisation in crude and retail fuels is also likely to ease incremental pressures on headline inflation.

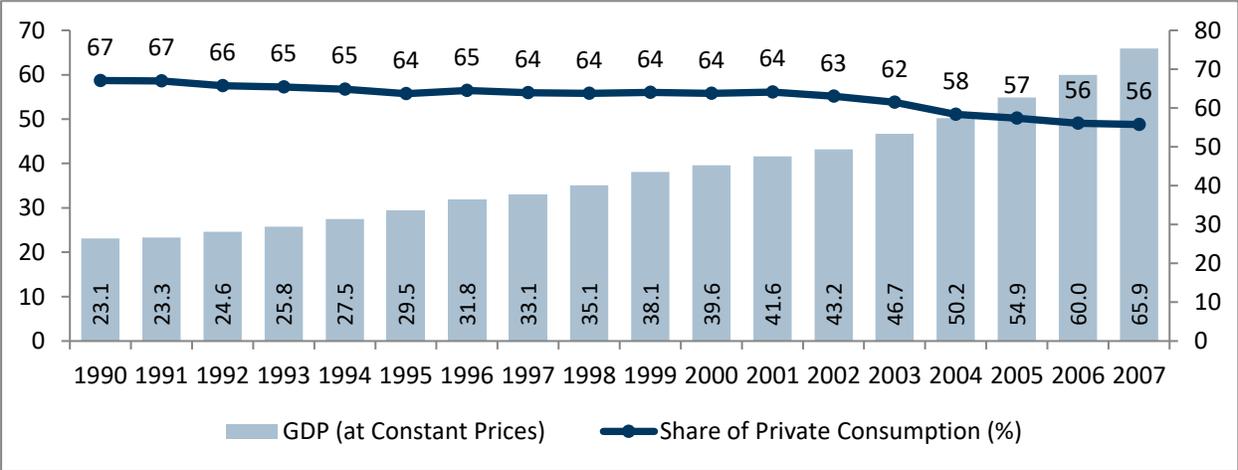
India’s retail inflation has spiked sharply to 6.3% in May 2021 after easing to 4.23% in April 2021, as per data released by the government. Retail inflation, measured by the Consumer Price Index (CPI), has jumped primarily due to higher food and fuel prices. It has breached the Reserve Bank of India’s target range of 2-6% for the first time in five months. Food inflation rose to 5.01% in May, compared to 2.02% in April. The core inflation in May stood at 6.6%. Wholesale price-based inflation data released indicated that it had surged to a record high of 12.94% in May due to rising prices of crude oil and manufactured goods. Experts have expressed concern about higher inflation and the second wave of the Covid-19 pandemic, which has severely impacted lower and middle income families. Several reports have highlighted how prices of several commodities have been rising for the past few months. It may be noted that the prices of petrol and diesel, edible oil and other FMCG products have sharply increased in May.

Overall, the yearly average Consumer Price Index (CPI) rate is expected to be ~3-4.5%, showcasing a significant drop as compared to FY20 (ending on March 2020), albeit owing to the significant demand slowdown from March to June 2020.

1.2.5. Share of household consumption as % of GDP

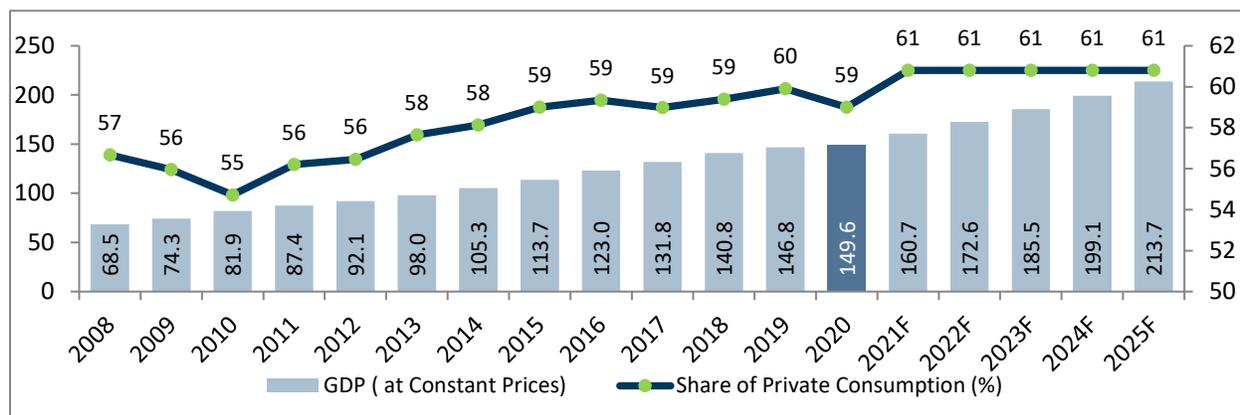
India Private Consumption (consumer expenditure) accounted for 57.9 % of its Nominal GDP in Sep 2020, compared with a ratio of 57.1 % in the previous quarter. India Private Consumption contribution to Nominal GDP ratio is updated quarterly, available from Jun 1996 to Sep 2020, with an average share of 59.1 %.

Exhibit 1.10(A): Household consumption, % of GDP (INR 000’Bn) and Growth %, India, 1990 to 2007



Source: World Bank, International Monetary Fund Estimate-June 2020, Frost & Sullivan

Exhibit 1.10(B): Household consumption, % of GDP (INR 000'Bn) and Growth %, India, 2008 to 2025F



Source: CEIC, World Bank, International Monetary Fund Estimate-June 2020, Frost & Sullivan

In the latest reports, India GDP contracted 23.9 % YoY in Jun 2020. India Nominal GDP reached USD 635.2 Bn in Sep 2020. Its GDP deflator (implicit price deflator) increased 3.8 % in Sep 2020. India GDP Per Capita reached 2,140.4 USD in Mar 2020. Its Gross Savings Rate was measured at 31.4 % in Mar 2020. For Nominal GDP contributions, Investment accounted for 28.3 % in Sep 2020. Public Consumption accounted for 11.9 % in Sep 2020.

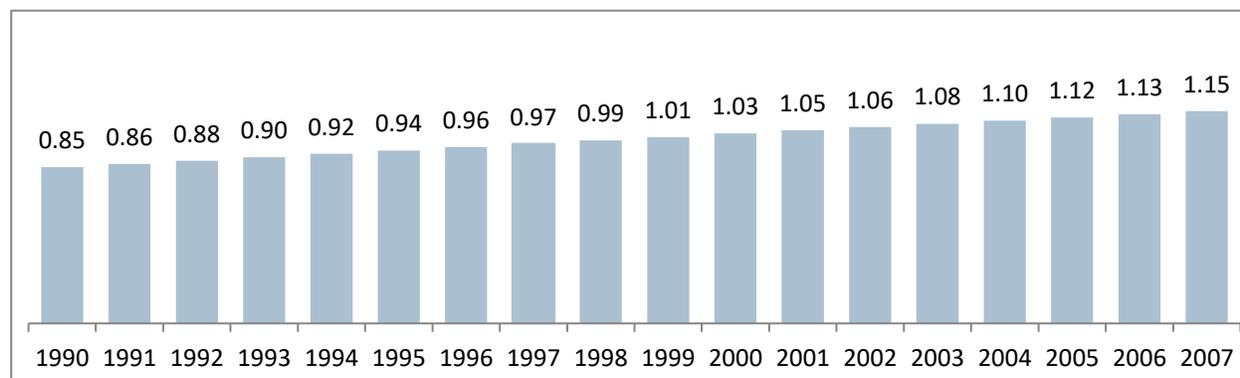
1.2.6. Demographic Overview of India

Population Growth

With a population of 1.35 Bn in 2019, India is the second largest populated country in the world. The population is estimated to grow at a CAGR of 1.3% during 2019-2025F replacing China and making it the most populous country in the world.

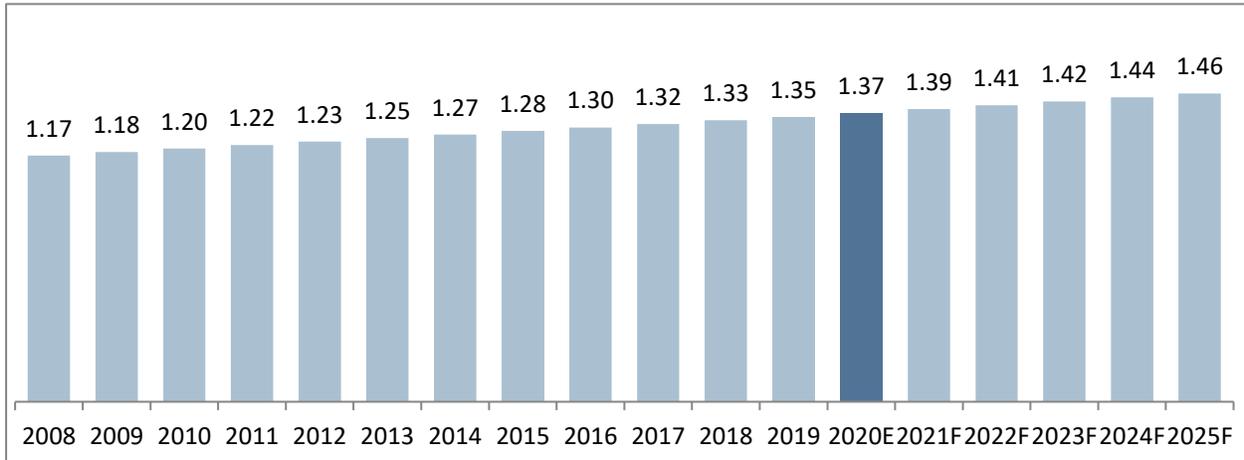
The country has a relatively young demographic profile, with an average median age of 26.7 years in 2019 and is estimated to be 28.2 years by 2020; one of the lowest globally as compared to 37.2 years in the US, 45.8 years in Japan and 36.3 years in China for 2020.

Exhibit 1.11(A): India Population in Bn, Historical and Projected, 1990-2007



Source: World Bank: Health Nutrition and Population Statistics: Population estimates and projections, International Monetary Fund

Exhibit 1.11(B): India Population in Bn, Historical and Projected, 2008-2025F

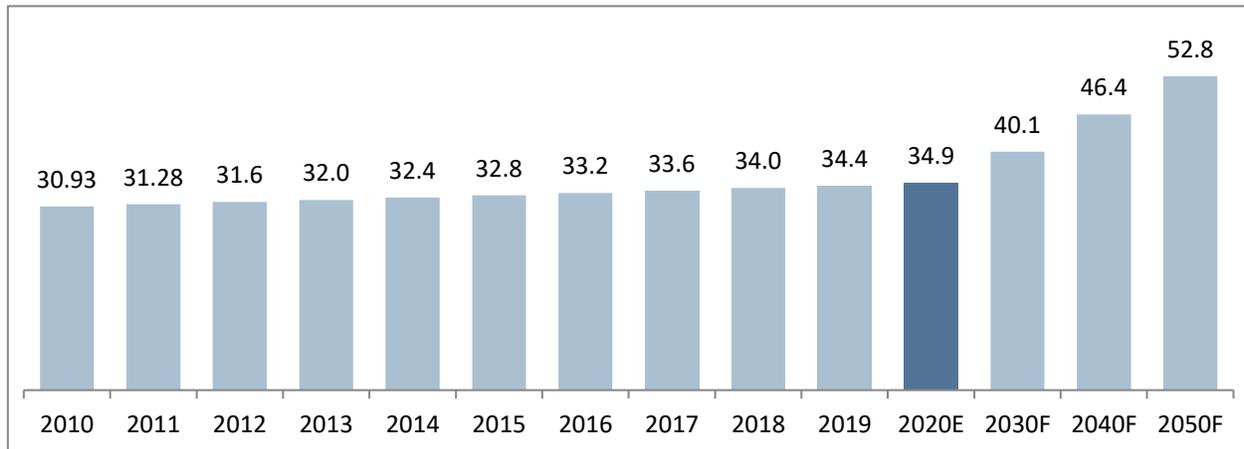


Source: World Bank: Health Nutrition and Population Statistics: Population estimates and projections, International Monetary Fund Estimates-June 2020

1.2.7. Urbanization

The growing urban population of India has led to an increase in the urbanization of the country. There has been a drastic increase in urban towns and cities in the country over the past few years. There are almost 10 Mn people migrating to cities and towns every year. India’s urban population has increased from 27.8% in 2001 to 32.8% in 2015 and is expected to further increase to 34.9% in 2020.

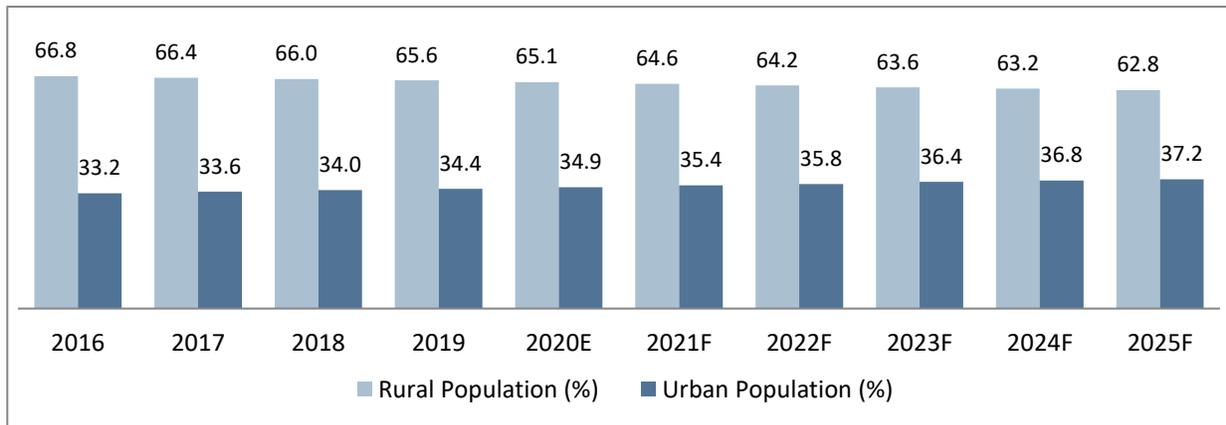
Exhibit 1.12: India Urban Population (%), 2010-2020E, Forecast 2050



Source: World Bank: Health Nutrition and Population Statistics: Population estimates and projections

The high economic growth, higher standard of living and increasing opportunities in the cities have led to urbanization, which has further added pressure on these cities in terms of infrastructure and housing. This has resulted in disordered urbanization and disparity in the market owing to the demands of the growing population. However, in order to cope up with this scenario the government has been working on planned urbanization, providing affordable housing to the poor by developing innovative housing finances.

Exhibit 1.13: Rural vs Urban Population, India Outlook (%), 2016-2025F



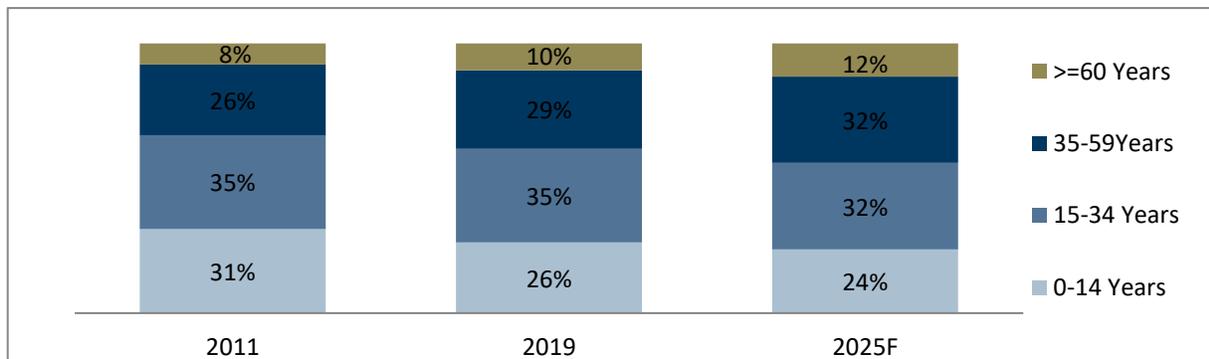
Source: World Bank: Health Nutrition and Population Statistics: Population estimates and projections, UN household size and composition database

1.2.8. Demographic dividend

The demographic dividend is considered to be an important factor for the economic growth as the working age population is usually more productive. India is set to witness a considerable increase in the working population over the next decade. The median age in India will be 28.2 years by 2020 and 31.4 years by 2030.

The Indian economy has a potential to grow at a rapid rate as the working age population (15-59 years) comprises almost 64% of the total Indian population in 2019. Moreover, the youth (15-34 years) make up majority of the working-age population. The demographic dividend can accelerate the development of the nation if implemented with effective policies.

Exhibit 1.14: Age Group Classification of the India Population, 2011-2025F



Source: World Bank: Health Nutrition and Population Statistics: Population estimates and projections

The Indian Government is serious about utilizing the potential of the demographic dividend and has introduced the National Skill Development Corporation (NSDC) which will be contributing significantly

(about 30%) to the overall target of skilling/up skilling 500 Mn people in India by 2022¹, by encouraging private sector initiatives in skill development programmes and providing funds.

1.2.9. Sectoral Share of GVA

In terms of the contribution of various sectors to India's Gross Value Added in FY20, the service sector is the dominant sector with a revenue share of 55%, followed by industry at 31% and agriculture at 14%. The key industries in the country are textiles, chemicals, steel, cement and food processing. The government is working towards increasing the share of the manufacturing sector, a sub-component of industry. The government's 'Make in India' campaign aims at increasing the contribution of the manufacturing sector from 18% in FY20E to 25% by FY25F.

Although agriculture has a low share at 14%, it employs 49% of the labour force. The key agricultural products include rice, wheat, oilseed, cotton, jute, tea, sugarcane and lentils

The services sector is the largest sector of India. Gross Value Added (GVA) at current prices for the services sector is estimated at INR 96.54 lakh crores in 2020-21. The services sector accounts for 53.89% of total India's GVA of INR 179.15 lakh crores rupees. With GVA of INR 46.44 lakh crores, the Industry sector contributes 25.92%. While Agriculture and allied sector share 20.19%. At 2011-12 prices, the Agriculture & allied, Industry, and Services sector's composition is 16.38%, 29.34%, and 54.27%, respectively. Share of primary (comprising agriculture, forestry, fishing, and mining & quarrying), secondary (comprising manufacturing, electricity, gas, water supply & other utility services, and construction), and tertiary (services) sectors have been estimated as 21.82%, 24.29%, and 53.89% respectively.

The service sector employs almost 29% of the labour force and includes key sectors such as financial services, telecommunication, tourism and insurance. Within the service sector, the financial sector continues to dominate in terms of contribution to the economy with a share of 22% in FY20E.

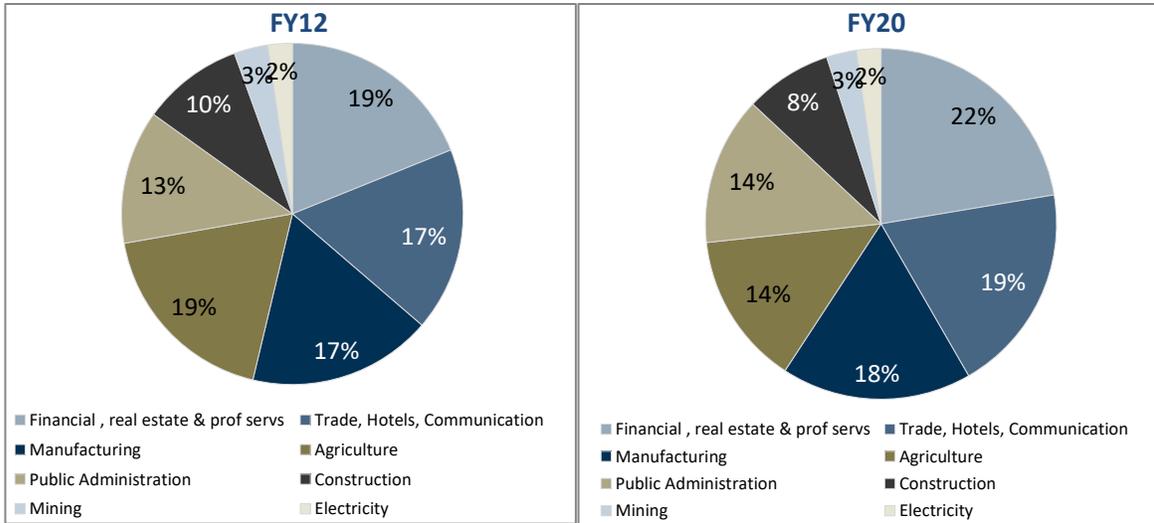
The Indian economy saw a recovery in the January-March quarter of 2021, before the second wave of the pandemic disrupted activity again. While gross value added in the final quarter of the fiscal year grew at a stronger pace than in the third quarter, the gross domestic product growth was subdued on account of past subsidy dues paid out in the fourth quarter.

Agriculture sector grew at 3.1% in fourth quarter compared to 4.5% in third quarter. The sector grew 3.6% for the full year. The mining sector contracted by 5.7% in fourth quarter compared to a contraction of 4.4% in the previous three months. Mining contracted by 8.5% annually. Manufacturing grew by 6.9% in fourth quarter compared to 1.7% in the previous three-month period. For the full year, the sector contracted by 7.2%. Construction grew 14.5% in fourth quarter compared to 6.5% in the preceding quarter. The sector contracted by 8.6% in the full year. Trade, hotel, transport, communication contracted by 2.3% in fourth quarter compared to their contractions of 7.9% in the previous quarter. Contraction for the full year was at 18.2%, the financial services sector grew at 5.4% compared to 6.7% in the previous quarter. For the full year, the sector contracted by 1.5%.

¹ Livemint

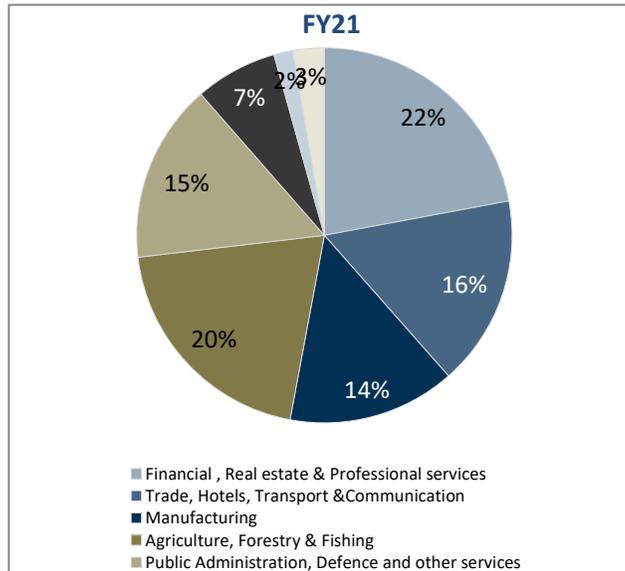
Source: BloombergQuint

Exhibit 1.15(A): Sectoral Share of GVA; (%), India, FY12 and FY20



Source: MOSPI – Second Advanced Estimates of National Income 2020-2021, at 2011-12 prices

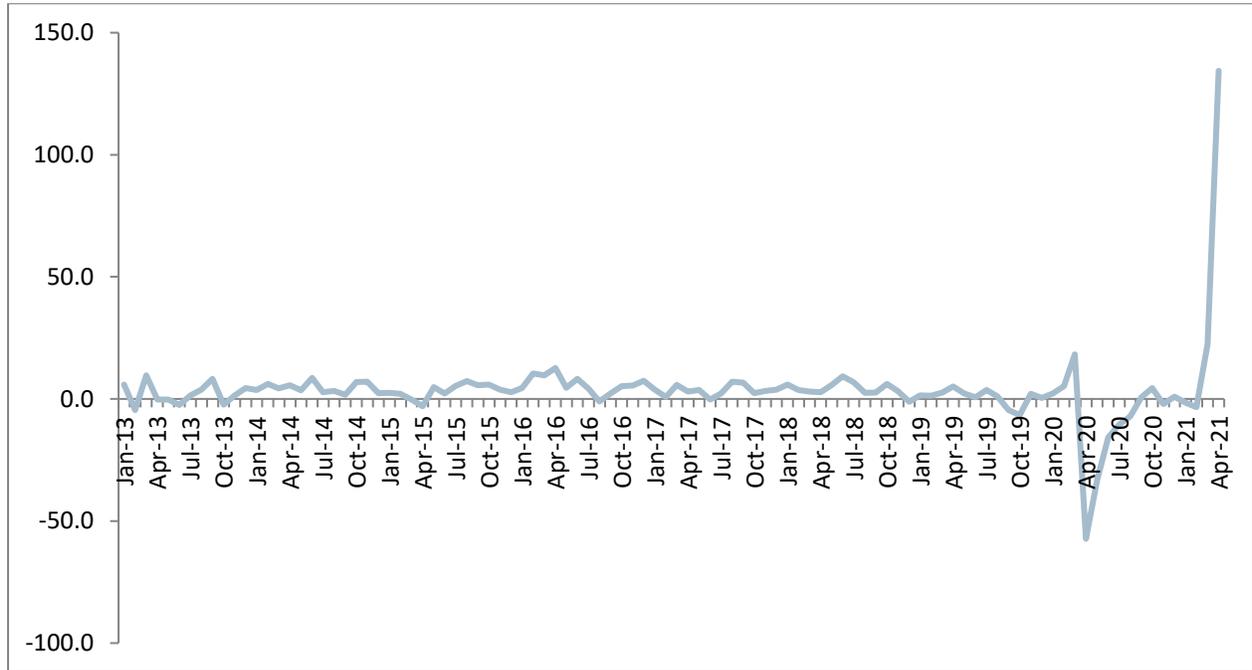
Exhibit 1.15(B): Sectoral Share of GVA; (%), India, FY21



Source: MOSPI – Second Advanced Estimates of National Income 2020-2021, at 2011-12 prices

1.2.10. Index of Industrial Production (IIP)

Exhibit 1.16: IIP Growth (%) – 2013 – 2020E



Source: MOSPI

IIP Growth (%)					
Jan-13	5.9	Oct-15	5.9	Jul-18	6.8
Apr-13	-0.2	Jan-16	4.5	Oct-18	6.1
Jul-13	1.4	Apr-16	12.6	Jan-19	1.4
Oct-13	-2.3	Jul-16	4.2	Apr-19	5.1
Jan-14	3.6	Oct-16	5.2	Jul-19	3.6
Apr-14	5.6	Jan-17	3.8	Oct-19	-6.6
Jul-14	2.8	Apr-17	3	Jan-20	2.2
Oct-14	6.9	Jul-17	2.2	Apr-20	-57.3
Jan-15	2.5	Oct-17	2.4	Jul-20	-10.5
Apr-15	-3	Jan-18	5.9	Oct-20	4.2
Jul-15	5.3	Apr-18	2.7	Jan-21	-1.6
				Apr-21	134.4

Source: MOSPI

The country's index of industrial production (IIP) surged **134.4%** year-on-year to 126.6 in the month of April primarily due to a low base in the previous year, according to the data released by the Ministry of Statistics & Programme Implementation (MoSPI).

India's industrial production contracted in January 2021 to -1.6% from 1.4% in January 2020, underscoring the flattening of the recovery trend seen in Oct-Dec quarter. The fall also marked a weak start to the calendar year 2021. India had imposed a lockdown on March 25, 2020 to curb Covid-19 and began lifting restrictions in stages from May, sparking an uptick. However, many states imposed shutdowns in July to curb outbreaks, undermining the recovery. The Centre further eased restrictions since September 1 and has taken steps to discourage local lockdowns.

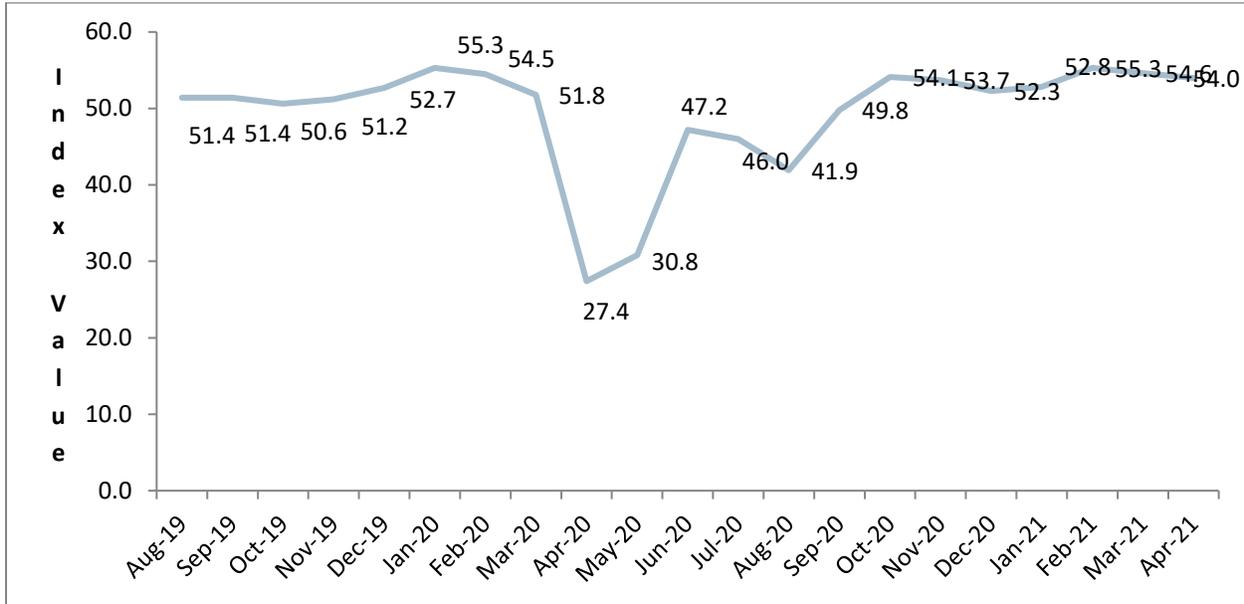
The high-frequency indicators suggest that the economy picked up pace toward the end of August 2020 even though Covid-19 cases continued to rise again. The cases started to rise in India by May 2020 which reached a peak in September 2020 which started to flatten by December 2020. Second wave of Covid started in March-end of 2021. The new surge is taking place despite a year of awareness about the crying need to follow Covid-appropriate behaviour.

- The sales of passenger vehicles in India have reduced by over 2% in FY 2020-21. Passenger vehicle wholesales declined by 2.24%. The industry registered sales of 27,11,457 units as compared to 27,73,519 units in 2019-20.
- Two-wheeler dispatches also declined in the same time period. Sale of units from manufacturer to dealer reduced by 13.18%. In FY 19-20, the industry provided 1,74,16,432 units to dealerships, whereas in FY 20-21 the industry only registered wholesale of 1,51,19,387 units.
- The weightage of Manufacturing, Mining and Electricity production in overall Index of Industrial Production (IIP) is 77.6%, 14.3% and 7.9% respectively. The overall Index of Industrial Production for the month of February 2021 stands at 129.4 and January 2021 stands at 136.2 as compared to December 2020 (135.9), November 2020 (126.1) and October 2020 (129.2). The Indices of Industrial Production for the Mining, Manufacturing and Electricity Sectors for the month of February 2021 stand at 116.5, 129.3 and 153.9 respectively.
- The net sales of consumer electronics and appliances industry grew by 23.5% y-o-y in Q3FY21 to INR 14.2 thousand crores from INR 11.5 thousand crores during the same period last year. Further, the net sales of players in this industry improved on a yearly basis from a decline of 54.7% in Q1FY21 to a growth of 23.5% in Q3FY21. This growth was primarily driven by pent up demand and festive season in Q3FY21 in particular aided the growth. Consumer electronics and appliances industry witnessed sharp contraction in demand in Q1FY21 due to the outbreak of Covid-19 and subsequent restrictions. However, demand has been improving from Q2FY21 till Q4FY21 due to ease in restrictions and is backed by pent up demand.
- Amid the GDP performance of all sectors, by clocking the 3.4% growth in FY21, agriculture achieved the bright spot. The growth was driven largely by a bumper rabi harvest and facilitated by relaxation in lockdown. The gross value added (GVA) at current prices for agriculture and allied sectors rose by 3.4% in FY21 as against 4.0% Y-o-Y growth in FY20 vs. FY19. All other sectors (except Electricity and

gas) had recorded a negative Y-o-Y growth in GVA. Electricity sector grew by 2.9% making Agriculture as the fastest growing segment

1.2.11. Purchasing Manager’s Index (PMI)

Exhibit 1.17: India Purchasing Manager’s Index – 2019 - 2021



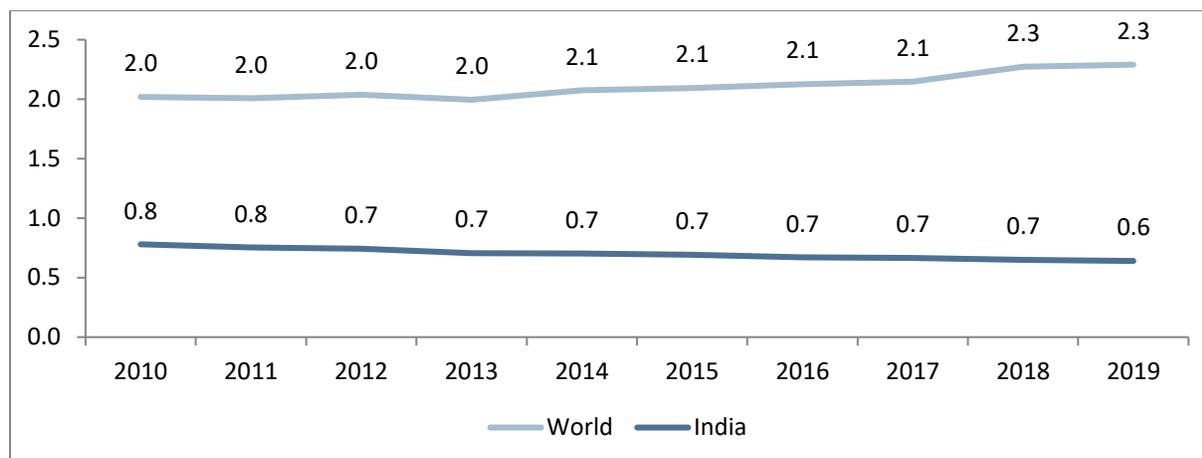
Source: MOSPI

A PMI reading over 50 or 50% indicates growth or expansion of the manufacturing sector as compared to the previous month, while a reading under 50 suggests contraction. A reading at 50 indicates that the number of manufacturers reporting better business is equal to those stating business is worse.

India PMI Index dropped drastically during the month of April 2020 to 27.4 which stayed at this level for about a quarter. PMI numbers from Q4 of FY 2020-21 looked promising with the index jumping all the way up to 54 in March 2021 from 27.4 in April 2020. The shift in PMI numbers suggest positive outlook of the Indian economy.

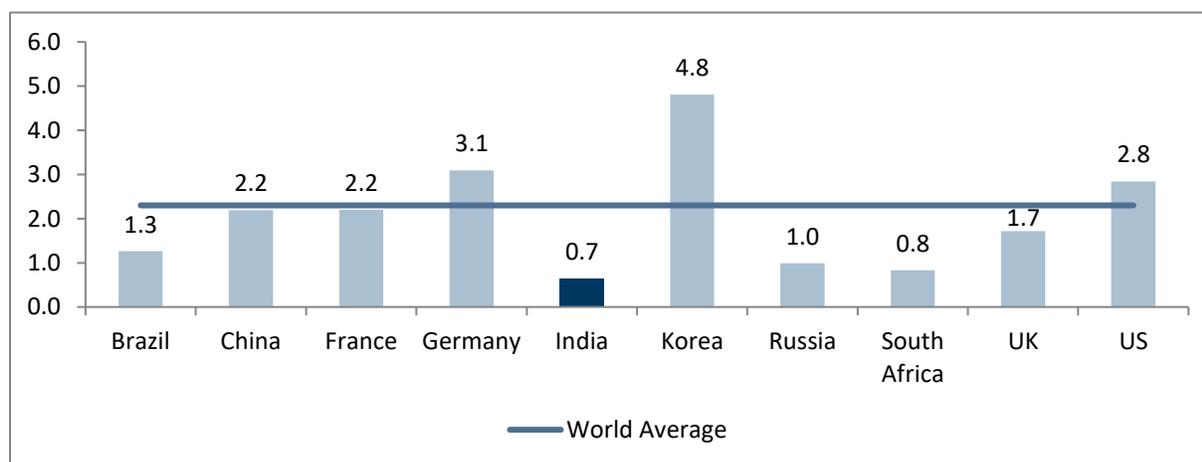
1.2.12. India's expenditure on R&D

Exhibit 1.18: World vs. India's Expenditure on R&D as a % of GDP; 2010 – 2019



Source: World Bank

Exhibit 1.19: World vs. India's Expenditure on Research and Development as a % of GDP; 2018



Note: Brazil and South Africa values are dated to 2017 as the World Bank has not updated the 2018 numbers; World average is 2.3%

Source: World Bank

Investment in research and development (R&D) is an important parameter manifesting data-driven and research-backed policymaking. It also supports creation of intellectual property rights and competitiveness. As a part of the Sustainable Development Goals, countries have pledged substantial increase in public and private spending in research and to also increase the number of researchers by 2030. Investment in research and innovation in India, which currently stands at about 0.65% of GDP for 2020 as compared to 4.3% of GDP in a small country like Israel, needs to be significantly enhanced. India has witnessed a stagnant range of 0.6% to 0.7% of GDP in the last two decades; India will need to allot at least 2% of GDP by 2030 to Research and Development.

In Covid-19 times, India has witnessed the importance of indigenous research in different sectors; like agriculture, healthcare, IT or manufacturing. The National Research Foundation (NRF), meant to fund,

mentor and build quality of research in India, will indeed give a boost to the society and community relevant research as envisaged in the NEP, and also Atmanirbhar Bharat programme.

India is now focussing on increasing the R&D spend to bring India on par with the other countries as it is significantly lower than the top 10 economies' spend of 1-3%. It remains low despite the Centre's higher contribution to GERD (gross domestic expenditure on R&D). **Ramping up investment in research and development (R&D) will be the key for India to become the fourth largest economy, and increased investment from the private sector will be vital for this.** India must now focus on improving its performance on institutions and business sophistication innovation inputs. These are expected to result in higher improvement in innovation output.

Section 2: Overview of Global Chemicals and Specialty Chemicals



Chemicals and Specialty Chemicals Market

2.1 Global Chemical Industry Overview

The global chemicals market was valued at around USD 5,027 Bn with China accounting for major market share (39%) in the segment followed by European Union (15%) and United States (13%). India accounts for ~4% market share in the global chemicals market. The global chemicals market is expected to grow at 6.2% CAGR; reaching USD 6,780 Bn by 2025. Going forward the APAC is anticipated to grow at the fastest rate of 7-8% during the forecast period (2020-25F). The chemicals markets in Western Europe, North America, and Japan are relatively mature and hence would record slow growth rates of around 3-4%.

Exhibit 2.1: Global chemicals market, 2015, 2020 & 2025F, USD 4,227, USD 5,027 Bn & 6,780 Bn

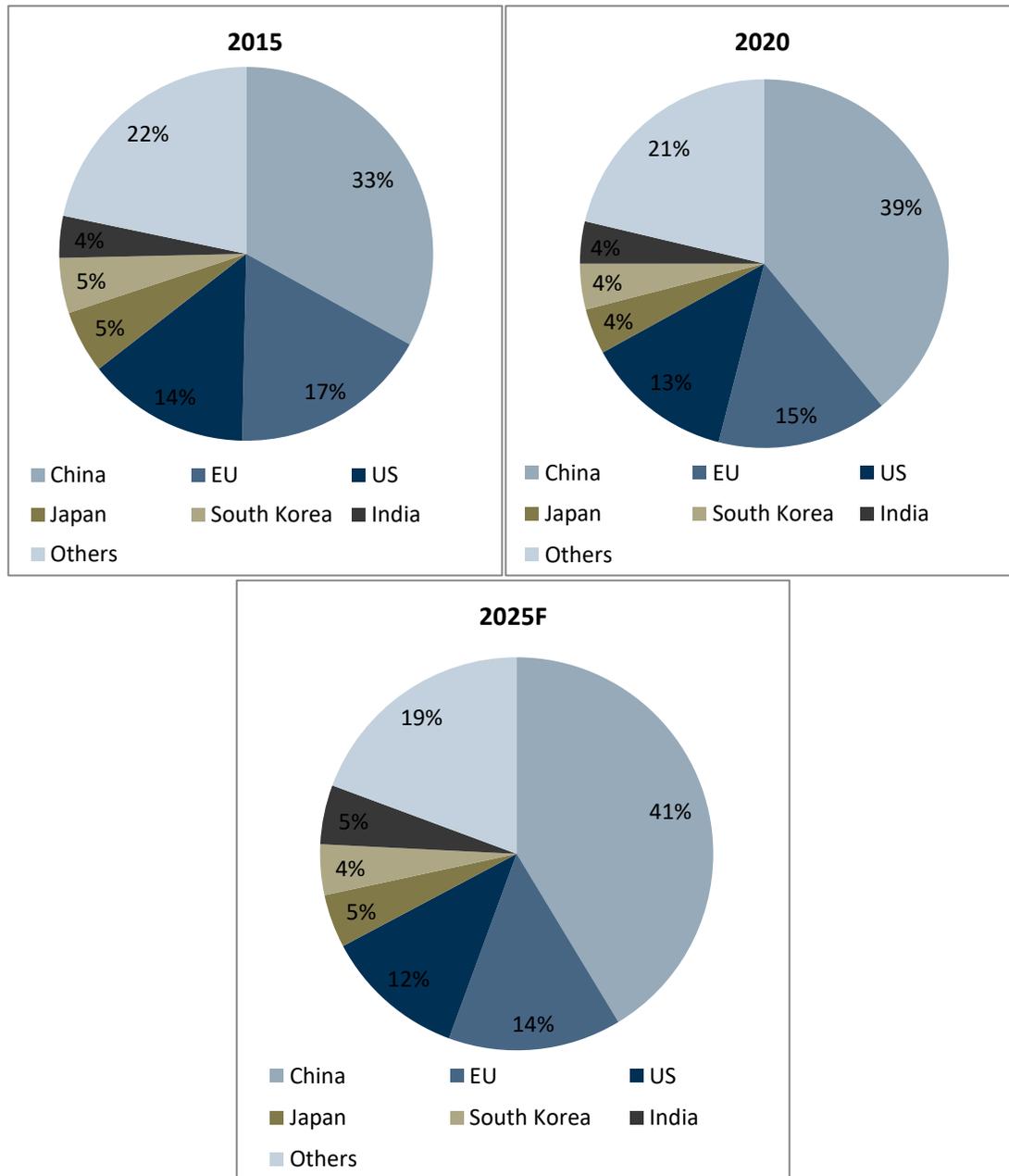
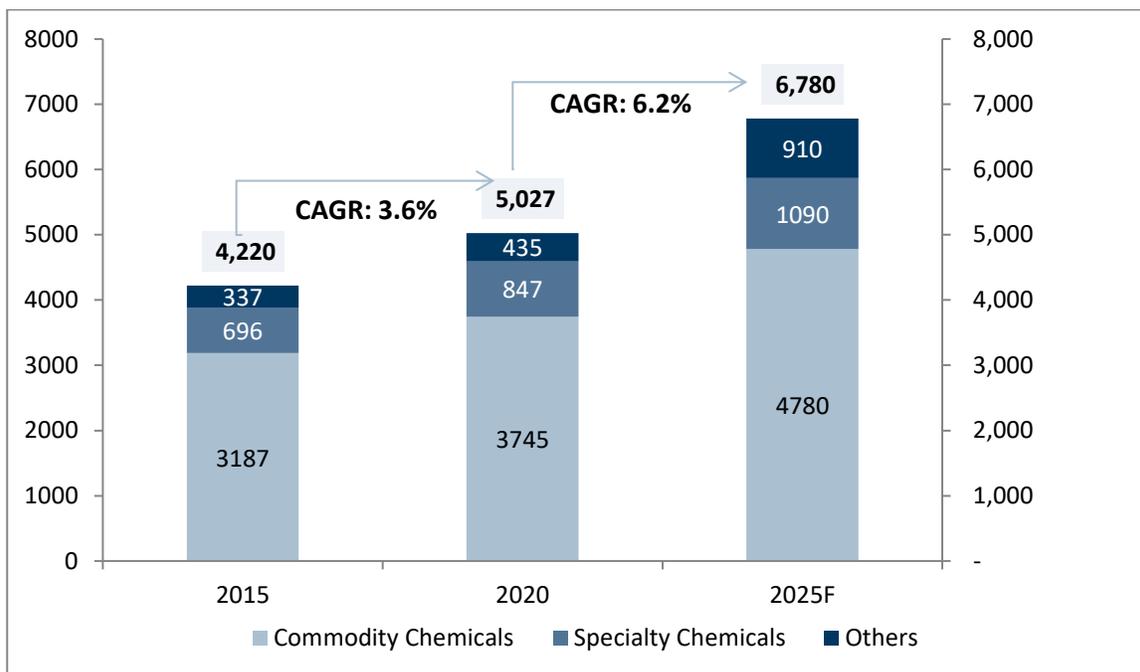


Exhibit 2.2: Global chemicals market, CY2015, 2020 and 2025F (USD 4220 Bn, USD 5027 Bn and USD 6780 Bn)



Source: Frost & Sullivan Primary Research & Analysis

Note: Others mainly include Biotech chemicals. Also note that the Indian chemical industry generally showcases Agrochemicals & Fertilizers and Pharmaceuticals API outside of Specialty chemicals and Petrochemicals outside of Commodity Chemicals. In the above graph the specialty chemicals section, however, is inclusive of the 2 categories (Agrochemical and Fertilizers and Pharmaceuticals API) and the Commodity Chemicals section is inclusive of Bulk chemicals and Petrochemicals.

	Commodity Chemicals	Specialty Chemicals	Other Chemicals
2015-20	3.3%	3.9%	5.2%
2020-25F	5.0%	5.2%	15.9%

Commodity Chemicals: The commodity chemicals market includes companies that manufacture basic chemicals in large volumes. These include plastics, synthetic fibres, films, certain paints and pigments, explosives, and petrochemicals. There is limited product differentiation within the sector; products are sold for their composition. The commodities market is highly fragmented. The leading companies, The Dow Chemical and BASF SE, account for less than 5% of the total market each. Other industry leaders include Bayer AG, DuPont de Nemours, and AkzoNobel. More than 85% of the market share, however, is accounted for by a mix of other companies. The end user markets include other basic chemicals, specialties, and other chemical products; manufactured goods such as textiles, automobiles,

appliances, and furniture; and pulp and paper processing, oil refining, aluminium processing, and other manufacturing processes. Markets also include some non-manufacturing industries. The sector is presently valued at ~USD 3,745 Bn and is expected to grow at 5%-6% globally in the next five years.

- **Petrochemicals** are derived from crude oil, crude products, or natural gas. Petrochemicals are used in the manufacture of numerous products such as synthetic rubber, synthetic fibres (e.g., nylon and polyester), plastics, fertilizers, paints, detergents, and pesticides. It is the basis for most organic chemistry. The global petrochemicals market size was predicted at ~USD 475 Bn in 2020 and is anticipated to witness a CAGR of 5%-6% over the forecast period. The growth of the market for petrochemicals will be driven by rising demand for downstream products from end-use industries and capacity additions in the base chemical industry.

Specialty Chemicals: The specialty chemicals market is characterized by high value-added, low volume chemical production. These chemicals are used in a wide variety of products, including fine chemicals, additives, advanced polymers, adhesives, sealants and specialty paints, pigments, and coatings. The specialty market is extremely fragmented. The consolidation of companies has been a major trend, and is expected to continue. Similar to the commodity sector, the specialty sector is affected by high costs of energy and feedstock. Intangible value issues include heightened emphasis on research, customer migration to alternative products, and the impact of regulations on products. The overall market stood at ~USD 847 Bn in 2020, and is expected to showcase a growth between 5-6% over the next five years.

- **Pharmaceutical (API):** API are generally considered a sub-sector of the chemical industry. Information and statistics on the chemical industry may or may not include the pharmaceutical sector, though it tends to be demarcated as a separate category. The global active pharmaceutical ingredients market size is projected to reach ~USD 250-270 Bn by 2025 at a CAGR of 5%-6% during the forecast period. The market growth is driven mainly by factors such as rising drug R&D, the increasing incidence of chronic diseases, the growing importance of generics, and the increasing uptake of biopharmaceuticals. On the other hand, unfavourable drug price control policies across various countries and high manufacturing costs are expected to restrain the growth of this market. Following are some of the critical success factors for the players involved in pharmaceutical chemicals and API –

1. **Marketing strategy** – Most leaders have a well-defined product marketing strategy to target right customer segment. Companies have invested in R&D to introduce new products beneficial to the end users.
2. **Reduced Dependence on China** – Both global and domestic drug companies have started to diversify their sourcing of APIs and KSMs
3. **Strong hold on the entire value chain** – Manufacturers are now positioning themselves at solution providers; starting with raw material intake from the supplier, culminating with storage of the finished product in automated warehouses to contractual agreements with distributors to market their products.

- Agrochemicals & Fertilizers:** The global Agrochemicals & Fertilizer Market is expected to garner revenue of ~USD 250-260 Bn by 2025 with a CAGR of 5.5-6% during the forecast period of 2020-25. The major chemicals used in agriculture to regulate plant growth are synthetic fertilizers, pesticides, and hormones, amongst others. The growth of agriculture in the emerging markets such as South America, Africa, and the Middle East is paving the way for several profitable opportunities for the market players. Additionally, a strong focus of agrochemical manufacturers on product innovation is expected to render a higher competitive advantage to them over their rivals. The market of agrochemicals & fertilizers in China and India is expected to grow significantly owing to the increase in consumption and production of fertilizers, such as nitrogen based, potassium based fertilizers, in these countries. China and India are the major exporters of agrochemicals & fertilizers in the Latin America, Asia Pacific and other regions. These factors are expected to create a robust platform for the growth of the China and India market. A key success factor for the crop protection chemicals in the market is extensive R&D capabilities of a company to develop new molecules satisfying the government norms and stringent environment regulations (possibly having higher pesticide biodegradability index). Emergence of bio-pesticides are making a splash in the existing crop protection market, however product features in these green pesticides are so limited that it has not gained popularity as much as traditional crop protection chemicals. Although it remains a challenge as of now, to introduce (equally effective) 100% sustainable pesticide, transition to hybrid pesticides is seen as future solution for the sustainable agriculture. This essentially ensures a robust growth trajectory for traditional crop protection chemicals in high-volume-high-growth centres like India. Following are some of the critical success factors for the players involved in crop protection chemicals –

- 1. Backward integration of technical active ingredients** – Many formulators’ needs to have backward integration of its technical AI’s (Active Ingredients) in order to succeed in gaining high profit margins in the market.
- 2. Comprehensive product portfolio** – ‘One stop solution’ for farmers of all the agrochemical needs surely drives the success of one firm over another
- 3. Strong distribution network** – Distribution network plays vital role in reaching at the fragmented farmers’ base across the world also enabling excellent feedback mechanism & deep customer relations.

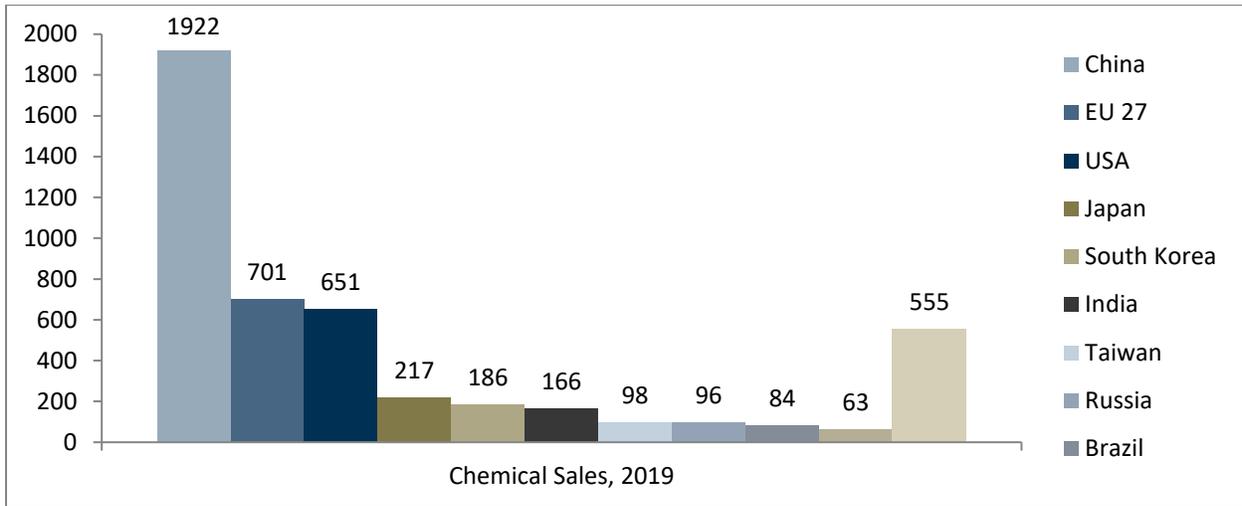
List of Key Global Chemical Companies – based on Revenue

Sr. No.	Company Name	Headquarters	2020 Chemicals Revenue (USD Mn)	2019 Chemicals Revenue (USD Mn)	2018 Chemicals Revenue (USD Mn)	2018-20 CAGR
1	BASF	Germany	69,464	66,401	60,220	7.4%
2	Sinopec	China	48,020	63,729	71,327	-17.9%
3	Dow	US	38,542	42,951	49,604	-11.9%
4	Sabic	Saudi Arabia	31,000	34,420	45,000	-17.0%
5	Mitsubishi Chemical	Japan	30,535	32,846	34,805	-6.3%
6	LyondellBasell Industries	US	27,753	34,727	39,004	-15.6%
7	LG Chem	South Korea	26,040	24,780	25,260	1.5%
8	Air Liquide	France	23,125 (FY21)	24,550	24,793	-3.4%
9	Syngenta Group	Switzerland	13,523	13,582	14,287	-2.7%
10	DuPont	US	20,703	21,512	22,590	-4.3%
11	Ineos	UK	12,885	15,350	18,988	-17.6%
12	Wanhua Chemical	China	10,642	9,848	10,986	-1.6%

Global chemicals sales were valued at USD 4738 Bn in 2019. China is the largest chemicals producer in the world, contributing to 40.6% of global chemical sales in 2019. With 14.8%, the EU27 chemical industry ranked second in total sales and United States ranked third with 13.8%.

Worldwide, the competitive landscape has changed significantly over the last ten years. Today, next to the EU 27, US and Japan mostly emerging countries from Asia rank in the top 10 in terms of sales. The BRICS countries (Brazil, Russia, India, China and South Africa) accounted for 47.2% of global chemical sales in 2019. Together with the EU27 and the USA the BRICS accounted for more than three quarters of global chemical sales, in 2019. The remaining quarter of global chemical sales were generated mainly by emerging countries in Asia, including the Middle East.

Exhibit 2.4: Global Chemicals Sales, 2019 USD 4738 Bn



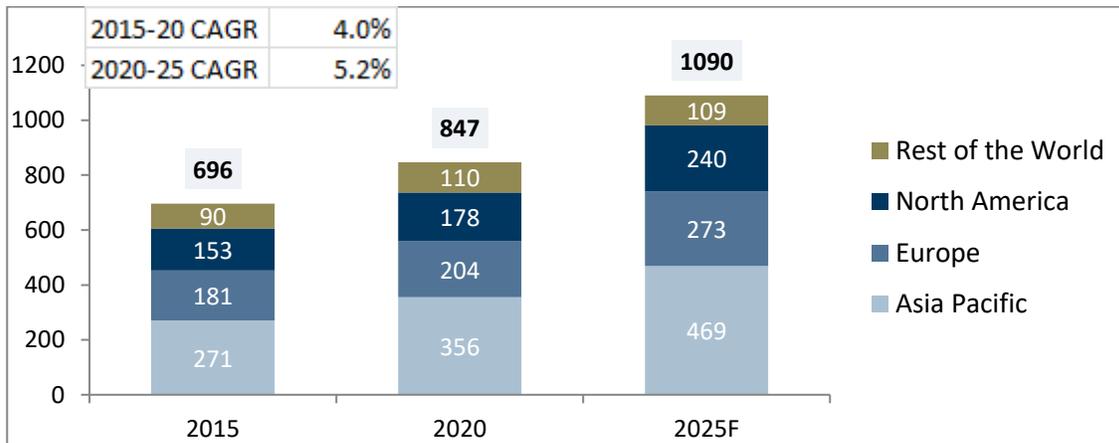
Source: CEFIC, IBEF (data published for 2019)

2.2 Global Specialty Chemicals Market

Specialty chemicals are low-volume and high-value products which are sold on the basis of their quality or utility. Thus, they may be used primarily as additives or to provide a specific attribute to the end product. Specialty chemicals are more likely to be prepared and processed in batches. The focus is on value addition to the end-product and the properties or technical specifications of the chemical.

Rapid industrialisation in India and China is expected to drive demand for specialty chemicals. The Asia Pacific (APAC) dominates the market across the world, with a share of 42%, owing to the huge customer base, leading to high demand for specialty chemicals, increasing industrial production, and robust growth of the construction sector in the region. APAC is followed by Europe and North America.

Exhibit 2.5: Global Specialty Chemicals Market by Geography, 2015, 2020, 2025F Value (USD 696, USD 847 Bn, USD 1090)



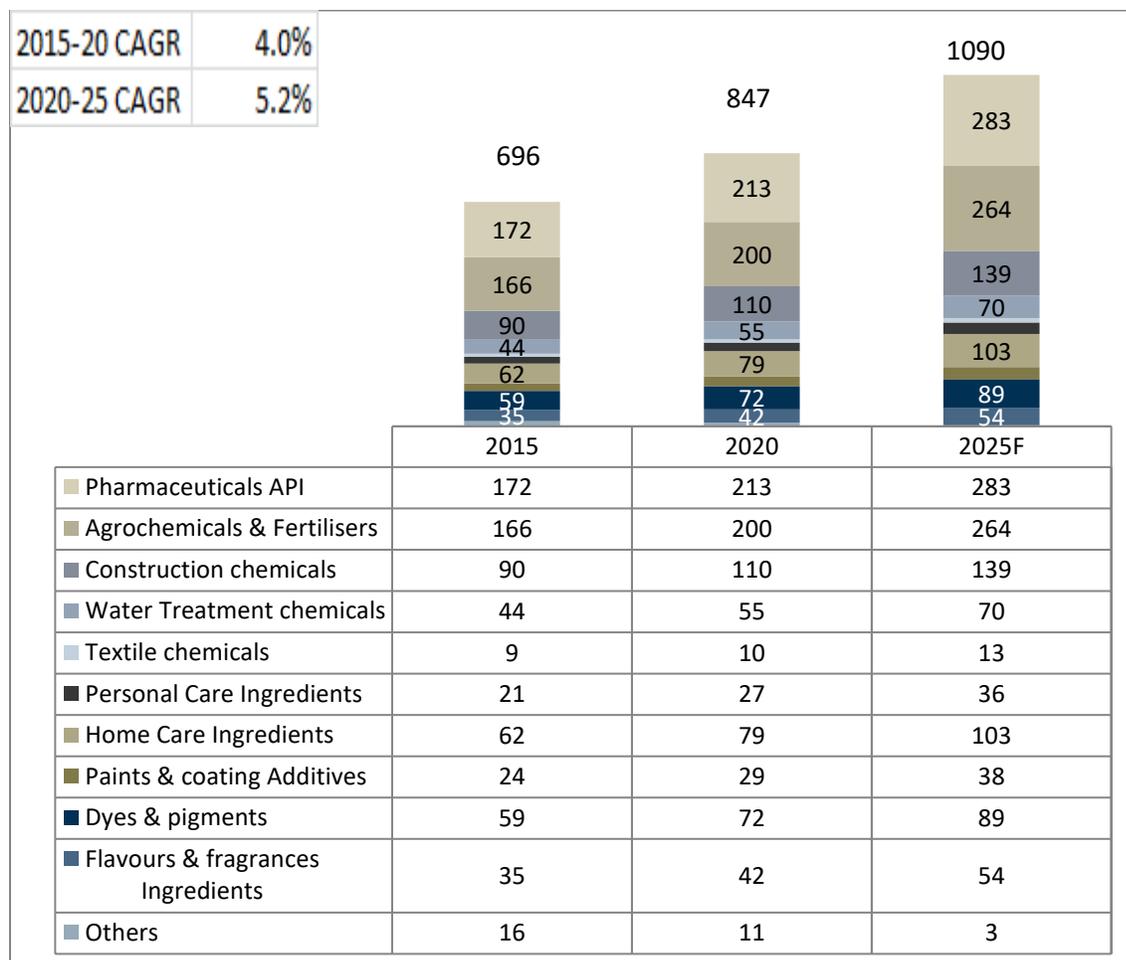
Source: Frost & Sullivan Primary Research & Analysis

With a high population base and majority of countries being underdeveloped or developing nations in Asia Pacific (APAC), there is high rate of construction activities resulting in higher demand for construction chemicals and paints & coatings additives. Embracing modern practices in the fields, agrochemicals have seen tremendous growth particularly for pesticides and fertilizer consumption. The consumption of pesticides in Asia-Pacific recorded the fastest growth rate on a global basis and reached a projected volume of ~797.5 KT in 2020. In 2020, China, India and Japan represent the largest agrochemicals markets of the Asian continent. Amongst that, China is leading the agrochemicals market with its developing agricultural sector along with the need for its ever growing population. Globally, China is not only the largest producer but also the largest consumer of fertilizers.

2.3 Market Segmentation – by Industry and Application Type

Specialty chemicals industry can be categorised into a mix of end-use driven segments and application-driven segments. In terms of attractiveness, the various segments across specialty chemicals differ in competitive intensity, margin profiles, defensibility against raw material cost movements, and growth.

Exhibit 2.6: Global Specialty Chemicals Market, Value (USD Bn), 2015, 2020 and 2025F

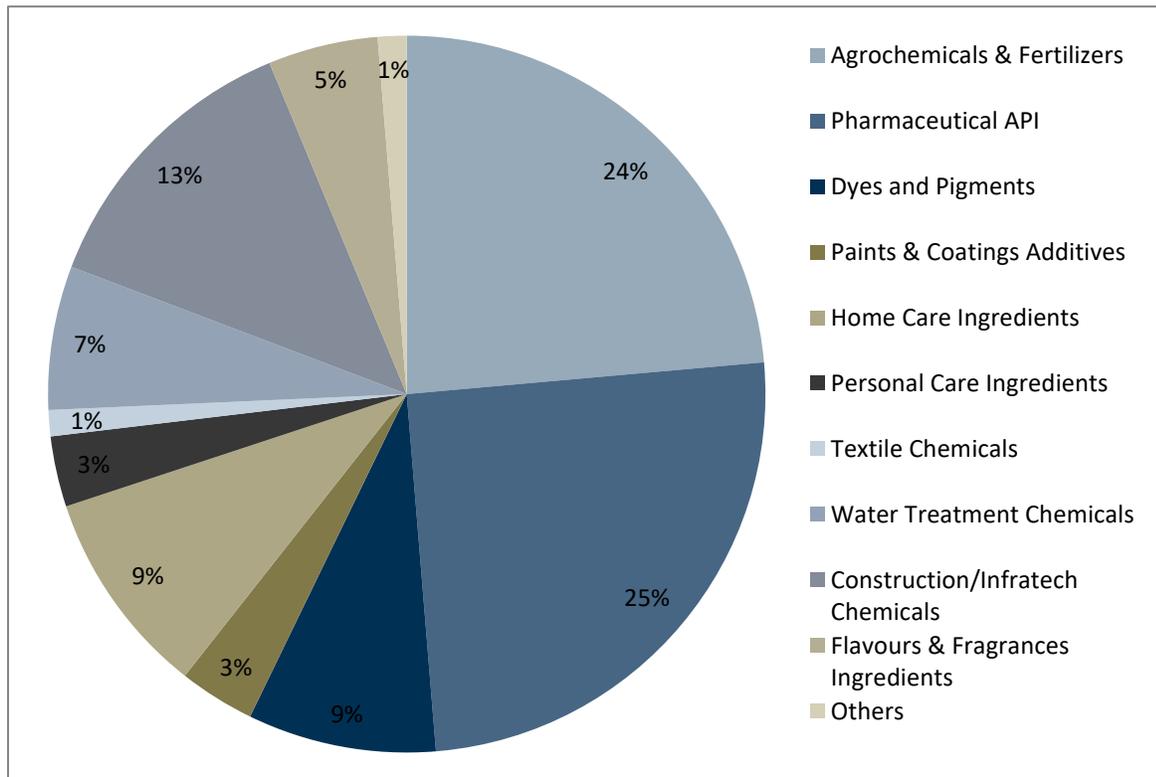


Others include: Sealants and Adhesives, Polymer Additives etc.

CAGR	Agrochemicals & fertilizers	Pharmaceutical API	Dyes and Pigments	Paints & Coatings Additives	Home Care Ingredients	Personal Care Ingredients	Textile Chemicals	Water Treatment Chemicals	Construction/Infratech Chemicals	Flavours & Fragrances Ingredients	Total
2015-20	5.4%	4.4%	4.1%	4.2%	5.0%	4.9%	2.5%	4.3%	4.1%	3.9%	4.0%
2020-25F	5.7%	5.8%	4.3%	5.0%	5.4%	6.2%	3.8%	5.0%	4.8%	5.2%	5.2%

Source: Frost & Sullivan Primary Research & Analysis

Exhibit 2.7: Global Specialty Chemicals Market, Industries & Applications, 2020, Value (USD 847 Bn)



Source: Frost & Sullivan Primary Research & Analysis

List of Key Global Specialty Chemical Companies (Sales 2019)

Sr. No.	Company Name	Headquarters	Segments
1	BASF	Germany	Chemicals, Materials, Industrial Solutions, Surface Technologies, Nutrition & Care, Agricultural Solutions
2	Solvay	Belgium	Consumer Chemicals, Advanced Materials, Performance Chemicals, Functional Polymers
3	Evonik Industries	Germany	Sustainable Nutrition, Health Care Solutions, Advanced Food Ingredients, Cosmetic Solutions, Membranes, and Additive Manufacturing.
4	Clariant	Switzerland	Additives, Catalysts, Functional Minerals, Industrial & Consumer Specialties, Masterbatches, Oil and Mining Services, Pigments
5	Akzo Nobel	Netherlands	Paints, Performance Coatings. Specialty Chemicals
6	Henkel	Germany	Laundry & Home Care, Beauty Care, Adhesive Technologies
7	LANXESS	Germany	Specialty Chemicals, polymers, Additives for lubricants
8	Croda International	UK	Speciality Chemicals for: Personal Care, Health Care, Crop Care, Lubricant Additives, Coatings and Polymers, Geo Technologies, Polymer Additives, Home Care Industrial Chemicals
9	Huntsman International	USA	Assorted polyurethanes, performance products, and adhesives for customer
10	The Lubrizol Corporation	USA	Ingredients and additives for personal care products, pharmaceuticals and medical devices, specialty materials, including plastics technology, and coatings in the form of specialty resins and additives

The COVID-19 pandemic has had an unprecedented impact on the global economy. Chemical companies in North America and Europe have specifically started focusing on operational efficiency, asset optimization, and cost management. On a short term basis, most companies are considering to implement a series of targeted, strategic initiatives across major functional areas such as R&D and technology. Companies are also keen on addressing long-term opportunities like investing in innovation, emerging applications, adopting new business models that generate sustained growth, analysing temporary vs. permanent customer buying behaviour patterns across geographies.

The industry is expected to see the following trends in the next 2-5 years:

- Companies will try and shift their focus toward new value streams and growing end markets, such as health care and electronics
- Most governments have announced policy proposals related to regulation, trade, and sustainability which could prove beneficial in shifting the dependence of the industry from China
- Chemical companies are now experiencing significant changes in the way they operate and serve their customers by leveraging on remote and digital sales channels

5 year growth forecast split by key industries highlighting key factors driving growth

Segments	Key Growth Drivers	(2020-25 CAGR)
Agrochemicals	<p>Increasing global population, Decreasing arable land, and consequent requirement to improve crop yields.</p> <p>New demand for agricultural products would also be created by the use of agricultural products for industrial applications such as in fuel blending and polymer manufacturing, opening up new avenues of applications for agrochemicals</p>	5.7%
Fertilizers	<p>Strong growth in food demand (in proportion with the growing world population) is expected to exhibit a strong growth. Conversely, as a result of increasing urbanisation levels, available arable land is expected to decrease. Hence fertilizers to play a key role in increasing the average crop yields per hectare.</p> <p>Contract farming is also expected to create a positive impact on fertilizer usage where multinationals & large contractors help farmers improve yield of their crops by providing technological as well as training assistance/support.</p>	6.1%

Pharmaceuticals Chemicals (API)	Growing demand for generic drugs globally and India being the largest provider of generic drugs results in higher demand for domestic consumption of Pharmaceuticals chemicals.	5.8%
Construction/ Infratech Chemicals	Rise in construction projects across emerging markets and increased adoption of construction chemicals for improvement in quality of projects	4.8%
Home Care Ingredients	Growth in Household and Industrial & Institutional Cleaners market. Growing consumption of Environmentally Friendly Products	5.4%
Personal Care Ingredients	Growth in demand for personal care products is driven primarily by emerging markets in the Asia-Pacific region, particularly China and India which are expected to grow at around 9-10% CAGR. USA and Europe are expected to grow at ~4% primarily driven by the shift towards natural active ingredients.	6.2%
Paints & Coatings Additives	Demand driven by growing automotive industry, increasing urban population, rising household consumption expenditure and improving economic conditions	5.0%
Water Treatment Chemicals	Strengthening environmental regulations and rising water quality standards for municipal consumption in matured markets of North America and Europe In emerging markets, strong economic growth resulting in greater municipal and industrial spending in water treatment effort will drive growth of this segment.	5.0%
Textile Chemicals	Increasing demand for finishing chemicals that allow a variety of beneficial properties like anti-microbial properties, wrinkle-free properties, stain-resistance, etc. to be imparted to the textile	3.8%
Flavours and Fragrances Ingredients	Strong growth in low-fat and low-carbohydrate foods and beverages in North America Higher consumer willingness to experiment with new flavours and fragrances	5.2%

	<p>Increased production of processed foods in developing countries causing a spurt in the demand for flavours</p> <p>A shift in perception of fragrance from being a nonessential attribute to an indispensable part of personal care</p>	
Dyes and Pigments	<p>Growth is demand for high performance pigments (HPP) which are highly durable pigments, resistant to UV radiation, heat and chemical</p> <p>Use of eco-friendly colorants such as low impact dyes is emerging</p>	4.3%

In addition to the above factors, a lot of emphasis is laid upon green chemicals. With an increasing awareness of the ill-effects of certain chemicals on humans and the environment, there is a growing trend in the chemicals industry to shift towards what is known as “green” chemicals or more accurately sustainable chemistry. These are products which are bio-degradable and provide higher performance and functionality while being more environmentally benign throughout its entire life-cycle, including its design, manufacture, use, and ultimate disposal.

The classification as green or sustainable is measured across the life cycle of any chemical product, including its design, manufacture, application, and disposal. The products can be used for various applications such as food ingredients, home and personal care products, water treatment, and industrial cleaning products. The demand for green chemicals is particularly high from the textile industry which is one of the major end-users of chemicals. The evolution of green chemistry in the chemical industry will be a critical trend fuelling the growth of the green chemicals market. The Global Green Chemicals market is expected to reach ~USD 40-50 Bn by 2025 at a CAGR of 10.5% from ~USD27 Bn in 2020.

2.4 Impact of COVID 19

Many leading chemical manufacturers have reduced capital and operational expenditure to address the crisis. Capacity utilizations had scaled down to 40%-60% capacity during May-Aug 2020 due to labour shortages and disruptions in the supply of raw material since March 2020, however companies have ramped back to pre-Covid levels. The supply chains are being reconfigured as competitive order of chemicals producers in the US, Middle East, China and Europe has changed. The demand for chemicals for automotive, transportation and consumer products sectors have fallen by ~20%-30% with the automotive industry almost coming to standstill in April-May 2020. However, given strong fundamentals the market is expected to recover between 2021-22.

The Government has implemented enterprising initiatives and schemes such as Make in India, Aatmanirbhar Bharat Abhiyan and the Production-Linked Incentive (PLI) Scheme with the objective of improving the competitiveness of domestic manufacturing, attracting investments and enabling exports. These initiatives are expected to boost domestic production and also increase the demand for

chemicals and petrochemicals. Such significant measures are expected to transform India into a global manufacturing hub for chemicals and petrochemicals

With Covid-19, China is facing an unprecedented global backlash and many companies are not considering it the first preferred location for setting up factories. Given that global companies are now transitioning their operations away from China to other geographies like India, Vietnam among others, the overall capacity utilization and labour issues are also expected to be resolved. India's strategic advantage in this regard has been elaborated in the ensuing section. Most companies in the chemical industry have stepped up to produce raw materials for sanitization and safety products which have been the need of the hour. The companies are also looking at innovations around 3D printing, polymer recycling, green hydrogen as a source of energy, bio-based products etc. to have better sustainability and higher margins. China's weakened position is a blessing in disguise for India. Taking advantage of this situation, the Indian government has taken policy interventions to attract companies looking to shift their manufacturing base to India in the post COVID-19 scenario.

Global manufacturers have initiated talks with Indian firms to explore the possibility of shifting a part of their supply chains from China as they seek to diversify their operations following the covid-19 outbreak. First of the lot are companies interested in sourcing automobile components and electronic products from India. In the chemicals sector, India could become global specialty chemical export hub. The key growth accelerator would be our readiness in responding to the strong demand of key global markets to de-risk their supply chain by diversifying their base beyond China. In a way China's loss is India's gain. The tightening of environmental protection norms in China since January 2015 resulting in increase in operating costs, closure and relocation of manufacturing facilities along with rising labour costs and the recent trade dispute between China and United States have reduced Chinese exports and resulted in shifting the source of key raw materials from China to India. Indian companies were also heavily reliant on China which, over the years, has emerged as a manufacturing powerhouse. These companies suffered huge losses as bulk of the supplies from China was stalled owing to pandemic making Indian companies adopt the strategy of local sourcing. Local sourcing and global companies shifting base to India is expected to boost manufacturing sector of India. In a nutshell, India is on a growth trajectory with Indian companies opting for local sourcing and bulk of Global companies shifting their base to India.

Section 3: Overview of Indian Chemicals and Specialty Chemicals

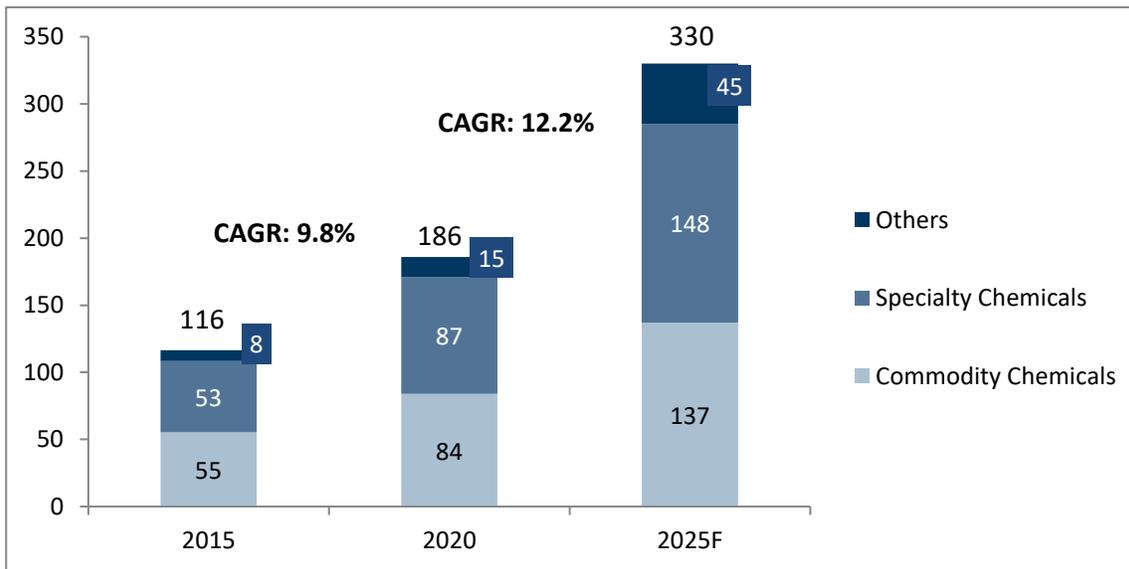


Chemicals and Specialty Chemicals Market

3.1. India Chemical Industry Overview

The Indian chemicals market is valued at USD 186 Bn (~4% share in the global chemical industry) with the commodity chemicals accounting for almost 46%. It is expected to reach ~USD 330 Bn in the next 5 years, with an anticipated growth of ~12.2% CAGR. The specialty chemical industry forms ~47% of the domestic chemical market, which is expected to grow at a CAGR of around 11% over the same period. Agrochemicals and Fertilizers account for 18-20% of the domestic chemicals market and around 38% of the specialty chemicals domain which constitute of various differentiated chemicals used in the agro space including pesticides, herbicides etc. Pharmaceutical API make up for the second largest share of around 20% of the specialty chemical market with an anticipated growth of over 11% by 2025F.

Exhibit 3.1: Indian Chemicals Market, 2015, 2020 and 2025F (USD Bn)



Source: Frost & Sullivan Primary Research & Analysis

Note: Indian chemical industry generally showcases Agrochemicals & Fertilizers and Pharmaceuticals API outside of Specialty chemicals. In the above graph the specialty chemicals section, however, is inclusive of the 2 categories to maintain consistency with the Global section. Agrochemical & Fertilizer and Pharmaceuticals API contribute to more than 55% of the specialty chemical space in India.

	Commodity Chemicals	Specialty Chemicals
2015-20	8.7%	10.4%
2020-25F	10.3%	11.2%

The Specialty chemicals industry is driven by both domestic consumption and exports. India’s specialty chemical companies are gaining favour with global MNCs because of the geopolitical shift after the outbreak of Covid-19 as the world looks to reduce its dependence on China. Currently China accounts for ~15-17% of the world’s exportable specialty chemicals, whereas India accounts for merely 1-2%

indicating that the country has large scope of improvement and widespread opportunity. It is anticipated that Specialty chemicals will be the next great export pillar for India.

Home and personal care chemicals, water treatment chemicals, construction chemicals, agrochemicals etc. are areas where Specialty chemicals find applications. The growth of the market is in conjunction with the overall growth of the Indian economy. Aarti Industries, Atul Limited, Vinati Organics, Alkyl Amines, Navin Fluorine are the bigger players prevalent in the Indian Specialty chemicals market.

The “Make in India” campaign is also expected to add impetus to the emergence of India as a manufacturing hub for the chemicals industry in the medium term. Through incentives, subsidies and grants under this campaign, Indian companies could gain further ground as companies would want to reduce dependence on China after the COVID-19 pandemic and shift their supply chains.

With over 1.3 billion population, India is one of the World’s largest markets. The fact that the Per capita consumption of chemicals in India is lower, compared to western countries, offers immense scope for new investments. As per Ministry of Chemicals and Fertilisers, the petrochemical demand is expected to grow at 7.5% CAGR from FY 2019-23, with polymer demand growing at 8%. Similarly the agrochemicals market in India is expected to grow at 8% CAGR reaching \$3.7 bn by FY22 and \$4.7 bn by FY25. While the specialty chemicals constitute 18% of total chemicals and petrochemicals market in India with the total market size is around \$32 bn [as on FY19]. The demand for speciality chemicals is expected to grow at 12% CAGR from FY19-22.

The decline in raw materials prices could also help the margins and reduce working capital need. However, input costs are a pass through for most companies and benefits could be limited. Overall, the specialty chemicals industry is likely to continue to perform well in the near to medium term and is expected to capitalize on the Make in India benefits to assume leadership position in the market.

The exports are on the rise as India is becoming a central manufacturing hub for such chemicals. Tightening of environmental norms (e.g. REACH Registration, Evaluation, Authorisation and Restriction of Chemicals Regulations) in developed countries and the slowdown of China are contributing to the growth of exports.

China’s specialty chemicals market has seen a downturn in recent years due to various factors; most prominent being the introduction of stringent environmental norms. Tightening environmental protection added new business operating costs and led to factory closures in high-polluting sectors, which weighed on industrial production. Stricter environment regulations have negatively impacted industrial output since 2017. Under these circumstances, the growth of the Chinese specialty chemicals market also has been slowing down. In addition, the recent trade friction between the United States and China reduced Chinese exports to the United States by approximately 3% from 20% in 2018 to 17% in 2019.

Stringent environmental norms: The Chinese government started implementing stricter environmental protection norms from January 2015. In 2018, an estimated 40% of the chemical manufacturing capacity in China was temporarily shut down for safety inspections, with over 80,000 manufacturing units charged and fined for breaching emission limits. China’s Ministry of Environmental Protection enforced strict penalties on polluting industries, including chemicals.

In 2016, the Government of Jiangsu, China, issued a development plan for the Yangtze River Delta Economic Belt. The pollution in the river has reached dangerous levels with several chemical manufacturers located near the river owing to proximity to ports. As per the plan, the government has set a goal of shutting down or relocating nearly 1,000 chemical plants, which use older technology or are located near the Yangtze River, within three years (2018-2020). By the end of 2020, 134 chemical firms will be shut down, relocated or renovated. No factories will be allowed within 1 km of the river.

Also, the Chinese government has mandated the construction of compulsory effluent treatment plants and imposed green tax on the chemicals industry to combat pollution. As a result, the overall cost of production is likely to go up with capital expenses incurred towards effluent treatment as well rise in compliance cost. The cost is expected to be higher for the smaller non-integrated plants operated by medium- and small-scale players. This is likely to impact production in the medium term and thereby overall chemical exports.

Rising cost of labour: The labour cost (hourly cost of compensation) in China was lower than that of India till 2007. However, over 2005-2015, the average labour cost in China increased nearly 19-20% CAGR, against 4-5% CAGR in India. In fact, over the last five years, this cost has more than doubled compared with India, rendering Chinese manufacturers' uncompetitive vis-à-vis India in terms of labour cost.

All these factors are pushing the capex and opex costs upwards, making Chinese chemical companies less competitive in the export market.

The pandemic has compounded the situation further as companies across the world are looking for alternate supply solutions. Japan announced that it will offer economic stimulus package to encourage companies to shift manufacturing back to Japan. This further proves that increasing number of countries want to reduce dependence on China and develop either local supply chain or alternative chain. As a result, several Indian players have witnessed order inflows from global chemical players to meet the short-term supply disruptions from China, which is a positive remark for Indian market.

Owing to shutdowns in China and lack of capacity additions in other developed countries, India stands to benefit in the export market. Also supporting the growth in India is its ability to manufacture at a lower price compared with its western counterparts. Moreover, the specialty chemicals consumption in the country is low compared with the global average. The increasing availability of basic chemicals is likely to support investments in the specialty chemicals segment further.

Specialty chemical companies will prosper in India because of its chemistry, R&D skillset and economies of scales achieved by the country. India's R&D capabilities and the long-term relationships that the Domestic chemical companies have forged with the customers are also key to the growth of Indian players. The specialty chemical companies thrive on domestic availability of raw materials, thereby increasing more domestic opportunities. The sector focuses on accelerated capital expenditure (Capex) to build product development capabilities and investment in Research and Development (R&D) for added traction in the sector. Increased R&D allows these companies to step up their position in the speciality chemicals manufacturing value chain to become 'proprietary chemical producers'. For FY18-20, the aggregate Capex spends of our speciality chemicals universe were 1.5x

(INR 78bn) those during FY16-18. The companies had spent Capex for capacity augmentation and/or product development based on their end-user industries. Additionally, India's Environmental and Health Safety practices are much more stringent than other manufacturing centres like China, providing a significant strategic advantage.

The companies supplying speciality chemicals to the pharma and agrochemical industries are expected to show higher performance as compared to specialty chemical companies serving other industries to steady growth in Pharma and Agro segments and stringent regulations that create entry barriers for competitors. Speciality chemical companies are also spending heavily on Capex to meet demand of industries in the pharma and the agrochemical sectors as they pose great growth opportunities, given the current pandemic situation.

China is the largest chemical producer in the world, contributing 36-40% of global chemical sales. Many downstream multinational companies that imported the bulk of their chemical requirements from China may consider supplementing this supply from elsewhere and large chemical markets that remain accessible in this scenario could present opportunities for Indian chemical companies.

High Entry Barriers to the Industry

Certainly, Chemical Industry need right qualified persons, have some regulations in place for effluent, transport and handling, hence this Industry has high entry barriers for a new Entrant.

- a) Involvement of complex chemistries in the manufacturing of products: Complex production processes requiring high levels of technical knowledge and Research & Development capabilities, the Specialty Chemicals industry observes a high barrier to new entrants. Agrochemical players like Gharda, PI Industries have dedicated research and development centres where development teams work on manufacturing processes, alternate routes and new molecules which are high performing than the existing molecules.
- b) Given the nature of the application of products and the complex processes involved, the products are subject to very sensitive and rigorous product approval systems with stringent impurity specifications. Intermediates that enter the API drugs are having further more stringent quality and process restrictions. Typically, the requirement has to be enlisted as a supplier with customers after lengthy qualification for the products, particularly with the customers in industries such as automotive, petrochemical refineries and pharmaceutical industries where stringent regulatory and industry specific acts as an entry barrier. As a consequence of this, approval of any such product typically takes a few years. For example, Indian Pharmacopoeia Commission (IPC) is an autonomous institution of the Ministry of Health and Family Welfare which sets standards for all drugs that are manufactured, sold and consumed in India. Similarly for exports, B.P. suffix for British Pharmacopoeia and the U.S.P. suffix for the United States Pharmacopoeia are the other International standards that the companies have to abide by to be able to qualify itself as a standard product.
- c) Further, the costs involved of approving any change in suppliers of such products are relatively high, consequently dis-incentivising any such change in suppliers. Customers typically select suppliers after carefully reviewing them and tend to develop long-term relationships with them as well as limit the number of such suppliers.

- d) The Specialty Chemicals companies, API and drug intermediates enjoy the strong entry barriers in the form of stringent quality (specifically human consumption), vendor acquisition, lengthy and complex product approval, registration process, customer loyalty among others.

These barriers help the companies to ensure sustainable growth. Further, a distinguished and resilient business model is also a unique driver for these companies. Companies specifically catering to API, drug intermediates FMCG, HPC and food ingredients enjoy strong entry barriers due to their differentiated models and higher levels of product customization. Pharma API are meant for human consumption and have direct impact on human body and its functioning, hence attract even more scrutiny and strict guidelines making it a difficult market to penetrate by new-comers. The level of technical skill and expertise that is essential for developing in-house innovative processes, undertaking complex chemistries and handling some of the raw materials and intermediates, requires a significant amount of training that can only be achieved over a period of time thereby creating a further entry barrier for new entrants.

Key players in the Specialty Chemicals market

Sr. No.	Company Name	Business Segments	FY2021 Revenue (INR Cr)	Net Profit (INR Cr)	Net Profit Margin (%)	% Revenue from Exports
1	PI Industries	Pesticides/Agro Chemicals sector	4,390	718	16.36%	85%
2	Astec Lifesciences	Pesticides/Agro Chemicals sector	563	65.05	11.56%	48%
3	Bharat Rasayan	Crop Protection	1,099	163.9	14.91%	n/a
4	UPL	Agrochemicals, industrial chemicals, chemical intermediates, specialty chemicals, and crop protection solutions	38,694	2,872	7.42%	n/a
5	Sumitomo Chemical India	Crop Protection, Environmental Health, Professional Pest control and Feed	2,645	345.41	13.06%	20%
6	Aarti Industries	Speciality Chemicals (Benzene based Intermediates) and Pharmaceuticals API	5,023	524	10.4%	43.5%

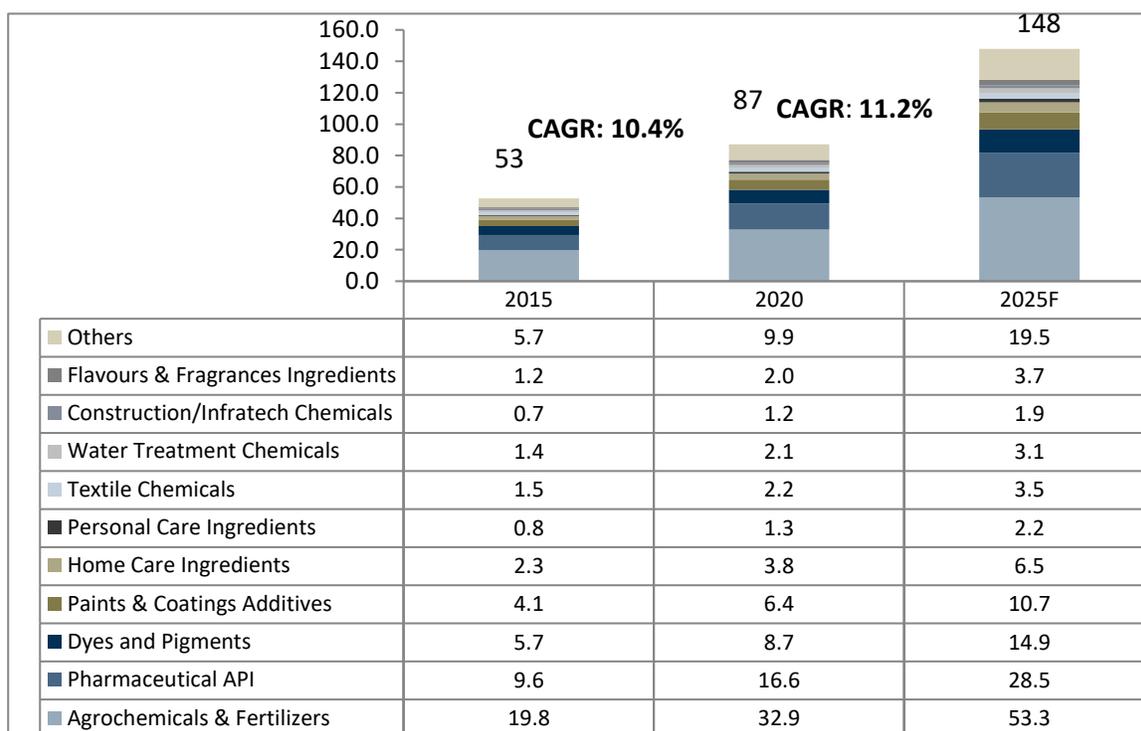
7	SRF	Fluorochemicals, specialty chemicals, technical textiles and packaging films	6,988	925	13.24%	<i>n/a</i>
8	Navin Fluorine International Ltd.	Fluorine chemistry	1,133	232.98	20.56%	50%
9	Vinati Organics	Organic intermediates, monomers and polymers	954	269.34	28.23%	83%
10	Deepak Nitrite Ltd.	Chemical Intermediates	4360	775.81	17.79%	28%
11	Gujarat Alkalis and Chemicals	Commodity Chemicals	2429	166.85	6.87%	<i>n/a</i>
12	Balaji Amines Ltd.	Commodity Chemicals	1,228	231.71	18.87%	15%
13	Lanxess	Specialty Chemicals	2,607	<i>n/a</i>	<i>n/a</i>	<i>n/a</i>
14	Laxmi Organic Industries Ltd.	Specialty Chemicals	1,760	127	7.22%	<i>n/a</i>
15	Chemcon Speciality Chemicals Ltd.	Specialty Chemicals	243	56.4	23.21%	<i>n/a</i>
16	Rossari Biotech Limited	Specialty Chemicals	709	80.22	11.31%	<i>n/a</i>
17	Camlin Fine Sciences	Specialty Chemicals	1,170	65.36	5.58%	<i>n/a</i>
18	Praj Industries	Bio-chemicals	1305	81	6.21%	<i>n/a</i>
19	Godavari Biorefineries	Bio-chemicals	1,449	1.65	0.11%	<i>n/a</i>
20	Alkyl Amines Chemicals Ltd.	Amine derivatives, Speciality Chemicals	973	197	20.25%	18%
21	Atul Ltd	Life Science Chemicals and Performance and	3,731	652	17.47%	50%

		Other Chemicals				
22	Solar Industries India Ltd.	Energy Materials	2,516	288	11.45%	n/a
23	Fine Organic Industries Limited	Oleochemical - Additives	1,121	115	10.26%	55%

3.2. Market Segmentation– by Industry and Application Type

Traditionally, low cost labour and raw material availability were the advantages enjoyed by Indian manufacturing companies. Increasingly, though, specialty chemicals companies are focusing beyond these traditional cost advantages. Product development capabilities have become progressively more important across various segments and differentiate the top and bottom performers.

Exhibit 3.2: Indian Specialty Chemicals Market, Value (USD Bn), 2015, 2020 and 2025F

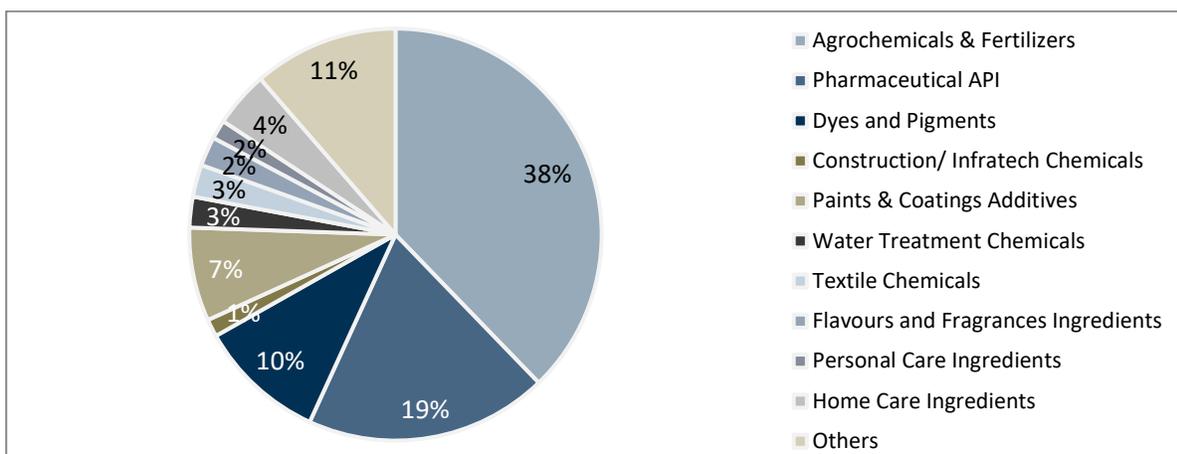


Others include: Sealants and Adhesives, Polymer Additives etc.

Note: Indian chemical industry generally showcases Agrochemicals & Fertilizers and Pharmaceuticals API outside of Specialty chemicals. In the above graph the specialty chemicals section, however, is inclusive of the 2 categories to maintain consistency with the Global section. Agrochemical & Fertilizer and Pharmaceuticals API contribute to more than 55% of the specialty chemical space in India.

Source: Frost & Sullivan Primary Research & Analysis

Exhibit 3.3: Indian Specialty Chemicals Market by Industry and Applications, 2020, Value (USD 87 Bn)



Others include: Sealants and Adhesives, Polymer Additives etc. Note: Indian chemical industry generally showcases Agrochemicals & Fertilizers and Pharmaceuticals API outside of Specialty chemicals. In the above graph the specialty chemicals section, however, is inclusive of the 2 categories to maintain consistency with the Global section. Agrochemical & Fertilizer and Pharmaceuticals API contribute to more than 55% of the specialty chemical space in India.

Inclusions:

- **Agrochemicals and Fertilizers:** Agrochemicals include organic fertilizers, liming and acidifying agents (which are designed to change the pH), soil conditioners, insecticides and pesticides, fungicides, herbicides, and other chemicals like crop-growth regulators. Fertilizers are mainly inorganic compounds of nitrogen like urea or ammonium nitrate, compounds of phosphorous and potassium.
- **Dyes and Pigments:** These are inclusive of Reactive Dyes, Disperse Dyes, Acid Direct Dyes, Azo Dyes, Sulphur Dyes, Solvent Dyes, Vat Dyes, Food Colorants, Organic Pigments, Optical Whitening agents, Inorganic Pigments, Pigment emulsions among others
- **Construction/Infratech Chemicals:** These are inclusive of concrete admixtures (plasticizers, accelerators, retarders, air entrainers), waterproofing (bitumen, PVC, silicon, SBR and others), protective coatings (epoxy, PUR, PE, alkyl, acrylic and others), concrete repair mortar (cement based and plaster based), plasters, base coats among others
- **Paints and Coatings Additives:** These are made up of insulating paint additives, powder coating additives, catalysts, wetting agents, levelers, clarifier, coupling agents, deflocculants, thinners, thickeners, anti-caking agents and other chemicals.
- **Water Treatment Chemicals:** These are made up of PH neutralizers, algacides, antifoams (including insoluble oils, silicones, alcohols, stearates and glycols), biocides, boiler water chemicals, coagulants and flocculants, corrosion inhibitors, disinfectants, defoamers among others.
- **Textile Chemicals:** These are inclusive of coating & sizing agents, colorants & auxiliaries, finishing agents, surfactants, de-sizing agents, bleaching agents, leather chemicals among others.
- **Flavors and Fragrances:** Essential Oils (orange, corn mint, eucalyptus, pepper mint, lemon), Oleoresins (paprika, black pepper, turmeric, ginger, others), Aroma chemicals (esters, alcohol, aldehyde, phenol, others), others.
- **Home & Personal Care Ingredients:** These are inclusive of formaldehyde, glycerols, titanium dioxide, isopropyls, alcohols, dimethicone, sodium lauryl sulphate, parabens, tocopherols benzenes, oleochemicals, surfactants, polymers, botanical extracts among others.

Source: Frost & Sullivan Primary Research & Analysis

The rise of environmentally friendly specialty chemicals in India

The concept of Green Chemicals in India is evolving. The rising pollution and harm caused to water bodies owing to emission of harmful chemical effluents into water is leading to rise in concern of sustainability.

The classification as green or sustainable is measured across the life cycle of any chemical product, including its design, manufacture, application, and disposal. The products can be used for various applications such as food ingredients, home and personal care products, water treatment, and industrial cleaning products. The demand for green chemicals is particularly high from the textile industry which is one of the major end-users of chemicals.

The companies in India are still preparing themselves to a larger picture of green and environmentally friendly chemicals start from raw materials to manufacturing process. Over the years it will gain momentum.

Another challenge is seemingly high initial cost of such products which is a major hurdle in getting service providers and consumers accede and adapt the change towards environmentally friendly chemicals. However green chemicals seem comparatively costlier in the initial stage, but their usage over a period of time has shown a reduction in price by approximately 18-20% thus higher ROI.

However, the green chemical wave is inevitable, and it is just matter of time by when the adoption of these new age products will be mandatory and obligatory. People need to be educated about green tendency, green chemical revolution and the benefit of keeping an eco-friendly environment. Once the product is tested by customers they would continue its usage and eventually the industry will prove to be a boom.

The pharmaceutical industry was among the first to embrace Green Chemistry (GC) for its significant potential to reduce costs and risks. The market for GC is expected to outpace the growth of overall global chemical market in the coming decades as companies respond to consumer demand for more sustainable products and tightening regulations on the use and generation of hazardous substances. Green pharmaceuticals as a segment are projected to grow from \$27 billion in 2016 to USD 96.2 billion in 2026. In recent years generic drug companies, API manufacturers, and smaller R&D Pharma companies' exhibit interest and advances in Green chemistry principles. The industry has taken effort to implement key metrics to keep track of GC which includes E-factor, Process Mass Intensity (PMI), atom economy, number of steps, and carbon foot- print, among others. While E-factor was the first metric used by the industry, recent studies have pointed out PMI as the most preferred metric among "big Pharma". PMI measures the ratio between the mass of all materials used to make a product and the mass of the product.

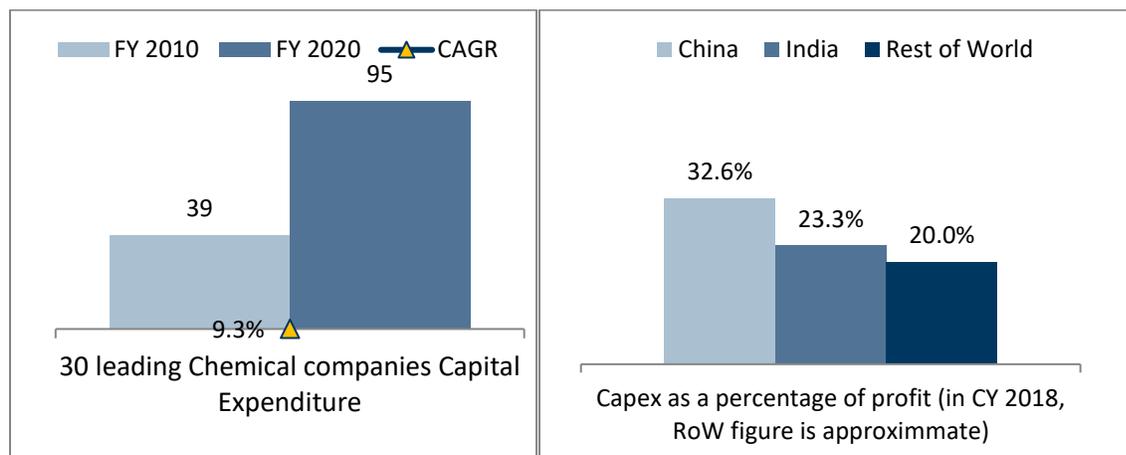
Indian government bodies such as the Department of Science and Technology, the Ministry of Chemicals and Fertilizers, and the Department of Pharmaceuticals, are beginning to organize various green chemistry initiatives and in some cases to partner with SMEs to partially fund investments in green technology. Generic drug Pharma and Active Pharmaceutical Ingredients (API) manufacturers in India exhibit significant interest and some advances in using GC principles. At the same time, majority (65%) of Indian companies rely on treatment and disposal of wastewater instead of source reduction

and one in five (20%) does not use any GC metrics. The study found that generic Pharma is more advanced in adopting GC principles than API manufacturers. Regulatory risk and time pressures to deliver drugs were reported as the two most significant barriers for greater adoption of GC in India, while cost savings and environmental regulations were cited as the top two drivers.

3.3 Trend of evolution of products : R&D and innovation of sustainable products

Aggregate R&D expenditure incurred by key 30 leading global chemical companies has grown at a 16% CAGR over FY10-19, while the revenue has grown at an 11% CAGR over the same period. INR 4.5bn was spent in FY19 by these companies on R&D as compared to INR 1.1bn in FY10. R&D expense as a percentage of revenue has remained in the range of 0.4-0.5% from FY15-19. India's share in the aggregate R&D spending incurred over the globe by chemical companies has grown from 2.7% in CY08 to 3.3% in CY18. R&D spending has grown at a 16% CAGR over FY10-19 in the domestic chemical industry.

Exhibit 3.9: Capital Expenditures by Indian Companies and comparison with China (INR billion)



Rapid investment in capacities over the past five years has provided a boost to the speciality segment. Companies are continuing to spend heavily on Capex to meet demand of these industries as they pose great growth opportunities, given the current pandemic situation. Some companies have delayed their Capex investments due to the COVID-19 crisis, but have not abandoned them.

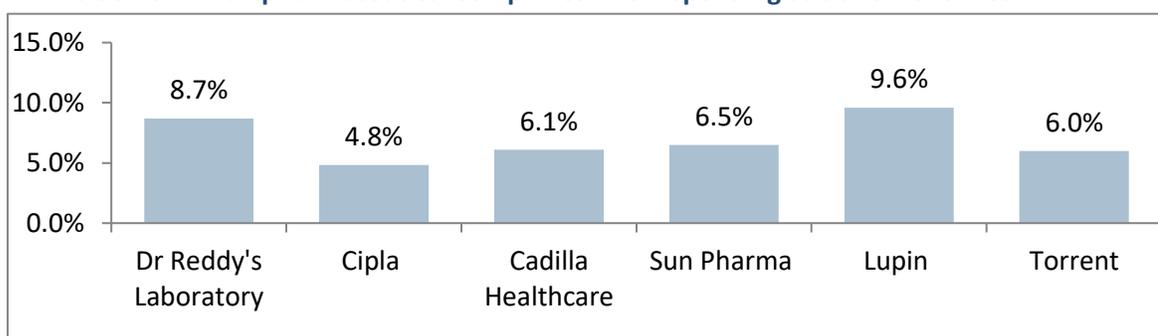
Capex incurred by key speciality chemicals during FY16-18 was 1.5x (INR 52bn) that incurred by these companies over FY13-15. Also, average EBITDA margin expanded by ~250bps over FY18-20, which implies that a higher share of value-added products drove the growth. For FY18-20, the aggregate Capex spends of our speciality chemicals universe were 1.5x (INR 78bn) those during FY16-18. The companies had spent Capex for capacity augmentation and/or product development based on their end-user industries. Most of it was spent for revenue generation, and backward integration.

The pharma industry is also spending on R&D to keep up with the momentum. The Indian government recently concluded an assessment of India's opportunity in global pharmaceutical R&D to evaluate

Department of Pharmaceuticals' (DoP) vision of developing India as a drug discovery and pharmaceutical innovation hub.

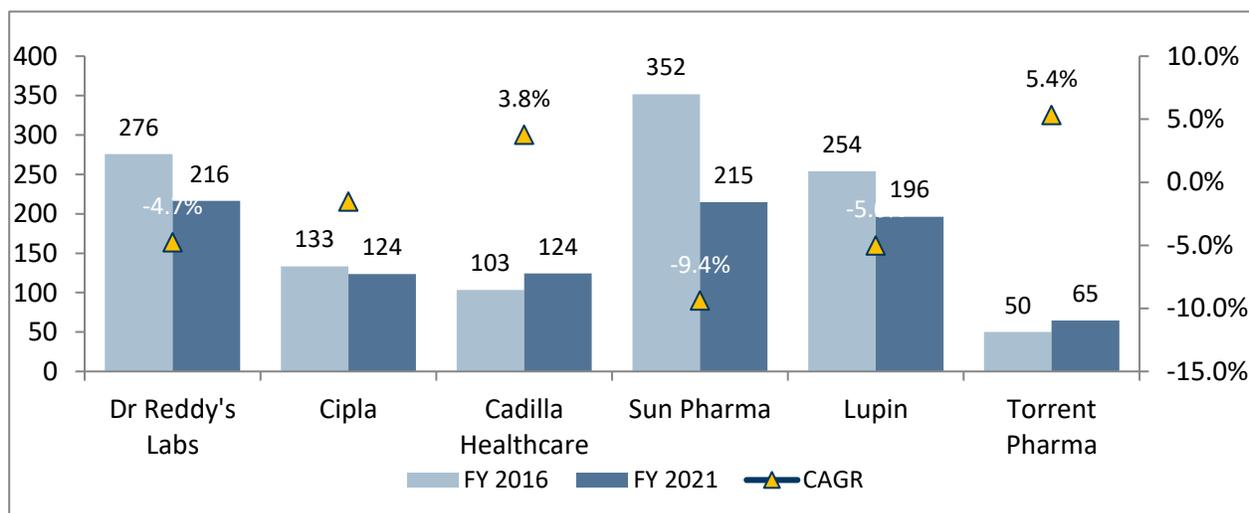
The basis of the DoP's vision was a white paper shared by McKinsey, which outlined potential and key imperatives for the Indian government, where McKinsey pointed out that almost all the patented pharmaceutical products have come from global Big Pharmaceutical companies, and their research and development (R&D) spend as a percentage of sales is around 20% of their sales turnover. In terms of the largest R&D spending ratio to revenue for Indian drug companies. Dr Reddy's Laboratory spent ~9%, Cipla ~5%, Aurobindo Pharma ~6% and Sun Pharma ~7% of their revenues respectively on R&D in FY21. On an average, the Indian pharmaceutical companies tend to spend less than 11-13% of their annual turnover on R&D.

Exhibit 3.10: Indian pharmaceutical companies - R&D spending as a % of revenues FY21



Source: Annual Reports, McKinsey, Business Standard, Pharmabiz, Frost & Sullivan

Exhibit 3.11: Indian pharmaceutical companies - R&D spending, USD Mn, FY2016-FY2021



Note: Cipla R&D spend is for FY16 and FY20

Source: Annual Reports, McKinsey, Business Standard, Pharmabiz, Frost & Sullivan

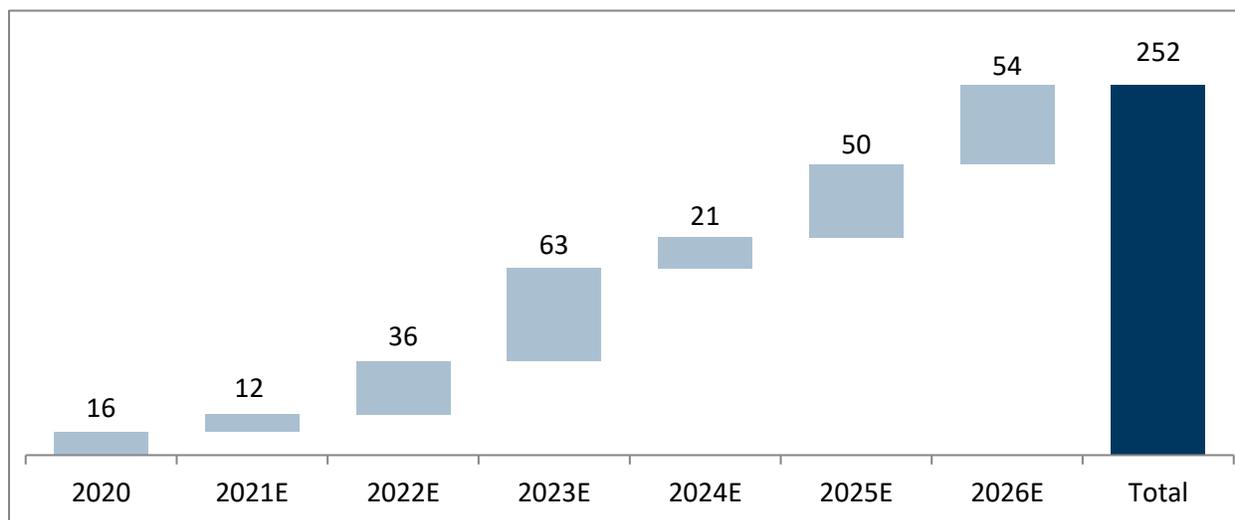
During the Covid-19 pandemic, India showed an exemplary work on international cooperation by sending valuable medicines and vaccines to many countries, and added India is now world renowned for its pharmaceutical innovation and for producing high quality medicines at a low cost.

The Indian government looks at placing India’s pharmaceutical sector on par with the USA and Europe, with multiple opportunities for Indian vaccine manufacturing companies, considering the knowledge base, cost of production and skilled labour. India is looking at a great opportunity to ramp up investments and collaborate with global players in the pharmaceutical and biotech domain to cater to global needs. India is evaluating and observing a great opportunity to ramp up its R&D, technology, manufacturing, and innovation and attracting larger investments.

As per estimates, about USD 252 Bn worth of drug sales are likely to get off patent from CY2020 to 2026. Some of the Indian companies are now well placed to capture this opportunity. With on-going developments, India has started focusing on self-reliance at a large-scale. This presents a large opportunity for Indian generic companies. However, as opposed to international markets, R&D spending in India is limited. Overall world-wide R&D pharmaceutical spends in 2020 was ~20% of pharmaceutical revenues; however, in India, on an average, the R&D spends were between less than 11% of sales. Indian companies have understood the need of R&D spend and already ramped up their expenditure on development and research to propel their growth and have strong positioning in market. This will lead to more new product lines developed by Indian pharmaceutical companies with their increased R&D spend. In order to support these new product lines, the demand for purchase of raw materials and intermediates by these companies is expected to increase, providing a boost to the specialty chemicals industry.

The new Pharma policy also provides incentives for APIs that will bring a huge change in the long run. It also provides incentivisation to scientists, which is being done in other countries as well and will bring us on par. The bulk drug parks along with R&D centres and the PLI scheme will help India gain the advantage to lower their cost of production.

Exhibit 3.12: Worldwide patent expiration for drug sales (Total USD 252 Bn)



Source: Evaluate Pharma – World Preview 2020, EY-FICCI, Frost & Sullivan

3.4 Growth Story

5 year growth forecast split by key industries highlighting key factors driving growth

Segments	Key Growth Drivers	India Market, (2020-25 CAGR)
Agrochemicals & Fertilizers	<p>Increase in awareness levels of farmers</p> <p>Improvement in rural income encouraged by various government schemes</p> <p>Need to improve agricultural yields at a faster pace compared to the growth in demand to be able to meet food sufficiency targets</p> <p>DBT (Direct Benefit Transfer) allows for direct transfer of benefit or subsidy to citizens living below poverty line</p>	10.1%
Pharmaceuticals Ingredients (API)	<p>India supplying key drugs for treatment of Covid-19 across the world</p> <p>Growing demand for generic drugs globally and India being the largest provider of generic drugs results in higher demand for domestic consumption of Pharmaceuticals chemicals.</p> <p>The government of India has launched Production Linked Incentive (PLI) Scheme for promotion of domestic manufacturing of critical Key Starting Materials (KSMs)/ Drug Intermediates (DIs) and Active Pharmaceutical Ingredients (APIs) In India. The scheme intends to boost domestic manufacturing of identified KSMs, Drug Intermediates and APIs by attracting large investments in the sector and thereby reduce India's import dependence in critical APIs.</p> <p>The Government of India announced INR 9,940 crores packages to boost the domestic API manufacturing industry. The package is divided into two parts – INR 6,940 crores has been allocated for the PLI Scheme and INR 3,000 crores will be spent on setting up three bulk drug parks.</p>	11.3%
Construction/ Infratech Chemicals	<p>Growth in Indian construction industry over the next five years, driven by housing and infrastructure projects</p> <p>Increase in adoption of global standards of construction in India will lead to growth of this market</p>	10.4%

Paints & Coatings Additives	Growth in per capita paint consumption in India Strong growth in automotive industry	10.8%
Water Treatment Chemicals	The growing urban population is adding to the demand for water purification and waste water management 'Namami Gange Programme' - an Integrated Conservation Mission, approved as 'Flagship Programme' by the Union Government in June 2014 with budget outlay of INR 20,000 Crores to accomplish the twin objectives of effective abatement of pollution, conservation and rejuvenation of National River Ganga	8.6%
Textile Chemicals	Driven by domestic demand and exports of high quality textiles	9.8%
Flavours & Fragrances Ingredients	Marketing by FMCG companies has created demand for categories like deodorants, room fresheners and perfumed soaps in rural markets Increasing demand for processed food	12.9%
Home Care Ingredients	Growth in population and per capita income to drive growth in this segment Growth in demand for safety and hygiene in urban as well as rural areas	11.5%
Personal Care Ingredients	Growth in population and per capita income to drive growth in this segment Rapid increase in the adoption of personal care products, especially in rural markets	11.1%
Dyes & Pigments	The current strategy of most European pigment producers is to use their local facilities for high-end performance colorants for new and niche markets and source non-differentiated dye, pigments from low-cost facilities based in China and India	11.4%

3.5 Chemicals - The Recovery Driver

As the chemical industry lies at the heart of several value chains and acts as a solution provider to other sectors of the economy, it plays a pivotal role in leading a sustainable recovery. Today, chemical innovations already contribute to several sustainable development challenges such as energy and climate, transport, health and food, among others. The chemicals and materials sector can leverage both direct and indirect stimulus programmes, and can strengthen their broader impact to provide shared value across business and society. Below are some examples of how direct and indirect stimulus packages have impacted the chemicals and materials sector –

- China introduced higher export subsidies for petrochemical products and launched billion-dollar investments in a total of 16 refineries and petrochemical projects
- Several EU countries, the US and Japan are incentivizing the creation of local pharmaceuticals clusters. For instance, France aims to move production of paracetamol at home. Japan offers subsidies to firms restoring manufacturing of pharmaceuticals.
- Germany's green hydrogen strategy includes a USD 10 Bn budget – multiple times the current German hydrogen market, but still a small portion of the country's overall electric energy sector
- The EU is backing e-mobility subsidies, with a plan worth USD 91 Bn – 250% of the EU's electric vehicle market (worth USD 37 Bn in 2019, according to estimates by Allied Market research)
- Chemicals Industry in India has been de-licensed except for few hazardous chemicals; Upcoming Petroleum, Chemicals and Petrochemicals Investment Regions (PCPIRs) and Plastic parks will provide state-of-the-art infrastructure for Chemicals and Petrochemicals sector

As economies are gradually reopening for business, companies are turning their attention to recovery. As the market stands now, we forecast the following developments in the chemical industry over the mid-term (2-3 years).

- **Specialty chemicals to drive growth; Agro-chemicals and Pharma-chemicals to be focus areas:** Post the opening of the lockdown across major global economies, the specialty chemical industry was amongst the first to recover, given the increasing need for its inputs towards essential supplies such as pharmaceuticals, personal health and hygiene and agrochemicals. This sector is expected to be the key driver for growth in the chemicals sector, out-pacing petrochemicals and other bulk chemicals in the next 2-3 years.
- **China's loss, India's gain:** Several global players are opting for a "China + 1 offshore strategy", with capacities shifting to cost efficient markets with strong technology capabilities like India. Stringent environmental regulations and increased cost of labor have already stifled growth in China, which contributes 35-40% to the global chemical industry. The pandemic has compounded the situation further as companies across the world are looking for alternate supply solutions. Japan's announcement to offer incentives to companies shifting base from China to India further proves the desperation engulfing

countries to reduce dependence on China and develop local supply chains. JVs / Technology transfers will drive the knowledge wave for the Indian industry, given stronger IP protection rights. China's Chemical Industry is very large, approximately 10 times, as compared to India; even a small shift from China to India will be a big boost for India. The spillover impact of China's declining competitiveness has set the stage for India to intensify its effort to capture larger market share.

- **US China Trade War:** Four years and a new president later, US tariffs on Chinese products remain. Even after the Phase One trade deal (meant to be the first in a series of deals) was signed in January 2020, US tariffs on Chinese products remained in place. When the COVID-19 pandemic hit, the trade war faded into the background, used only to highlight China's inability to meet the conditions of the deal to purchase an additional USD 200 Bn in American products over the 2017 level through 2021 due to the disruption from the pandemic. The trade war continues to ravage the US economy even under the new Biden administration. The Biden administration has not made changes to tariff structures and is said to be examining the Phase One trade deal. Wang Yi, the Chinese foreign minister, recently asked President Joe Biden to restart talks with China to remove tariffs and sanctions. Wang pointed out that the United States has greatly diminished bilateral talks at all levels. Biden signed an executive order to analyse global supply chains in four industries that were strongly affected by the pandemic. These include computer chips, large-capacity electric vehicle batteries, pharmaceuticals, and critical minerals in electronics. The semiconductor industry faced serious bottlenecks at the outset of the global pandemic, when Chinese factories were in lockdown. These industries were also hit by the US-China trade war, and the two external shocks led many C-suite executives to reassess their firms' global supply chain resilience

While these headwinds in the Chinese industry cannot be expected to be permanent, whenever the Chinese companies make a comeback, it would be at a significantly higher cost of production given the significant investment in environmentally compliant equipment and manufacturing practices. India, in the meantime, would have significantly strengthened its position in the global supply chain and would be a very viable alternative for global players looking to de-risk their supply chain, while retaining their sourcing costs. Pharmaceuticals and agrochemicals are the key sectors that are particularly set to benefit from this shift in dynamics, wherein the Chinese manufacturers continue to operate at lower capacity levels, given the increased monitoring of safety standards and compliance norms.

The powering trend of de-risking of input procurement from China by global chemical leaders offers great export as well as domestic sales opportunity for Indian specialty chemical industry.

Resilience in manufacturing and supply systems

The COVID-19 global crisis continues to disrupt manufacturing and global supply chains with severe consequences for society, businesses, consumers and the global economy. Since the start of the outbreak, the global production system has been challenged by factory shutdowns, demand surges for essential goods, stockpiling and panic-buying, as well as shifting consumer preferences.

World Economic Forum has appreciated the manufacturing sector for adopting the following strategies to combat the current crisis, in the short-term, and help build resilience across manufacturing and supply systems by incubating new business partnerships and public-private cooperation.

- **Ensuring business continuity and protecting employees** – Companies are protecting employees, ensuring supply security, mitigating financial impact and navigating continued market uncertainty as the demand drops. Companies have moved quickly to support suppliers, ensure cash liquidity and mitigate the impact on customers, while repurposing manufacturing to produce essential goods.
- **Preparing for recovery and increasing resilience** – Companies are already focused on preparing for the post COVID-19 scenario while drawing key learning from this pandemic and its impact on global businesses. Leading multinational companies have already launched strategic initiatives to create more resilient supply chains before the on-going crisis and are now seeing an acceleration of the speed and determination of implementation.

3.5 Strong Growth Path

India's growth story was largely positive based on the strength of domestic absorption and the economy was registering a steady pace of economic growth pre-Covid. Moreover, its other macroeconomic parameters like inflation, fiscal deficit and current account balance had exhibited distinct signs of improvement. Though the pandemic has led to a short-term slowdown of the economy, the medium-long term fundamentals are sound and India is expected to witness the revival of its economy soon.

The government has taken several measures to revive the economy and to return to a normal to high growth trajectory. As the monetary and fiscal stimuli work their way through, India can expect an economic turnaround soon. In addressing the current slowdown, India has several advantages and comforting factors including the following:

- **Aatmanirbhar Bharat Abhiyan:** Prime Minister Narendra Modi on May 12, 2020 announced the Aatmanirbhar Bharat Abhiyan which combined relief, policy reforms and fiscal and monetary measures to help businesses and individuals to cope with the situation created by the pandemic and helps transform India into a self-reliant economy. Government seized the crisis to push forward long-pending industrial and other economic reforms in a least political resistant atmosphere.
 - This campaign is especially expected to benefit the Specialty chemicals sector, with several players hoping to position themselves as an alternative to China as the coronavirus crisis prompts companies to diversify their supply chains.
 - Government announced a production linked incentive (PLI) scheme for the promotion and manufacturing of pharmaceutical raw materials in India. The government's move is aimed to boost domestic manufacturing and cut dependence on imports of critical Active Pharmaceutical Ingredients (APIs). Further, the government has also decided to develop three mega bulk drug parks in partnership with states. These schemes will likely appeal more to the smaller players and should foster more investments. The government is soon planning to roll out such a scheme for the chemicals sector as well.

- The government is also in the process of launching a production-linked incentive (PLI) for the chemical sector to increase self-reliance in the country. This move is to reduce country's dependency on imports of basic chemicals. The PLI scheme will help the sector to identify import-dependent chemicals and work towards producing them within the country.
 - Specialty chemical companies will look at import substitution along with export opportunities to further drive their business. Historically, domestic consumption has been the driving metric for Specialty chemicals manufacturing in India, with exports playing a much smaller part – owing to reduced raw material availability, higher utility tariffs and a stricter regulatory structure. However, owing to the current geo-political issues, India's focus on being a manufacturing hub for exports of specialty chemicals will increase, subsequently increasing the share of exports in the overall market.
 - Aether promotes make in India and Atma Nirbhar concept of manufacturing by focusing on Import Substitute Products and manufacturing products In India against competition with Chinese manufacturers.
- **Preferred Destination for Foreign Investment:** Lately, India has become an attractive destination for foreign investment owing to its large and rapid growing consumer market in addition to a developed commercial banking network, availability of skilled manpower and a package of fiscal incentives for foreign investors
 - **Strong and Diversified Industrial and Infrastructural Base:** India has established a strong and diversified manufacturing base for the production of a wide variety of basic and capital goods to meet the requirements of various sectors; and systematically rolled out a public-private partnership (PPP) programme for the delivery of high-priority public utilities and infrastructure.
 - **Burgeoning Foreign Exchange (Forex) Reserves:** Foreign exchange reserves of India totalled USD 477 Bn as on March 20, 2020. This figure stood at USD 581 Bn as on December 25, 2020, recording a whopping increase of USD 104 Bn in a relatively short period of around 9 months. The forex kitty had surged by USD 3.074 Bn to record a high of USD 608.081 Bn in the 2nd week of June 2021. Sliding from a lifetime high, the country's foreign exchange reserves declined by USD 4.148 Bn to reach USD 603.933 Bn for the week ended 18 June 2021 due to a fall in gold and currency assets, the Reserve Bank of India (RBI) data suggested. India's foreign exchange reserves however, provide confidence in the country's ability to manage the balance of payments.
 - **Demographic Dividend:** Presently, India is one of the youngest nations in the world with more than 62% of its population in the working age group (15-59 years), and more than 54% of its total population below 25 years of age. Its population pyramid is expected to bulge around the 15-59 age groups over the next decade. This poses a formidable challenge as well as a huge opportunity.
 - **Aatmanirbhar Bharat Abhiyan- 02:** These announcements were made on 12th Oct 2020:
 - Rs 25,000 crores provided as additional capital expenditure to Ministry of Road Transport and Ministry of Defence
 - 11 States were sanctioned Rs. 3621 crores as interest free loan towards capital expenditure

- **Aatmanirbhar Bharat Abhiyan- 03:**

- Prime Ministers Rozgar Protsahan Yojana (PMRPY) was implemented up to 31.3.2019 to incentivize formalization and creation of new employment
- Total benefit of Rs. 8300 Crores has been given to 1,52,899 Establishments covering 1,21,69,960 Beneficiaries under PMRPY

Across India, the recent revision of Market Access Initiative by the Ministry of Commerce and Industry aims at benefiting the small to mid-segment newer industry players which do not possess global sales and marketing reach. As a result of the revised MAI policies, the robust growth in Contract Research & Manufacturing Services (CRAMS) industry in India will support newer economies such as Myanmar, Cambodia to collaborate with the local Indian players beneficial for the overall growth of the Asian economy. Moving forward, with a total of over 300 USFDA approved manufacturing sites, the country can become the global leader in the CRAMS industry with the implementation of mandates including Schedule M (Good Manufacturing Practices (GMP) for Premises & Materials and Requirements of GMP in Plant and Equipment) outlining various requirements for manufacturing good quality drugs and pharmaceuticals, by applying Current Good Manufacturing Practice (CGMP) guidelines.

India is an attractive hub for foreign investments in the manufacturing sector. Several mobile phone, luxury and automobile brands, among others, have set up or are looking to establish their manufacturing bases in the country.

The manufacturing sector of India has the potential to reach USD 1 trillion by 2025. The implementation of the Goods and Services Tax (GST) will make India a common market with a GDP of USD 2.5 trillion along with a population of 1.32 billion people, which will be a big draw for investors.

With impetus on developing industrial corridors and smart cities, the Government aims to ensure holistic development of the nation. The corridors would further assist in integrating, monitoring and developing a conducive environment for the industrial development and will promote advance practices in manufacturing

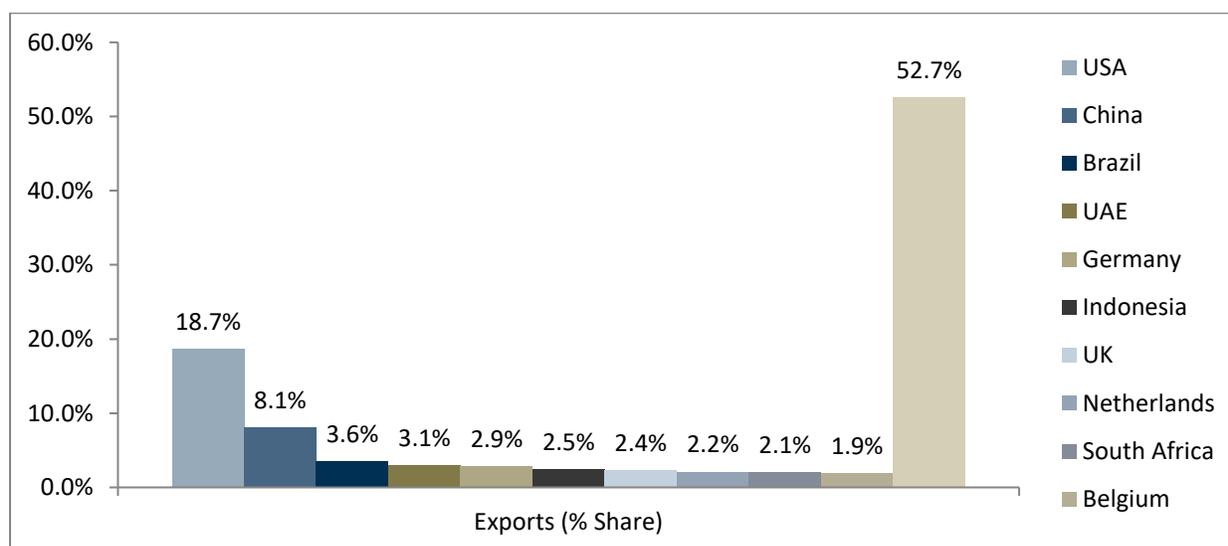
3.6 India Trade Scenario

India's exports of chemicals

India's chemical exports logged a compound annual growth rate (CAGR) of about 13% between 2015 and 2019, compared with about 7% for China. The key sub-segments likely to benefit from higher exports would be colorants and agrochemicals, with export shares of 45-50% and 50-55%, respectively.

According to World Integrated Trade Solution (under World Bank), in 2018, the top partner countries and regions to which India exported Chemicals were United States, China, Brazil, United Arab Emirates and Germany. While India exported chemicals worth USD 44.6 Bn in 2018, over 35% of the exports were to the mentioned 5 countries. Moreover, in 2018, the top countries and regions to where most chemicals were exported across the globe were United States, China, Germany, Belgium and Switzerland contributing to ~37% of the world's exported chemicals.

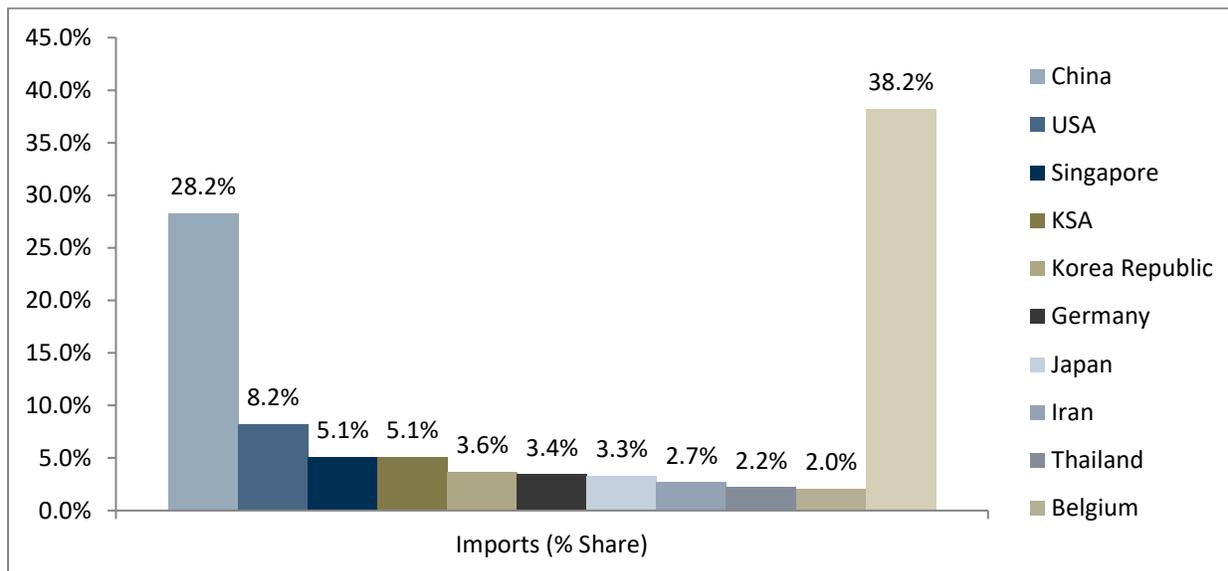
Exhibit 3.13: Indian Chemical Exports by Country, 2018, Value (USD 44.6 Bn)



Source: wits.worldbank.org

In 2018, the top partner countries and regions from which India imported Chemicals included China, United States, Singapore, Saudi Arabia and Korea Republic. Indian imports were valued at USD 57.9 Bn with China contributing to almost 28% of India's total imports. Moreover, in 2018, the top countries and regions from where chemicals were imported across the globe were Germany, United States, China, Ireland and France contributing to over 40% of the world's imported chemicals.

Exhibit 3.14: Indian Chemical Imports by Country, 2018, Value (USD 57.9 Bn)



Source: wits.worldbank.org

The government has started various initiatives such as mandating BIS-like certification for imported chemicals to prevent dumping of cheap and substandard chemicals into the country.

The Indian government recognises chemical industry as a key growth element and forecast to increase share of the chemical sector to ~25% of the GDP in the manufacturing sector by 2025. A 2034 vision for the chemicals and petrochemicals sector has been set up by the government to explore opportunities to improve domestic production, reduce imports and attract investments in the sector. The government plans to implement production-link incentive system with 10-20% output incentives for the agrochemical sector; to create an end-to-end manufacturing ecosystem through the growth of clusters.

In October 2020, the government urged players in the agrochemicals industry to come out with new molecules of global standards for the farmers' benefit, while CropLife India, the industry body, pitched for stable policies and regulatory regimes to boost growth in the sector. 100% FDI is allowed under the automatic route in the chemicals sector with few exceptions that include hazardous chemicals. Total FDI inflow in the chemicals (other than fertilisers) sector reached USD 17.77 Bn between April 2000 and June 2020.

The government has proposed several incentives for setting up a sourcing or manufacturing platform within an Indian SEZ:

- Effective April 1, 2020, 100% Income Tax exemption on export income for SEZ units for the first five years, 50% for the next five years thereafter and 50% of the ploughed back export profit for next five years.
- Single window clearance for central and state-level approvals
- Duty free import/domestic procurement of goods for development, operation and maintenance of SEZ units

3.7. Impact of Make in India

The chemical industry contributes approximately 6.6% of national gross domestic product and accounted for 15-17% of India's manufacturing sector in FY20. The government permits 100% foreign direct investment (FDI) in this sector under the automatic approval route. The manufacturing of most chemical products inter-alia covering organic/inorganic, dyestuff and pesticides is de-licensed. The factors such as boost to specialty (as well as fine agrochemicals) chemicals due to rapid development in construction and agricultural sector, inadequate per capita consumption and strong demand from paints, textiles and diversified manufacturing base shall aid towards the development of Indian chemicals sector.

Frost & Sullivan's analysis indicates that the major indicators like success of Make in India and governments' permit for 100% FDI is positively impacting specialty chemicals segment; pertaining to competitive manufacturing costs, higher investments in R&D, cheaper raw material availability/transport, strong demand from end-use segments, overall supportive ecosystem, etc. Within the specialty chemicals, manufacturing of fine chemicals (pesticide ingredients as well active pharmaceutical ingredients), flavour & fragrance ingredients, surfactants and colorants will be most attractive segments in the next half decade. This is due to their strong growth potential, highly differentiated products folio and high penetration levels predominantly.

Moreover, India's specialty chemical companies are gaining favour with global multinational corporations because of the geopolitical shift after the new coronavirus outbreak as the world looks to reduce its dependence on China. Increasing tariff levels and changing environmental policies in China along with 'Make in India' initiative and a permit to 100% FDI from India, would add more possibilities of specialty chemicals manufacturing base shifting from China to India. With the rapid globalisation and opening up of the Indian economy, "Intellectual Capital" has become one of the key wealth drivers in the present international trade. Intellectual property rights have become significantly conspicuous on the legal horizon of India both in terms of new statutes and judicial pronouncements. India ratified the agreement for establishing the World Trade Organization (the "WTO"), which contains the Agreement on Trade Related Aspects of Intellectual Property Rights (TRIPS). Indian Statutes, enforcement provisions and methods of dispute resolution with respect to intellectual property (IP) protection are fully TRIPS-compliant. India has laws covering various areas of intellectual property as Trade Marks, Patents, Copyrights and Related Rights, Industrial Designs, Information Technology and Cyber-crimes, Data Protection among others.

Across India, the recent revision of Market Access Initiative by the Ministry of Commerce and Industry aims at benefiting the small to mid-segment newer industry players which do not possess global sales and marketing reach. As a result of the revised MAI policies, the robust growth in Contract Research & Manufacturing Services (CRAMS) industry in India will support newer economies such as Myanmar, Cambodia to collaborate with the local Indian players beneficial for the overall growth of the Asian economy. Moving forward, with a total of over 300 USFDA approved manufacturing sites, the country can become the global leader in the CRAMS industry with the implementation of mandates including Schedule M (Good Manufacturing Practices (GMP) for Premises & Materials and Requirements of GMP

in Plant and Equipment) outlining various requirements for manufacturing good quality drugs and pharmaceuticals, by applying Current Good Manufacturing Practice (CGMP) guidelines.

On the pharmaceutical industry front, realigned government policies to reduce the manufacturing facility approval time with a less than two weeks timeline for receiving NOC for export licenses will support the leading players such as Dr Reddy's Laboratories Ltd, Cadila Pharmaceuticals Ltd, and Cipla Ltd. etc. to continue to dominate the API manufacturing in India. Furthermore, with a cost advantage of almost 40-50% as compared to regulated markets and the availability of sufficient R&D infrastructure, India is expected to continue to enjoy a competitive advantage in the region there by assuring a strong CRAMS (Contract Research & Manufacturing Services) industry growth. The Government of India is committed to ensuring the delivery of affordable healthcare in the country as well as ensuring that there is a steady supply of critical drugs. This has resulted in the launch of the Production Linked Incentive Scheme (PLI) for APIs, KSMs and DIs as well as the Scheme for Promotion of Bulk Drug Parks. These schemes have been constructed to incentivize large-scale manufacturing of critical bulk drugs and to build the required infrastructure for developing manufacturing clusters for across India. This aligns with the Government's mission for self-reliance (atmanirbharta).

About 65 per cent of the raw materials for Indian drug makers worth \$3.5 billion are being sourced from China. The focus on self-reliance was triggered by the supply shock created due to the Covid-19 pandemic. However, self-reliance has also been necessitated due to the sharp rise in prices of APIs sourced from China in recent years. In June 2020 Director-General, Pharmaceutical Export Promotion Council had said India is moving towards reducing dependency on the import of Active Pharmaceutical Ingredients (APIs) and drug intermediates from China. "There has been a 4 per cent reduction in import of APIs and other raw materials from China in the last one year."

In addition to the production linked incentive (PLI) scheme, the Department of Pharmaceuticals (DoP) is planning to allow the industry to import a maximum of 30% of the total value of chemicals/intermediates. Having categorised Pharmaceuticals as a 'priority sector', the government is aggressively working on creating a single-window clearance to expedite FDI and domestic investment in the Pharmaceuticals sector.

The government is also expected to introduce a production-linked incentive scheme for the agro-chemicals sector with incentives of 10-20% output and creating an end-to-end manufacturing ecosystem through cluster development. The sector can progress by adopting a multi-pronged approach by leveraging the reforms in rules and regulations as well as 'Make in India'. Indian government has set up a 2034 vision for the chemicals and petrochemicals sector to seize the opportunities to strengthen domestic manufacturing, reduce imports and attract investment for manufacturing key chemicals in the country. The government has taken initiative to promote and facilitate 'Aatmanirbhar Bharat' (self-reliance India) in the chemicals and petrochemicals sector. The government might relook at the Pesticides Management 2020 Bill as it does not meet the farmer's requirement; most clauses being redrafted from Insecticides Act 1968 and Rules 1971.

3.8. India – Racing Ahead of China

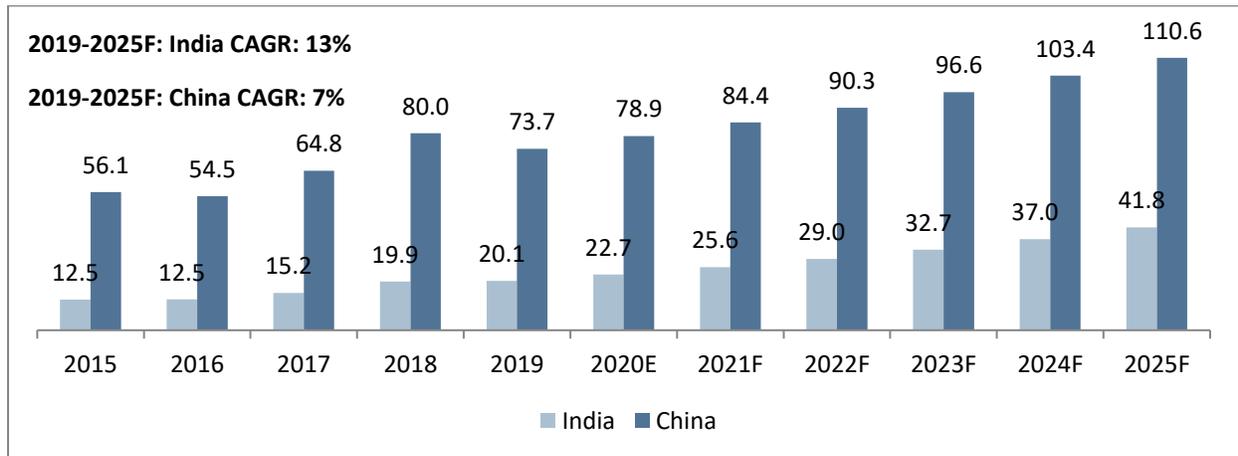
China’s specialty chemicals market has seen a downturn in recent years due to various factors. Most prominent amongst these are the recent environmental norms introduced by the Chinese government, which have led to shutdown of a number of chemical plants.

The Chinese government started implementing stricter environmental protection norms from January 2015. With the focus on controlling pollution, the Chinese Ministry of Environmental Protection enforced strict penalties on polluting industries, including chemicals. Some of the major steps taken were:

- Shift towards gas-based power plants from coal-based ones
- Implementation of strict penalties for noncompliance
- Construction of compulsory effluent treatment plants
- Mandatory for all polluting industries to operate from industrial clusters away from habitat
- Small to mid-size chemicals plants to relocate by the end of 2020
- All larger plants must relocate by the end of 2025 and start the process by no later than 2020
- Taxes to be levied on polluting industries based on pollution type, location and severity

As a result of all of the above, the Chinese chemical companies are witnessing a rise in capex and opex costs, making them less competitive in the export market. In 2017, an estimated 40% of the chemical manufacturing capacity in China was temporarily shut down for safety inspections, with over 80,000 manufacturing units charged and fined for breaching emission limits.

Exhibit 3.15: Chemicals Exports Trend – India vs China (Calendar year 2015 – 19 Actuals, Calendar year 2020 – 25 Forecast), USD Bn



Source: World Bank, Frost & Sullivan

Note: The forecasted data is not published by World Bank; it has been calculated considering the same CAGRs for both the countries. The actual CAGR for India and China respectively for the period 2015-2019 stood at around 13% and 7%; as World Bank does not forecast the export trends, the same CAGR (13% for India and 7% for China) has been considered for the forecast period 2020-2025.

The domestic chemicals industry in China is also witnessing a slowdown, as a result of slower economic growth. China's economic growth is expected to slow down further in the coming years, thus resulting in reduced domestic demand and several plants shutting down in the last three years. This has also resulted in China's overall exports of chemicals growing at a slower rate than India. **There is an ample replaceable export market for India to capitalize on, and weave a strong growth story for chemicals – led by Specialty chemicals.**

Several global players prefer a "China + 1 offshore strategy", with capacities shifting to cost efficient markets with strong technology capabilities like India. Stringent environmental regulations and increased cost of labor have already stifled growth in China, which contributes 35-40% to the global chemical industry. The pandemic has compounded the situation further as companies across the world are looking for alternate supply solutions. Japan's announcement to offer incentives to companies shifting base from China to India further proves the desperation engulfing countries to reduce dependence on China and develop local supply chains. JVs/ Technology transfers will drive the knowledge wave for the Indian industry, given stronger IP protection rights. The spillover impact of China's declining competitiveness has set the stage for India to intensify its effort to capture larger market share.

Currently Indian companies are experiencing wave of bigger orders from Global companies who previously used to purchase from Chinese counterparts. For instance Vinati Organics, a niche chemicals manufacturer whose clients include Germany's BASF and Dow's chemical subsidiary, witnessed orders for an essential ingredient in the painkiller ibuprofen had surged 25% since February 2020. Many customers have been dependent on China for a long time and they are looking for an alternative and India is their preferred choice. Many small and large companies are experiencing surge in demand from global companies who are shifting their source from China to India.

With new regulations in place and the Chinese companies adhering to new norms, they are expected to bounce back with certain level of reforms in the way of operations. Whenever the Chinese companies make a comeback, it would be at a significantly higher cost of production given the significant investment in environmentally compliant equipment and manufacturing practices. India, in the meantime, would have significantly strengthened its position in the global supply chain and would be a very viable alternative for global players looking to de-risk their supply chain, while retaining their sourcing costs. Pharmaceuticals and agrochemicals are some of the key sectors that are particularly set to benefit from this shift in dynamics, wherein the Chinese manufacturers continue to operate at lower capacity levels, given the increased monitoring of safety standards and compliance norms.

The powering trend of de-risking of input procurement from China by global chemical leaders offers great export as well as domestic sales opportunity for Indian specialty chemical industry.

Improvement of Feedstock availability

Easy access to feedstock, presence of a strong domestic demand, lower capital and operating costs, and timely project implementation are in general, important factors for determining the competitiveness of chemical and petrochemical plants.

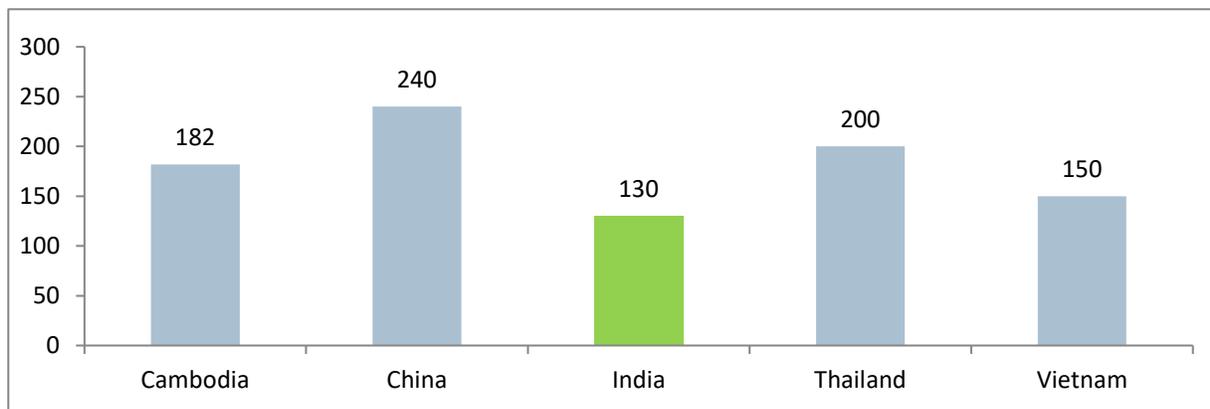
Government has encouraged companies to set up capacities in petroleum, chemicals, and petroleum investment regions (PCPIR) by demarcating special zones to aggregate feedstock demand. PCPIRs are expected to boost chemicals manufacturing, to the extent that it is sufficient to meet domestic as well as export demand. Dahej, Gujarat is a good example of the success of a PCPIR model. The Dahej industrial area now houses several basic, intermediate and specialty-chemical manufacturers. The availability of feedstock makes Dahej a popular destination for specialty chemicals, whereas the presence of specialty players strengthens the investment case for basic chemicals, intermediates and key starting materials for specialty chemicals.

For example, Ethylene Oxide was predominantly import dependent, however slowly the Indian domestic market was developed with major players such as Reliance Industries Limited, Indian Oil Corporation Limited, India Glycols Limited, etc. setting up and expanding the market. This enhances the feedstock availability of various chemicals. Indian Oil Corporation is planning to set up a new plant of MEG which is a derivative of Ethylene Oxide, by FY 2022. With this, demand for Ethylene Oxide is projected to record a marked growth in the successive years. Similarly Styrene was imported in India for a long time but with RIL initiating local Styrene production and becoming the first Indian player to produce Styrene in India resulted in import substitution and better availability of feedstock. Better feedstock availability would drive the market of intermediates chemicals.

Cost and Availability of Skilled Labour in India and China

Labour represents one of the main costs of manufacturing goods. And importers have watched China’s labour costs soar in recent decades, often growing by 10-15% annually. China’s minimum wages, which now range from about USD 140 to USD 346 per month, are set at the provincial level.

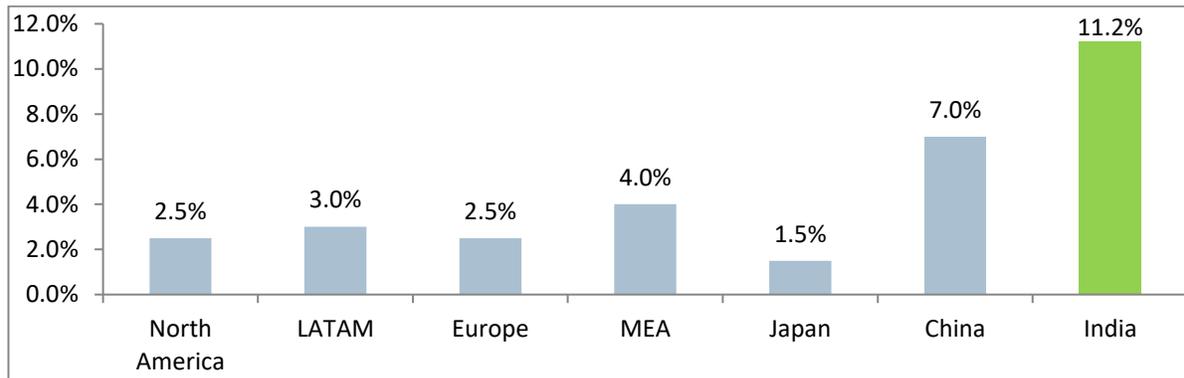
Exhibit 3.15: Average Monthly Minimum Wage (USD), 2019



Source: ASEAN Briefings

India’s minimum wages similarly vary across states and range from about USD 66 to USD 202. Mounting U.S. tariffs on Chinese goods over the past year have only strengthened the case for India as a cost-effective manufacturing alternative. And importers of labour-intensive products, like specialty chemicals, are in the best position to realize cost savings by moving to India.

Exhibit 3.16: Region-wise Specialty Chemicals Growth, 2020-25, %



Source: Frost & Sullivan Primary Research & Analysis

In terms of region-wise demand, India's specialty chemicals industry is expected to witness the maximum growth of 11% CAGR over the next five years compared with other markets, due to rising demand from end-user industries, coupled with tight global supply on account of stringent environmental norms in China. Markets like Americas, Europe and Japan are expected to clock less than 4% CAGR over the next five years, due to industry saturation in these regions.

The recent downturn observed in China's specialty chemicals industry is serving as an opportunity for Indian manufacturers, who have now gained a cost advantage over their Chinese counterparts. The changing regulatory and policy environment in China has led global companies to diversify supply risk, thereby improving export opportunities for Indian players. This is because, very few countries, other than India, have the requisite scale, technology, raw materials and government support to capture this opportunity.

The specialty chemicals growth story in China and India has been led by significant contribution from the unorganised segment comprising a multitude of smaller players. The supernormal growth in China had been contributed by large players as well as multiple small players, who were in non-compliance to environmental norms. These smaller plants have shut down in the recent times amid rising environmental concerns. While this has impacted the overall growth story, larger organised players with established markets and compliance certificates continue to operate.

India also faces threat from environmental concerns and tighter norms. However, considering the strict compliance by organised players in the market, this threat is limited to smaller players and shall serve as an opportunity for larger players to capture the market. Most large players are already making investments in Safety health & Environment (SH&E) to ensure plant sustainability.

China is also facing an unprecedented global backlash and many companies are not considering it the first preferred location for setting up factories. Companies are considering migrating to countries like India, Vietnam and others. China's weakened position is a blessing in disguise for India. Taking advantage of this situation, the Indian government has taken policy interventions to attract companies looking to shift their manufacturing base to India in the post COVID-19 scenario.

Global manufacturers have initiated talks with Indian firms to explore the possibility of shifting a part of their supply chains from China as they seek to diversify their operations following the covid-19 outbreak. First of the lot are companies interested in sourcing automobile components and electronic products from India. In the chemicals sector, India could become global specialty chemical export hub. The key growth accelerator would be our readiness in responding to the strong demand of key global markets to de-risk their supply chain by diversifying their base beyond China. In a way China's loss is India's gain. The tightening of environmental protection norms in China since January 2015 resulting in increase in operating costs, closure and relocation of manufacturing facilities along with rising labour costs and the recent trade dispute between China and United States have reduced Chinese exports and resulted in shifting the source of key raw materials from China to India. Indian companies were also heavily reliant on China which, over the years, has emerged as a manufacturing powerhouse. These companies suffered huge losses as bulk of the supplies from China was stalled owing to pandemic making Indian companies adopt the strategy of local sourcing. Local sourcing and global companies shifting base to India is expected to boost manufacturing sector of India. In a nutshell, India is on a growth trajectory with Indian companies opting for local sourcing and bulk of Global companies shifting their base to India. India's land reform policies to remove intermediaries to increase in agricultural production and to eliminate all elements of exploitation and social injustice within the agrarian system, to provide security for the tiller of the soil and assure equality of status and opportunity to all sections of the rural population will benefit the agrochemical sector as well.

Lower Corporate tax rate

India is taking initiatives to boost manufacturing sector. To encourage investment in the manufacturing sector, the Indian government has taken proactive steps, including offering competitive tax rates.

In 2019, the corporate tax rate was reduced in India for the first time in three decades, and the manufacturing sector benefited the most from the slashed taxation rate. For manufacturing firms incorporated after October 1, 2019 and beginning operations before March 31, 2023, the corporate tax rate has been slashed from 25% to 15% (this will amount to an effective tax rate at near 17%, including surcharge and cess).

This lower tax rate has allowed India to compete with ASEAN's emerging economies like Vietnam, Thailand, and Indonesia for foreign investment more effectively. India, however, has an edge over these nations due to its larger market, cheap labor pool, and quick availability of labour.

Ease of Business

India's rank in the ease of doing business index has progressed due to the pro-business reforms which has put the country among top 20 'improvers' according to a list by the World Bank on top 20 economies that have improved the most on ease of doing business core. The country's ranking rose to 63 in 2020 from 130 in 2016. It improved its rank in 6 out of 10 indicators with the biggest change in the 'Construction Permits' and 'Trading across Borders'. Five years ago, China ranked 90th in the report. While in 2019, its ranking climbed to 31st.

External Debt

On comparing debt portion of both the countries, India has low amount of debt as compared to China and even USA. As of Dec 2019, India owes ~US\$ 564 billion whereas China owes ~US\$2 trillion dollars. This indicates India is a more debt-ridden country as compared to China.

Infrastructure developments in India

In Union Budget 2020–21, the Government has given a massive push to the infrastructure sector by allocating Rs 1,69,637 crores (USD 24.27 Bn) to enhance the transport infrastructure. Government of India allocated Rs 111 lakh crores (USD 1.4 Tn) under the National Infrastructure Pipeline (NIP) for FY 2019–25. Sectors such as energy (24%), roads (18%), urban (17%) and railways (12%) amount to ~71% of the projected infrastructure investments in India. The Government of India is expected to invest highly in the infrastructure sector, mainly highways, renewable energy, and urban transport.

- In April 2020, the Government set a target of constructing roads worth Rs 15 lakh crores (USD 212.80 Bn) in the next two years
- In May 2020, Border Roads Organisation (BRO) achieved major milestone by digging up a 440-metre long tunnel below the busy Chamba town on Rishikesh-Dharasu road Highway (NH 94)
- Indian energy sector is expected to offer investment opportunities worth USD 300 Bn over the next 10 years
- NHAI will be able to generate revenue of Rs One lakh crores (USD 14.31 Bn) from toll and wayside amenities over the next five years
- In the Union Budget 2020–21, the Government has given a massive push to the infrastructure sector by allocating Rs 1,69,637 crores (USD 24.27 Bn) to develop the transport infrastructure.
- Communication sector has been allocated Rs 38,637.46 crores (USD 5.36 Bn) to develop post and telecommunications departments
- Indian Railways has received an allocation of Rs 72,216 crores (USD 10.33 Bn) under Union Budget 2020–21
- Ministry of Housing and Urban Affairs received an allocation of Rs 50,040 crores (USD 6.85 Bn) under the Union Budget 2020–21

Industrial corridor developments in India

11 industrial corridors are expected to come up by FY25 in India, Delhi-Nagpur industrial corridor project development activities are also expected to begin soon. Western Dedicated Freight Corridor (DFC) has been considered as the transportation backbone for the Delhi Mumbai Industrial Corridor (DMIC) project while Eastern DFC is the backbone for Amritsar Kolkata Industrial Corridor (AKIC) project. For other industrial corridor projects like Chennai Bengaluru Industrial Corridor (CBIC) and Bengaluru Mumbai Industrial Corridor (BMIC), NH-4 has been considered as the backbone. For the East Coast Economic Corridor (ECEC), NH-5 which is part of the Golden Quadrilateral, the Kolkata– Chennai rail route has been considered as the transport backbone.

The proposed North South East-West and East Coast Dedicated Freight Corridors will further supplement the existing transportation backbone for the corresponding Industrial Corridors. State

governments have been urged to transfer land to the project SPVs for commencement of project development activities or identify land for conducting the feasibility studies. National Industrial Corridor Development Corporation Ltd. is in constant engagement with the States to fructify this development. In a nutshell, industrial corridors are going to get developed with greater pace over the next half decade in the country.

3.9. Impact of COVID 19

With a longer shut down and delayed response in market opening up, demand in 2020 is expected to drop by almost 50% of normal growth for most chemicals in India. Regulatory pressures to ensure standardized quality will take a significant toll on supply moving forward. ~65% of the key raw materials are imported from China; this will affect supplies around 3-4 months even after markets open up.

It is a ripe opportunity for Ministry of Micro, Small and Medium Enterprises (MSME)'s to fill the gap in imports for select chemicals. The Government has deferred Equated Monthly Instalment (EMI)'s to ease the flow of working capital. The fundamental factors such as growing population and per capita chemical consumption depict a bright future. Opportunity for domestic capacity scale-up, developing alternative sources of supply and Investment in backward integration have opened up, so are the markets for exports where companies are looking for alternatives for China. With increased awareness on sanitation and cleanliness, there is a surge in demand for cleaning chemicals, personal hygiene and personal care products including soaps, surface cleaners and hand sanitizers.

Planned capacity expansions are expected to be delayed by a couple of quarters due to financial stress on investors. This factor adds further stress owing to non-availability of migrant labour, which requires the government to intervene, else will cause further delays.

Although India witnessed a significant downturn in 2020, it is expected to rebound to ~12.5% in 2021. Despite lock down there are several economic indicators which brings good news, in terms of e-way bills, electricity, and registrations of cars and two-wheelers, container traffic have risen up. Moreover, the capacity utilisation at factories has increased to over 70% in Q3 FY21 as migrant labourers return. April 2020's GST collection was at 28% of that collected in April 2019 which progressed to August 2020 collection at 88% of the August 2019 levels. The GST collections touched a new high of nearly INR 1.2 lakh crores in January 2021, indicating a sharp recovery post lockdown and better compliance manifested in record returns of INR 90 lakh. The country's GST collection is growing gradually indicating that economy recovery is in sight.

The chemical industry also serves as a feeder for many other industries, which may play an important role in our economic revival. The industry is adapting to changing needs and modifying supply chains, catering to new demands. Chemical companies now provide a wide range of products required for the production of sanitizers, disinfectants, test kit sets, ventilator parts, face shields, masks and PPE apart from supporting the pharmaceutical industry in key ingredients and packaging materials.

As the country prepares to unlock fully and resume economic activities, several sectors such as automotive and consumer durables are witnessing an uptake in growth as compared to previous

months. New opportunities have opened up for the chemical industry, with global supply chains looking to realign sourcing to mitigate future risks. It is also important to note the growing emphasis from the government and industry at-large on sourcing locally.

Sectors such as electronics, telecommunications, office automation equipment, large appliances etc. are now stepping up to increase local manufacturing. Established sectors like automotive and FMCG too are now realigning and developing local supply chain capability due to lessons learnt from the disruptions caused by the pandemic. Many of the medical applications like PPE, disposables and devices have established the capabilities to not only meet the domestic need, but also exporting in a short period. All these emerging opportunities for new entrepreneurs will create job avenues for many across India, contributing back to our economic growth.

At present, Indian Government's well thought through and ambitious growth target for the Chemical sector – USD 330 Bn by 2025, may seem challenging in the wake of the pandemic. Chemicals sector turned a net exporter with a trade surplus in FY 2019-20 after decades of deficits. This feat looked insurmountable just a couple of years ago but the Industry rose to the challenge. It is well within the chemical Industry's reach to regain its growth momentum and contribute to all other industries to put the Indian economy back on its growth path.

Having said that, Covid-19 has come roaring back and India is currently adding nearly a million cases every four days and fear reigns across the country. Lockdowns are being imposed from Delhi to Chennai to Mumbai and businesses are turning jittery.

The home and personal care sector was relatively less hit by the coronavirus outbreak last year with the huge demand for home care products. The situation continues to remain the same where the demand for home care and sanitization products have been growing and continue to grow even with the onset of the second wave.

The Indian pharmaceutical market grew a modest rate in FY21. The first half of FY21 was affected by Covid-19 lockdowns. There were both supply and demand side disruptions. The fear of infection resulted in clinics being shut while hospitals were operating at low capacity. The silver lining is the adoption of digital technology. Doctors, hospitals and patients have embraced telemedicine.

Companies making APIs and intermediates have benefited, as drug makers diversified their supply chain from China. The fourth quarter of FY21 has been the best, with the Indian pharmaceutical market growing at 8.7%. More than volumes, the growth was primarily driven by pricing growth of 4.3%. The second wave may boost sales of Covid-19 drugs, but it will impact the overall industry's growth as non-Covid care will take a backseat. Big companies selling medications for chronic ailments are doing well. The non-Covid segment had begun to recover but this recovery may now be disrupted by the second wave as hospitals and the overall healthcare infrastructure focus on dealing with the pandemic. The disruption caused by reverse migration last year was overcome but the second wave is again disrupting supply. After a brief disruption last year, production has recovered. Even the latest lockdowns haven't impacted production. Raw materials, mostly imported from China, now have alternative sources. But vaccine supplies remain a concern, as manufacturers are struggling to scale

up. The shortage of Remdesivir, used in the treatment of Covid, continues, even though companies have promised to increase production.

3.10 India enhances its Value Chain to tap the potential in Pharmaceutical Industry

Product development in the pharmaceutical industry is separated into the discovery, exploratory and development phases, with a development cycle typically lasting around 15 years, although this is complicated by globalisation and the multiple layers of delivery through distributors and wholesalers. Each participant in a drug delivery process has their own motivation and access to information, and is regulated and managed in different ways. With the globalisation of the drug manufacturing sector, manufacturers are targeting markets such as China, India and Brazil as locations not only to sell to, but also for outsourcing manufacturing, research, development and clinical trials. However, an array of issues (e.g. security, intellectual property and knowledge of government legislation) within these emerging markets has presented disruption challenges to drug producers. However India's lucrative policy reforms offered Indian players to produce drugs which can be bulk exported to western countries. Moreover India's effective Intellectual Property Rights (IPR) Policy safeguards new product developments as well as international patents.

The Indian pharmaceutical industry is the world's third largest in terms of volume and thirteen largest in terms of value. The impact transcends the value chain, with Indian pharmaceutical companies leading in APIs as well as formulations. India's API industry is ranked the third largest in the world (2019), and the country contributes approximately 57 per cent of APIs to the WHO's pre-qualified list. It also caters to 62 per cent of the global vaccine supply and is the largest supplier of generic drugs to the global manufacturing industry. Supported by a growing Pharma industry, India has a large, growing trained and skilled workforce to support large-scale pharmaceutical manufacturing projects. It also has the ability to manufacture high-quality medicines at competitive prices, with approximately 33 per cent lower manufacturing cost than that of the U.S. and half of that in Europe

The value chain in the pharmaceutical industry starts right from the raw materials procurement-to testing of materials, getting it manufactured in facilities, storing it rightly at the manufacturing sites at the right temperature, at the right conditions. That is moving them from warehousing to distributors to stockists, to hospitals or the retailer and finally to the patient. One of the major bottlenecks for Indian Pharmaceutical industry was related to the input material.

India deliberately worked hard on ensuring that the country has a control on the availability of these raw materials and also active pharmaceutical ingredients. From couple of years government and the industry have larger focus to change what has been the forte of the Chinese industry to supply API's to India. A lot of work has been done and a lot of it is in progress by various stakeholders to ensure that large clusters of API industry are created in India so that our reliance on imports is reduced.

How is the KSMs/Intermediates market growing in India and becoming self-reliant

Over 70% of India's KSM/API import requirement is satisfied by China, mostly for antibiotics and vitamins. India's dependence on China for APIs and bulk drugs can be attributed to the fact that Chinese imports are 20%-30% cheaper than their Indian counterparts. According to data from the Trade Promotion Council of India (TPCI), India currently imports 53 APIs and KSMs from China. In 2018-

19, India's Pharma companies imported Chinese-made bulk drugs and intermediates worth ~USD 2.4 Bn, highlighting the industry's large dependence on China

Key starting material (KSMs) for some key APIs like caffeine, chloramphenicol, azithromycin, sulfadoxine, ciprofloxacin, metformin, ciprofloxacin, levofloxacin, ofloxacin, ampicillin, amoxicillin and cephalosporins are sourced from China.

Covid-19 highlighted the loopholes of the Indian Pharmaceutical market. The irregularities in supplies not only skyrocketed the domestic prices for certain medicines but also disturbed foreign trade due to the restrictions on exports. The low availability of Key Starting Material (KSM) in India has highlighted the weak points of India's pharmaceutical sector. After Covid-19 pandemic, India decided to have higher focus on reducing import dependence of Active Pharmaceutical Ingredients (APIs) and key starting material (KSM) for drug manufacturing.

The DSA (Drug Security Authority) aims to make India self-sufficient and also help it become a global leader in manufacturing of APIs, key starting materials, intermediate and chemicals for domestic as well as export. The aim is to ensure India becomes a USD 120 billion industry in 10 years and transforms itself into a huge pharmaceutical market.

CSIR-NCL (Council of Scientific and Industrial Research–National Chemical Laboratory) has plans to scale-up research on drug intermediates to cut imports from China. NCL is working on molecules that can be key ingredients for making various kinds of drugs as a part of Prime Minister Narendra Modi's approved special package for the Promotion of Bulk Drugs Parks, announced on March 21.

The Government of India announced INR 9,940 crores packages to boost the domestic API manufacturing industry. The package is divided into two parts – INR 6,940 crores has been allocated for the PLI Scheme and INR 3,000 crores will be spent on setting up three bulk drug parks. Out of the total allocation of INR 6,940 crores for the PLI Scheme, INR 4,600 crores will be earmarked for fermentation-based products and INR 2,340 crores for chemical synthesis products. The PLI scheme is applicable to 41 critical KSMs/APIs and aims to address the supply issue of 53 identified critical APIs. The list has been classified into two broad categories – chemical synthesis products comprising of 27 KSM/APIs and fermentation-based products comprising of 14 KSM/APIs. Under the fermentation-based category, two companies per product will benefit from the incentives, while four companies per product will benefit under the chemical synthesis category.

The national scheme for promotion of bulk drug parks focuses on the reduction of the manufacturing cost of bulk drugs in the country and dependency on other countries for its availability. In line with this, CSIR-NCL has undertaken research work in the area of chemical synthesis of drug intermediates. More than 27 or so bulk drugs cover different therapeutic classes such as anti-viral, retro-viral, antibiotics, anti-bacterial, anti-fungal, cardiovascular, diabetes, cholesterol-lowering, anti-cancer to simple painkillers like paracetamol, are synthesised from about 10-12 simpler building blocks or KSMs/ drug intermediates.

These initiatives and government support will help India attain self-sufficiency in the drug supply chain. Advancements in chemical processes will bring down the cost of production through continuous flow synthesis, process optimisation, and reaction engineering which would help India is more self-reliant.

Moreover, environmental factors have played a key role in shifting much of API production to Asia from Europe with China benefiting in the last two decades. Due to rising pollution concerns and effluent treatment needed for Pharma/Chemicals segments, even China is grappling with various issues – Supply chain disruptions owing to blasts in chemical zones, closure of polluting units/transit to new chemical zones have created opportunities for Indian companies. Given the macro tailwinds in favour of Indian API players the traditional players who have been growing steadily despite Chinese competition to gain significantly

Above factors have led to rise in production costs for China resulting in inflationary pressures across value chain (basic chemicals, KSM, Intermediates, API's) and across product segments (both high volumes and niche segments). Rising prices in Pharma value chain is extremely positive for Indian players and Government too is pushing for PLI scheme to garner higher market share.

Backward integration – Considering the high dependence on imported API's from China for domestic consumption, companies like Divi's, Suven, Aarti Drugs, Hikal, IOL, Solara/Aurore have completed backward integration projects (from 50-70% of inputs to <20-30%) to de-risk their operations/dependence on China.

PLI scheme to trigger further investments to become self-sufficient – In March 2020, the government allocated Rs 30 bn for development of three bulk drug parks, as well as Rs 69.4 bn for manufacturers of those 53 crucial APIs of anti-TB drugs, steroids and vitamins (having higher dependence on China) over the next eight years.

GOI thrust on local production of API's: Considering the high dependence on imported API's from China for domestic consumption, Government has raised alarm bells, especially at a time when diplomatic relations with China are under strain. Government is pushing for API policy to support domestic industry through incentives, setting up of API Park and other measures to boost local production, especially for API's which are completely imported. While local API manufacturing may push up costs initially, over time, Government and Industry hopes to bring down dependence on China to about 40-50% of imports.

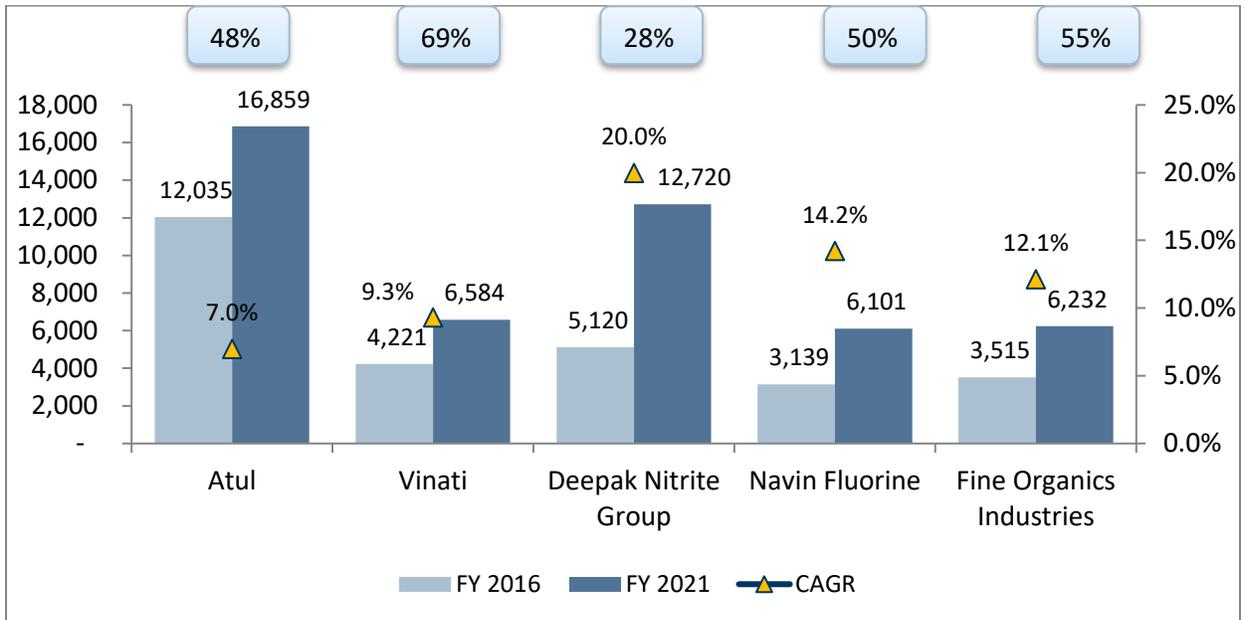
We need a paragraph here on how India has seized the whitespace and how India in the past has proven track record of leveraging disruptions in Pharma and IT sector value chains

3.11 Increased export by Indian Speciality companies

Indian Specialties have been growing over the years. In the past decade there has been appreciable growth in the revenues and profits of the speciality chemical companies, not only the domestic revenue growth but also the export growth seen in major chemical companies in India.

The export revenues of key listed specialty companies are as follows

Exhibit 3.17: Export by Indian Speciality Chemicals (in Rs. Mn) export share in FY21 included in rectangle



China has cracked down on environment scofflaws, forcing some small chemical makers there to shut down; US is making it hard to do business with China through a combination of import tariffs and intellectual property prosecutions; and COVID-19 is making all chemical buyers rethink and diversify their supply chains. Such factors are prompting purchasing managers in the US, Europe, and Japan to give India another look as a source of raw materials for their chemical products. An important factor in favour of Indian companies is their growing competitiveness vis-à-vis producers from other countries. India has some inherent growth drivers including a huge local demand base, significant exports with room to expand, and significant imports with scope for domestic substitution.

Moreover, India’s federal government positions itself as ready to support the shift from China to India in a range of industries. It has launched PLI scheme to push for indigenous manufacturing of pharmaceutical starting materials and active ingredients, many of which were made in India in years past. Following these reforms and Indian company’s proactiveness the growth in exports in expected to increase gradually.

Aether’s advanced intermediates/ specialty chemicals product portfolio is developed for the first time in India and constitutes 100% import substitution. Thus, Aether has being embodying from inception the recent “Make in India” or “AatmaNirbhar Bharat” campaigns of the Government of India. Aether’s position of technical and commercial excellence in their key products is such that in a period of just 4 years, it has transformed these products from being 100% imported into India from China to now these products are being exported to Chinese customers as well. Also Aether specialty chemicals product are produced via complex chemistries involving multi-step synthesis route thus creating “high value and high margin” products with key applications into Pharma APIs and Agrochemical segments.

Parameter	Commodity Chemicals	Regular Specialty Chemicals	Aether Specialty Chemicals
Blended Price	₹200-300 per kg	₹400-700 per kg	₹1440.85 per kg
Steps in the manufacturing process	1-2	2-3	4-10
Number of stages remaining until active ingredients are produced	n-10 and upwards	n-6 till n-9	n-1 till n-6

3.12 Third wave impact possible:

The third wave is expected due to Delta-Plus variant formed due to the mutation in the B.1.617.2 (Delta variant) that drove the fatal second surge in India. This new variant of concern is a sub-lineage of the Delta variant that has acquired a spike protein mutation 'K417N' which is also found in the Beta variant (first detected in South Africa). According to the Indian SARS-CoV-2 Consortium on Genomics (INSACOG), a consortium of 28 laboratories tasked with genome sequencing by the Ministry of Health and Family Welfare, Delta Plus variant has three worrying characteristics:

- a) increased transmissibility
- b) stronger binding in receptors of lung cells
- c) potential reduction in monoclonal antibody response

In case of adversity of third wave in India, The country cannot impose further nation-wide lock-down but however can impose restrictions on Industry and individuals to limit the spread of the virus.

From a pharmaceutical industry standpoint, Drug manufacturers have expanded capacity utilizations to enhance production of Covid-19 related drugs and cold medicines amid apprehension the third wave may strike anytime in Q4 of CY2021. Indian pharmaceutical companies have ramped up production and built up inventories of raw material to prepare for potential third wave of pandemic which is likely to spike the demand for drugs used in treatment of Coronavirus. Taking cues from the last wave where shortage of raw material had slowed down the production of Covid-19 related drugs, pharmaceutical companies have begun lifting major raw material from the market to rule out shortage of raw material. Last two waves have given some cues about the medicines that are commonly used in the treatment and based on those broad-level understanding, the Pharma companies have expanded their production. To ensure availability, Pharma companies have undertaken various steps to ensure supply chain is not hindered at all including steps like giving vendors some credit to build higher inventory on behalf of Pharma companies. Along with strategies for ramping production of essential covid-19 drugs, collaborating with all relevant stake holders across supply chain of Pharma industry from central, state to district level coordination is undertaken to mitigate the risk of third wave.

Taking learning from the second wave, the industry is preparing proactively and intends to be ahead in terms of drug availability and facilitating collaboration across stakeholders. Stockpiling, building inventory of essential drugs and strengthening infrastructure in terms of hospital beds, oxygen supplies will be important in preparation for likely challenges in case of Covid-19 third wave.

Owing to increasing demand of Covid-19 related drug raw materials, Prices of major raw material commonly used by drug companies have already started rising in the market owing to increased lifting.

Cost of most raw materials has risen by over 20% including paracetamol, azithromycin, ascorbic acid, ivermectin, doxycycline and methylprednisolone.

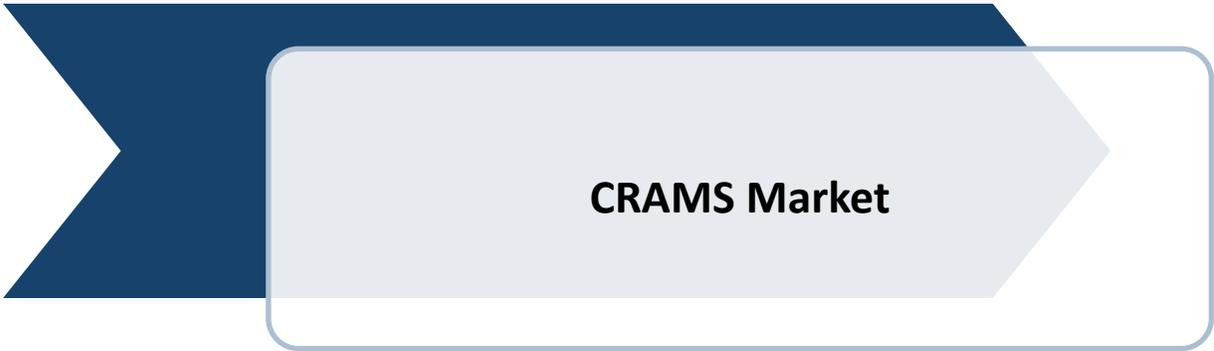
The pandemic is a global challenge that needs a global response. The convergence of global knowledge and expertise along with Indian pharmaceutical industry's scale and reach will help India in its fight against the pandemic. Several Indian Pharma companies have entered partnership with global companies to accelerate the process of drug manufacturing and distribution. For instance:

- Several Indian Pharma companies such as Cipla, Dr Reddy's Laboratories, Hetero Labs, and Jubilant Lifesciences had signed voluntary licensing agreements with Gilead Lifesciences for Remdesivir.
- Baricitinib from Eli Lilly which is currently being manufactured in India through collaboration with Cipla, Lupin, Sun Pharma.
- Molnupiravir of MSD is being licensed through Cipla, Dr. Reddy's, Emcure, Hetero Labs and Sun Pharma.

In a nutshell, to mitigate or minimize the risk of third wave, the industry is channelizing resources in strengthening the technological infrastructure and upskilling manpower for addressing any challenges concerning manufacturing and distribution

On the intermediate and chemicals front, a third wave of the Covid pandemic looms large on Indian chemical industry. However, the industry is well prepared to supply important chemicals required for production of important APIs. The country is trying to reduce import dependency on China and increase production capacities of important intermediates domestically. India's capacity to manufacture many bulk drugs had been gradually eroded by imports. In the past, India had the capacity and capability to manufacture many bulk drugs, intermediates and APIs locally (as they are imported today). Unfortunately, as low-cost imports became more prevalent, many of these APIs industries were closed. However the country is trying to reduce the dependency by doing a reversal of the same. In the recent years, a number of domestic pharmaceutical companies have started to backward integrate their manufacturing of APIs and started locally sourcing intermediates thereby encouraging intermediate manufacturers to produce more and more chemicals locally.

Section 4: Global and India CRAMS Market

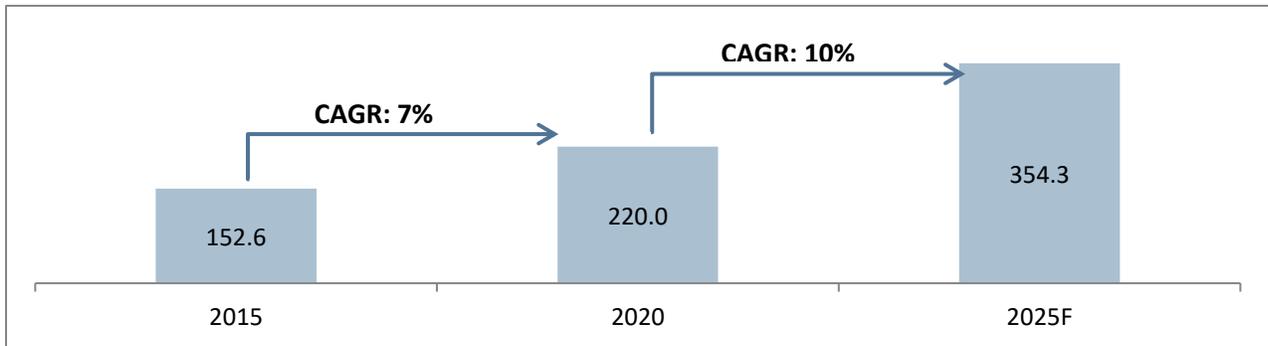


4.1 CRAMS - Global Overview

Contract Research and Manufacturing Services (CRAMs) refers to outsourcing services/ products to low-cost providers like India and China which maintains quality, world class standards and meets international regulatory norms like the USFDA, Australian-TGA, UKMCA, and EMEA. Pharmaceutical Industries have been traditionally outsourcing API's (Active Pharmaceutical Ingredients), intermediates and Formulations (Finished Dosage Forms).

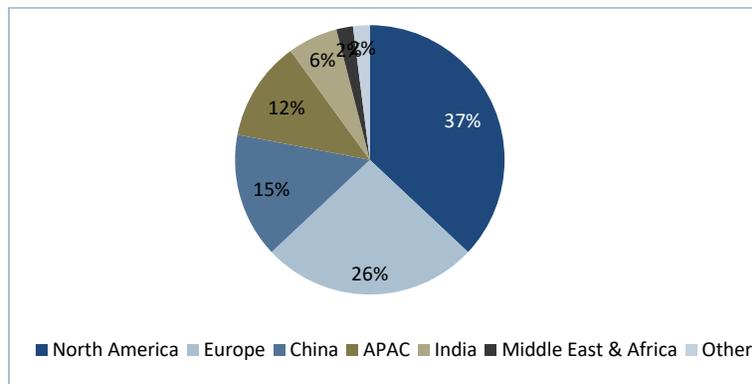
The global market for contract research and manufacturing services was valued at US \$ 220 billion in 2020; for global specialty chemicals contract manufacturing. Contract research and manufacturing services is used for contract synthesis of agrochemical technical grades or active ingredients, intermediates and specialty chemical products along with other fine chemicals like active pharmaceutical ingredients, etc. This market is anticipated to grow at 10 per cent CAGR in next 5 years. More and more companies are spending on R&D in the pharma sector. The overall R&D spends of the top twenty global players is expected to increase at 2.5% CAGR over the forecast period. With the research and development spend slated to remain healthy going forward, the CRAMS space is expected to benefit.

Exhibit 4.1 : Global Contract Research and Manufacturing Services market (in USD Bn)



Source: Frost & Sullivan Primary Research & Analysis

Exhibit 4.2: Global Contract Research and Manufacturing market, 2020, by Region , USD 220 Bn



Source: Frost & Sullivan Primary Research & Analysis

Developing countries such as India, China, Mexico, and Brazil are witnessing significant improvements in their healthcare infrastructure and technological innovations in their drug development processes. As a result, several pharmaceutical companies from developed countries are outsourcing the research and manufacturing operations to the vendors in such countries. The availability of labor at a comparatively lower price is one of the critical reasons for the growing popularity of outsourcing these processes. Moreover, the rising number of US FDA-approved manufacturing plants in developing countries also encourages outsourcing. These factors will augment the growth of the pharmaceutical CRAM market during the forecast period.

India market constitutes almost ~5% of the global CRAMS market which totals to USD 10.1 billion. This market is driven by research & development of new molecules/chemistries developed with the intention of reducing capital investments in the overall fine chemicals segment. The Chinese market for contract research and manufacturing services contributes around 15% of global market (by value terms) whereas Japanese market is around 8-9% (by value). North America & European Union countries contribute more than 60% market share in the global CRAMS/CSM segment.

The contract research and manufacturing services market across the globe was growing at a CAGR of 7% over 2015-20. With increase in demand for more speciality and fine chemicals and more players have increased their ability to serve this market, this growth of ~7% will remain continued globally. The pace of contract manufacturing has been increasing day by day, with companies shifting their focus on core activities. Major drivers of global contract research and manufacturing market are new active ingredients development, innovators shifting focus to core competencies and outsourcing of production to low manufacturing cost destinations. India, being a low manufacturing cost destination, has advantage of skilled labour force successfully delivering to the MNC's (their outsourcing needs).

Global CRAMS market players

Three quarter of global contract research and manufacturing services market is concentrated in North America, Europe and China. Major CRAMS players involved in the fine chemicals business are – Quintiles, Covance, Catalent, Paraxel, Lonza, Charles River Lab, Patheon and others.

4.2 India CRAMS Market

Contract manufacturing is a strong segment of the domestic market. Indian firms have several advantages over their Western rivals. The expertise gained in manufacturing generics through reverse engineering has helped some companies streamline the process for getting manufacturing up and running. Owing to a wide-ranging product mix consisting of high-end research services, biologics, and complex technology services, all offered at a low cost, contract research and manufacturing services (CRAMS) industry has witnessed tremendous growth in the Indian subcontinent.

Several key pharmaceutical players are now outsourcing their early drug development activities covering pre-clinical and early phase research to some of the leading CRO players in the market which was earlier handled by the companies themselves. Global pharmaceutical companies are currently focusing on outsourcing research activities to various academic institutes and private CROs to gain a competitive edge and remain flexible. In addition, they are lending a key focus on innovative drug

development to treat myriad chronic diseases. These aforementioned factors will expand the scope of the contract research organization (CRO) market in the forthcoming years.

China was the most suitable CRO option for international giants which now slowly shifting to other regions. Amid the economic turbulence and supply chain upsets of the past 2 years during Covid, big pharmaceutical companies are quietly shifting some of their drug discovery projects from research outsourcing partners in China to partners in India. International companies are looking towards diversification in research outsourcing in order to reduce dependency on single country and issues arising out of any discrepancy / Socio-economic disturbance at a country level. Companies that are fully ensconced in India look to China for diversification. Companies that are fully ensconced in China look to India.

India is amongst the preferred destinations for outsourcing of research as well as manufacturing activities. New age CRAMS providers are able to cater to not just the pharmaceutical clients, but also biotech, agrochemicals, nutrition, animal health, consumer goods and others. This has opened up wider growth opportunities for the sector. With the right scale, capacities, systems and infrastructure, integrated service providers are well placed to capture a larger share of the innovator manufacturing opportunities. Indian CRAMS companies hold a competitive edge across the global pharmaceutical industry in being the most preferred partners for drug development and manufacturing. Owing to a wide ranging product mix consisting of high-end research services, biologics, and complex technology services, all offered at a low cost, CRAMS industry has witnessed tremendous growth in the Indian subcontinent.

Outsourcing research helps improve cost efficiency as outsourcing certain parts of drug development helps companies in reducing costs and also provides flexibility in terms of managing resources. Factors like profit pressure due to patent expiry and price erosion due to generics is also pushing pharmaceutical companies to outsource their R&D. India becomes one of the most attractive destinations due to the large availability of skilled scientists in the country, better infrastructure (Scientific as well as digital), emergence of smaller pharmaceutical companies and biotech companies which have been instrumental in new drug development and a high growth potential of biosimilars – An R&D intensive segment of Pharma. The Indian government policies to encourage exports and support the growing R&D through several tax benefits have allowed the country to be on the forefront of contract research and manufacturing services

With externalization of research to emerging markets, India presents a strong case for outsourcing research and manufacturing. Whilst contract manufacturing is expected to garner a larger share of revenues in the range of over 50-60 per cent, the country is also witnessing a simultaneous contribution from the contract research services capturing rest of the CRAMS services

Indian CRAMS companies hold a competitive edge across the global pharmaceutical industry in being the most preferred partners for drug development and manufacturing. Owing to a wide ranging product mix consisting of high-end research services, biologics, and complex technology services, all offered at a low cost, CRAMS industry has witnessed tremendous growth in the Indian subcontinent.

With externalization of research to emerging markets, India presents a strong case for outsourcing research and manufacturing. Whilst contract manufacturing is expected to garner a larger share of revenues in the range of over 50-60%, the country is also witnessing a simultaneous contribution from the contract research services capturing rest of the CRAMS services and over 20% of the APAC CRO market. The Indian government policies to encourage exports and support the growing R&D through several tax benefits have allowed the country to be on the forefront of contract research and manufacturing services.

India is a preferred destination for outsourcing owing to its low-cost production and for cheap access to highly qualified scientists. Over the years, India's largest CROs have evolved from cut-rate service providers to powerhouses for high-quality chemistry and biology serving the Western market. The window of India's operating cost advantage is narrowing. The country's successful CROs have had to keep up with globally recognized processes, quality standards, and operating models to compete in the world market. State-of-the-art facilities and top-notch teams are not compatible with offering low-cost services. However, with India's cost advantage fading, the country has been able to place itself on the quality product delivery, rigorous R&D and development of new molecules, among other reasons making the country to hold a firm spot in the outsourcing industry.

The country has a big pool of qualified scientist which makes CRO a reality in India. The cost of labor is an incentive for an Indian base. The annual price of employing a scientist in India is as low as \$30,000, compared with \$180,000 in the US. On the outcome level, India's chemists produce similar results, if not better. This is the exact reason why large pharmaceutical companies turn to India to fill a gap between the type of R&D that they need and the number of people at their companies who are qualified to do it. It is easy for Indian companies to hire a huge pool of scientist at an economical rate to get the process done at a quite reasonable expenditure which otherwise would have cost quit lot in the western world.

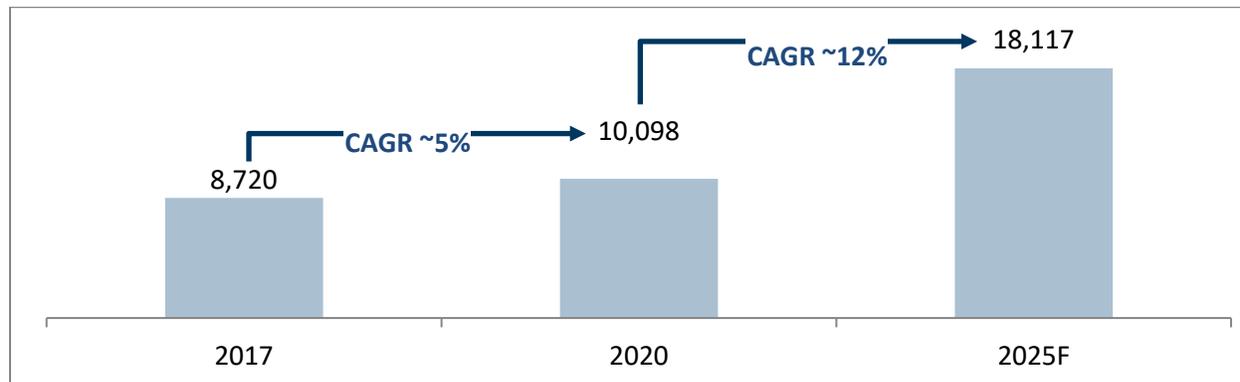
The evolution of the Indian drug discovery services has been quite drastic. The number of contract development and manufacturing organizations (CDMOs) have multiplied by many folds as compared to late 2000s versus today.

Global CRAMS market is highly fragmented with over 1000 players with SEA countries such as India, China, Japan, Singapore, Malaysia etc. expected to show a robust double digit growth. In most cases, process development and clinical research are the majorly opted services from CRAMS players. According to the Indian Government, India would be one of the top five pharmaceutical innovation hubs with one out of every 5 to 10 drugs discovered in India. Asia Pacific will stay at the forefront of the CRAMS industry with India and China leading the charts. Cost advantage, knowledge of regulatory and GMP requirements, and proficiency in English continue to be key strengths.

Environmental factors played a key role in shifting the API production base from Europe to Asia with China benefitting the most in the last 2 decades. However, various factors like blasts in chemical zones and closure of transit to new chemical zones in addition to the recent pandemic have created new opportunities for India. Given the macro factors in favour of the Indian API companies, tradition Indian companies that were steadily growing despite Chinese competition in the past will now grow at a significant pace. The above factors have also led to an increase in the production costs for China

resulting in inflationary pressures across the value chain and end segments. These rising prices in Pharmaceutical value chain in addition to the government’s push on the PLI scheme have proven to be extremely beneficial for the Indian players.

Exhibit 4.3: India CRAMS market (USD Mn)



Source: Frost & Sullivan Primary Research & Analysis

India is a frontrunner in the number of FDA-approved manufacturing sites outside the United States and a leader in the bulk drug manufacturing market dominated by generics and biosimilars. As a result, Indian CRAMS market is estimated to be in the range of USD 10 Bn in 2020 and expected to grow at CAGR of ~12% to USD 18 Bn in 2025.

India CRAMS market positioning in Global Market

	Global Market	India Market	India as a % of Global
2020	USD 220.0 Bn	USD 10.1 Bn	4.6%
2025F	USD 354.3 Bn	USD 18.1 Bn	5.1%

The share of Indian CRAMS market is expected to grow over the years with India having a market share of more than 5% of the global CRAMS market by 2025.

Expert Comments:

Industry experts such as Daara B. Patel, secretary general of the Indian Drug Manufacturers Association (IDMA) anticipate the Indian CRAMS industry to show higher than average growth when compared to the pharmaceutical industry growth rate in the near future. Also, In order to meet the changing market demands, companies such as GVK bio in India are differentiating themselves as Contract Research and Development Organizations (CRDO) as opposed to the traditional CRO model by positioning itself as an end to end solution provider for drug discovery, development and manufacturing.

Growth Drivers:

With a lower capital expenditure in the range of 25-50% for setting a facility, India is a big attraction for global pharmaceutical companies to collaborate with local CRAMS players. Apart from lower set up costs, it is easier to acquire trained manpower which further eases the R&D activities.

Abundant and widespread talent pool: Abundant pool of professionals in the area of drug development and research chemistry, owing to an enormous base of pharmacists and chemistry post graduates qualifying every year is an added attraction. With MNCs around the globe under constant pressure to prune costs, collaboration with CRAMS providers is the most viable option for maintaining profitability. India's top CROs and CDMOs are asserting themselves on the global stage. They are courting biotechnology companies by setting up satellite labs in the US and Europe. The CROs and CDMOs are hiring managers with Big Pharma or chemical experience.

Feasible and supportive government policies: Across India, the recent revision of Market Access Initiative by the Ministry of Commerce and Industry aims at benefiting the small to mid-segment newer industry players which do not possess global sales and marketing reach. As a result of the revised MAI policies, the robust growth in CRAMS industry in India will support newer economies such as Myanmar, Cambodia to collaborate with the local Indian players beneficial for the overall growth of the Asian economy.

Quantum of USFDA approved manufacturing sites: Moving forward, with a total of over 300 USFDA approved manufacturing sites; the country can become the global leader in the CRAMS industry with the implementation of mandates.

Patent Drug Expiry: Total sales potential from the expiry of drug patents between 2020-26 is estimated at ~USD 252 Bn. Since pharmaceutical research is costly and risky, companies hit by a patent cliff will not reinvest in research. They will first try to ward off generic manufacturers and reclaim their market share. While the flooding of the market with generic drugs might look appealing to consumers, in the long run, it will have drawbacks. The disruption in R&D will result in longer waiting periods for new drugs to release. This presents a large opportunity for Indian generic companies. India could concentrate on increase in exports to regulated markets of US and Europe.

Trade Agreements / Treaties: In some regions a structured government intervention by way of the existing Free Trade Agreements (FTAs) like the South Asian Free Trade Area (SAFTA), Japan-India Comprehensive Economic Partnership Agreement (CEPA), Association of Southeast Asian Nations (ASEAN) Trade in goods agreement, can benefit Indian companies to leverage such markets with customised therapeutic offerings. Regions working towards reducing the healthcare costs and with the upcoming patent cliff opportunity across formulations both chemical and biologics, could boost growth, create newer export corridors for Indian companies. Collaboration play (likes of GAVI for vaccine) with international regulatory bodies like International Council for Harmonisation of Technical Requirements for Pharmaceuticals for Human Use (ICH) and Pharmaceutical Inspection Convention and Pharmaceutical Inspection Co-operation Scheme (PIC/S) would also facilitate access to these markets.

Promoting CRAMS with Intellectual Property Treaties

Indian government is doing its part to help CRAMS development by signing intellectual property treaties. In June 2019, India accepted the three important classification treaties of the World Intellectual Property Organization that are designed to ease the search for trademarks and industrial designs, thereby helping brand owners and designers in their efforts to obtain protection for their own work. The treaties accepted by India are:

- Vienna Agreement
- Nice Agreement for International Classification of Goods and Services for the Purposes of the Registration of Marks
- Locarno Agreement for establishing an International Classification for Industrial Designs Additionally, the Indian Patent Office has worked towards reducing the processing time for filing IP application and appointing specialist judges in commercial courts to ensure the effectiveness of IP rights enforcement.

Section 5: Pharmaceuticals API Intermediates Industry Overview

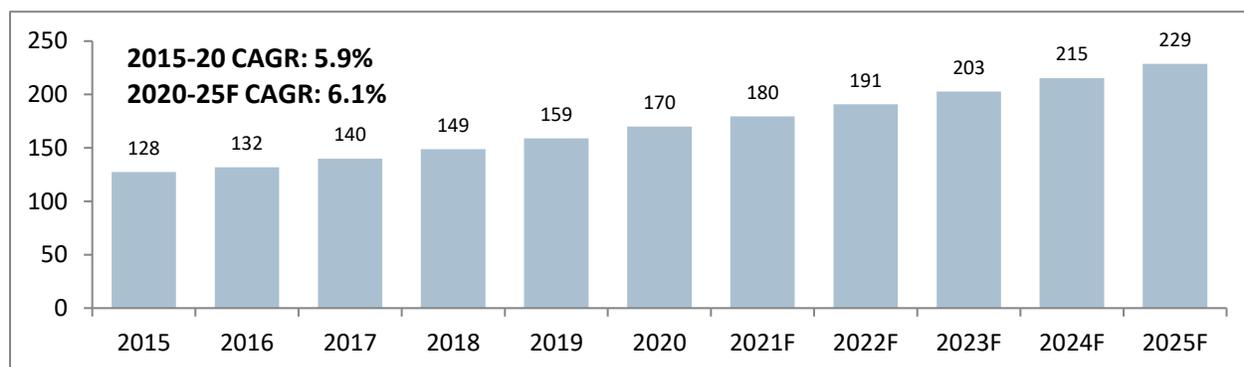


API Intermediates Industry Overview

5.1 Global Active Pharmaceutical Ingredients Market

The Global API market has shown steady growth of 5.9% since 2015 and is expected to further expand at 6.1% due to an increased focus on developing geographies. APAC API industry is majorly involved in manufacturing of API which is consumed domestically and even exported to developed nations on a large scale. The most attractive markets for API manufacturers to export their products are the US and Europe partly because they are the most lucrative markets. Globally on API manufacturing front, it is estimated that Chinese manufacturers make around 40% of all APIs used worldwide and that China and India are the source of 75% to 80% of the APIs imported to the US (2020). India plays a prominent role in the formulations segment of the industry. India is the third largest producer of pharmaceuticals in the world by volume. Some of the key API manufacturing locations across the global include China, India, North America (including both captive and merchant markets), EU (key manufacturing hubs including Italy, Germany, Switzerland, Italy, Belgium, Netherlands, UK, France, among others).

Exhibit 5.1 : Global API, Industry size (USD Bn), 2015-2025F



Source: Frost & Sullivan Primary Research & Analysis

Growth in the Active Pharmaceutical Ingredients market will be primarily driven by government initiatives, regional penetration, increasing aged population and patent expiration of prominent drugs. Among its various applications, anti-infectives, gastrointestinal disorders, oncology and hormone related disorders; oncology, HIV, Central Nervous System (CNS) and Cardiovascular (CVS) are likely to be the fastest growing application of API. Investments in R&D coupled with patent expirations of drugs will make Asia Pacific the fastest growing API market.

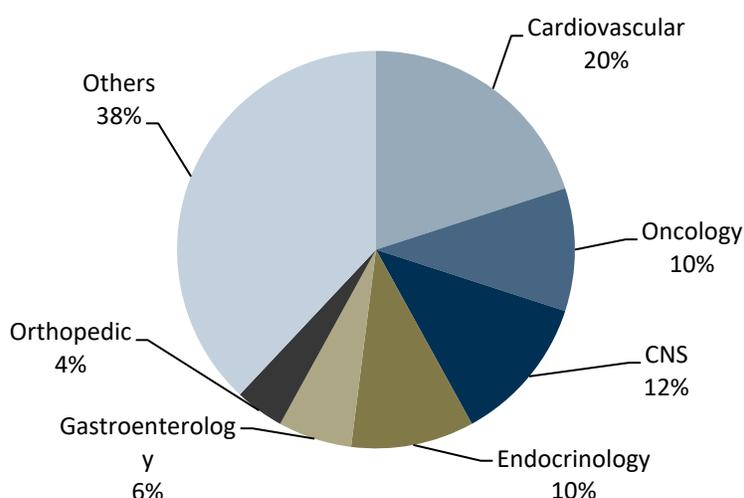
Synthetic API's form about 70% of the total market and Biologics about 30% (2020). Complicated process, higher regulations, high investments have been some of the key reasons for lower share of biologics. Biological drugs are gaining importance in the treatment of chronic diseases. These have been expensive due to challenging set of manufacturing requirements and difficult replication as against synthetic APIs. Advancements in the production technology have enabled production of biosimilars that are not exact copies of innovator drugs, but highly comparable in terms of safety and efficacy. However with increased interests in oncology products this segment is expected to have a higher growth

Biotech APIs segment is expected to grow at the highest CAGR during the forecast period. Biotech drugs are preferred due to their specificity in action, advancements in biotechnology, increase in the demand

for monoclonal antibodies and their similarity with the natural biological compounds found in the human body.

Monoclonal antibodies segment is expected to account for the largest share of the global APIs market, by type of APIs. In 2020, the monoclonal antibodies segment is estimated to account for the largest share of the APIs market. Due to their rising application in oncology and other therapeutic areas, there has been an increase in the number of FDA approvals in launching innovative biopharmaceutical products, which has resulted in investments and technical advances in R&D.

Exhibit 5.2: Global API market Split by Therapy Segment, 2020 (in USD Bn) – USD 170 Bn

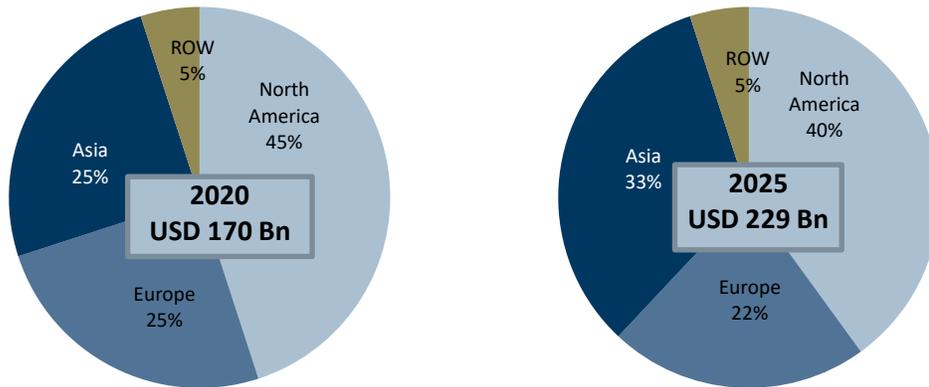


Source: Frost & Sullivan Primary Research & Analysis

Growth Rate (CAGR)	Cardiovascular	Oncology	CNS	Endocrinology	Gastroenterology	Orthopaedic
2019-25F	3.8%	7.4%	9.4%	7.0%	4.3%	6.6%

Cardiology/ cardiovascular was the largest therapy segment in API for the year. Increasing prevalence of cardiovascular diseases worldwide and high demand for fast-acting drugs are some of the key factors responsible for the segment growth. Oncology, HIV and Central Nervous System (CNS) are likely to be the fastest growing during the forecast period. Moreover with the growing prominence of Covid-19, there have been growing cases of people across the world undergoing depression phase. Owing to this the Antipsychotic and Antidepressants drug are highly sought and the therefore these markets are expected to grow with a decent CAGR.

Exhibit 5.3: Global API market segmentation by geography, 2020 and 2025



Source: Frost & Sullivan Primary Research & Analysis

North America will remain one of the largest markets for APIs, followed by Europe. APAC is majorly involved in manufacturing of API which is consumed domestically and even exported to developed nations on a large scale. The most attractive markets for API manufacturers to export their products are the US and Europe partly because they are the most lucrative markets.

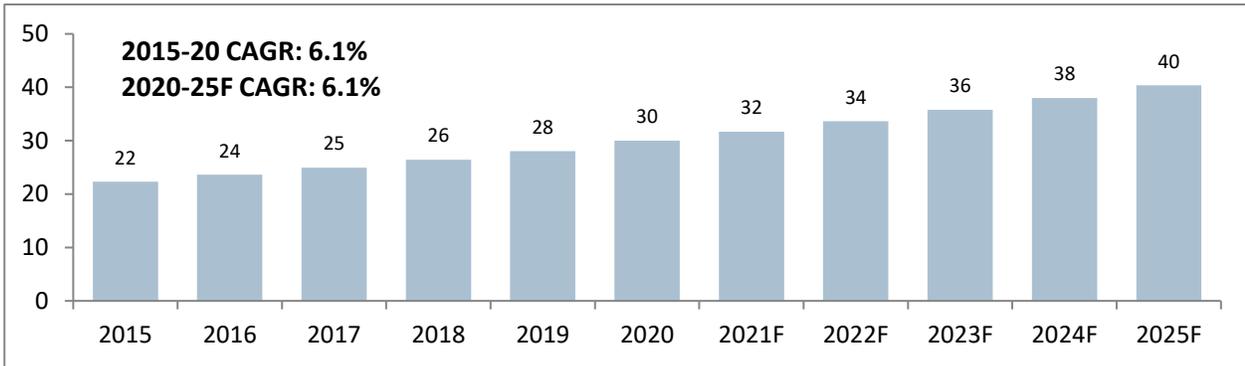
However with the Pharmerging markets which are mainly in Asia, growth will be over 12% in Asia (2021-2026). Tier I pharmerging market contains China, which dominated the global pharmerging market because of high government healthcare spending. Tier II is made up of Brazil, India and Russia, all of which feature an increase in lifestyle diseases, rise in consumer awareness and favourable government policies. Countries in Tier III, which hold the least market shares among pharmerging countries, include Indonesia, Thailand, Mexico, Turkey, Egypt, Vietnam and South Africa.

5.2 Global API-KSM Market

The Global market for speciality intermediates that go into pharmaceutical application was valued at USD 30 Bn for 2020. Key Starting Material (KSM) term is used for intermediates in pharmaceutical industry. These are building blocks of drug industry. High volume specialty intermediates constitute of the basic synthetic building blocks for producing active ingredients, these intermediates include organic acids, esters, amines, nitriles, aldehydes, anhydrides, ketene and diketene derivatives, ketones and others.

Emergence of Specialty Segments (Biologics) and with the market facing fierce competition from China, companies has started exploring the specialty segments for export purpose. These include. Key chemistries include Fluorine, Speciality Amines, Chlorine, Bromine etc.

Exhibit 5.4: Global API-RM/KSM, Industry size (USD Bn), 2015-2025F



Source: Frost & Sullivan Primary Research & Analysis

Evolution of production base for KSM and API

Phases	Novel Product – 1-3 Years from Launch	3-10 Years of Launch	> 10 Years of Launch
Price	Extremely High	High Price	Stabilized Price
Demand Volume	Market penetration stage: Low Volume	Exponential Growth: High Volume generated	Marginal Growth: Volume requirements will be high. Lookout for alternatives
API Production Location	Limited to the patent holders production site, concentrated in North America, Europe and Japan	API production outsourced to Asian region.	Commoditized production in Asia, mainly in India and China
Intermediate Production Location	Intermediates are mainly in-house or sourced from strategic partners in India	Intermediates are mainly in-house and part of it sourced from Asia, both India and China for intermediates in n-5/n-4 range	Intermediates are sourced mainly from China, for intermediates in n-1/n-3 range
Raw Material Consumption and Procurement	Key raw materials are under contract and generally sourced from fine and speciality chemical companies, mainly in Europe	Key raw materials are under contract and generally sourced from fine and speciality chemical companies, mainly in Europe, India and China	Key raw materials are sourced at the production location

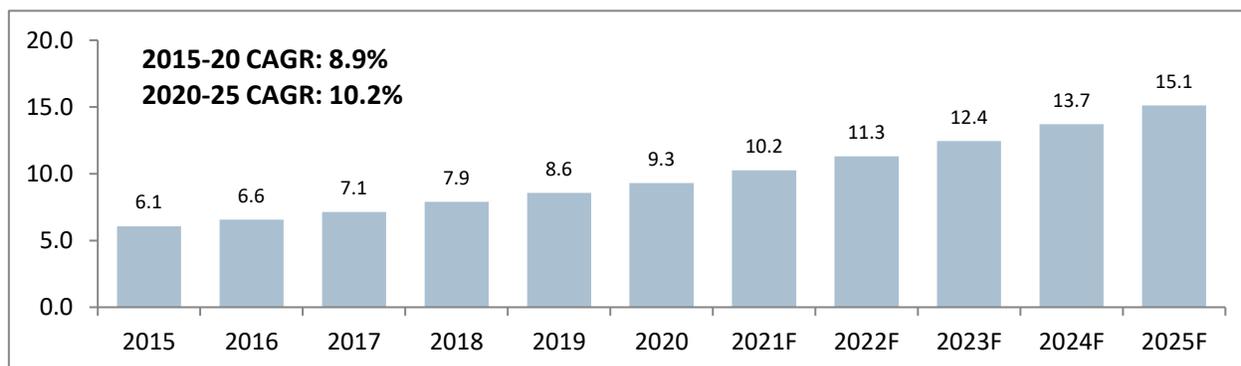
5.3 India Active Pharmaceutical Ingredients Market

Active Pharmaceutical Ingredient (APIs) are substances or a mixture of substances intended to be used in the manufacture of a drug (medicinal) product and that when used in the production of a drug becomes an active ingredient of the drug/ product. Key Starting Material (KSM) term is used for intermediates in pharmaceutical industry. These are building blocks of drug industry

The Indian pharmaceutical industry is the world's third largest in terms of volume and thirteenth largest in terms of value (2019). The increasing incidence of chronic diseases, along with growing importance of generics is the key factors driving the growth of the Indian APIs market. Advancements in active pharmaceutical ingredient (API) manufacturing and growth of the biopharmaceutical sector is also driving the market growth.

The Indian API market has shown steady growth of 9% since 2015 and is expected to further expand at nearly 10.2% going forward till 2025. By raising production yields, changing production processes and increasing sales in international markets, API manufacturers in India are making efforts to improve their marketing ability in the regulated markets. More than 30% of the APIs manufactured in India are exported to countries such as US, UK, Japan, etc. (2019)

Exhibit 5.5: Indian API Industry size (USD Bn), 2015-2025F



Source: Frost & Sullivan Primary Research & Analysis

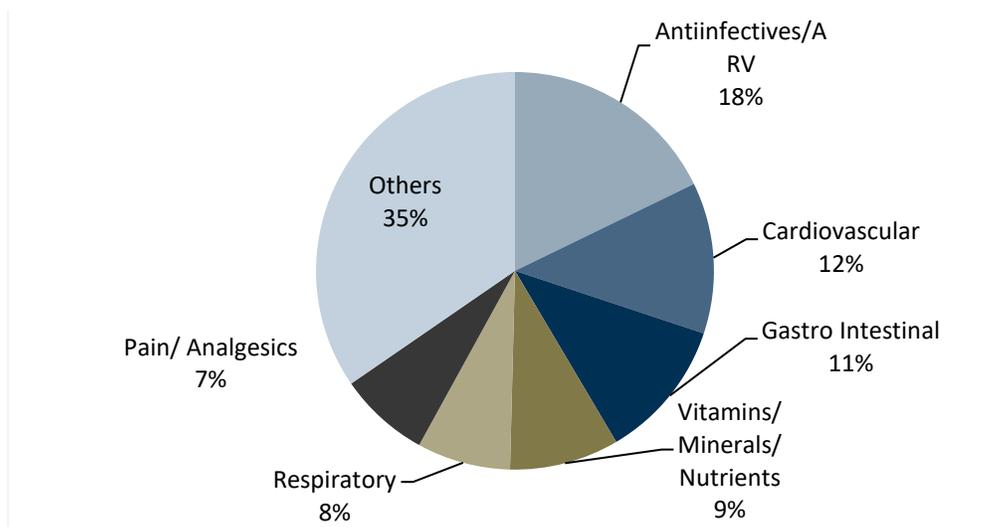
In the Indian API market, there are several APIs currently available. Key players, such as Sun Pharma, Cipla, Dr Reddy's, Aurobindo Pharma, Lupin, etc., develop these APIs. Companies either create in-house APIs or grant contracts to other companies. At present, APIs are primarily used for the production of generic drugs in the Indian market.

The key starting materials/ intermediates form the essential part of Pharmaceutical value chain in India. Intermediates refer to the substances that are semi-finished products and /or material that is essential to make a product. The market for Pharmaceutical intermediates in India for the year 2019 was estimated to be around USD 4.5 Bn, which grew at a CAGR of 8% over 2014-19.

The development of specialty intermediates is driven by the need for application-specific chemicals of various industries. Dynamic advancements in end-user industries demand for a change in product using different stages of intermediates. In India, with emphasis on product innovation, brand building and

environmental friendliness, the speciality intermediates is moving toward greater customer orientation. India's strengths in organic chemicals' synthesis and process engineering along with global reliance on Intellectual Property Protection are key aspects of differentiation.

Exhibit5.6: Indian domestic API market split by Therapy Segment , 2020 (in USD Bn) – USD 9.3 Bn



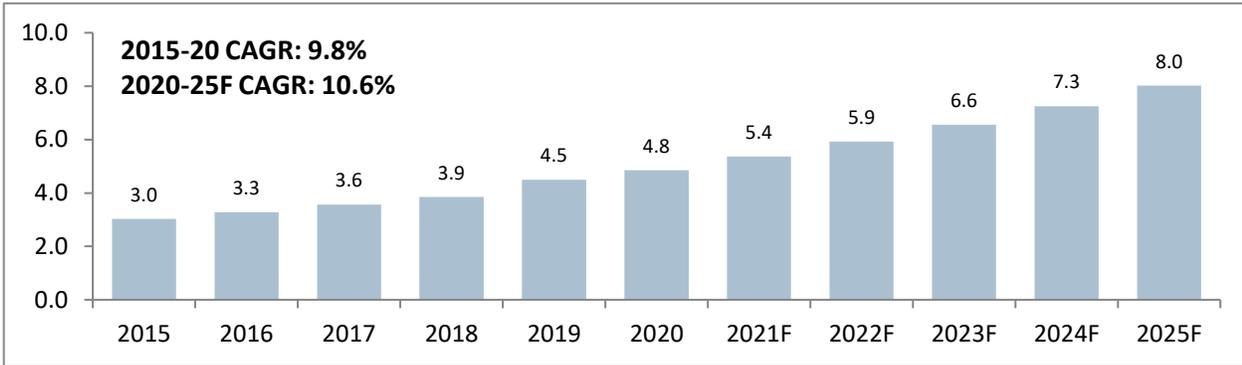
Source: Frost & Sullivan Primary Research & Analysis

Unlike the global market considering that the economy comes under 'developing' nations, anti-infective forms the largest category of APIs. Cardiovascular is one of the growing segments associated with growth in lifestyle diseases. Cardiovascular diseases (CVDs) became the leading cause of mortality in India.

5.4 India API- KSM Market

The key starting materials/ intermediates form the essential part of Pharmaceutical value chain in India. Intermediates refer to the substances that are semi-finished products and /or material that is essential to make a product. The market for Pharmaceutical intermediates in India for the year 2020 was estimated to be around USD 4.8 Bn, growing at a CAGR of 9.8% over 2015-20.

Exhibit 5.7: Indian API-RM/KSM Market size (USD Bn), 2015-2025F

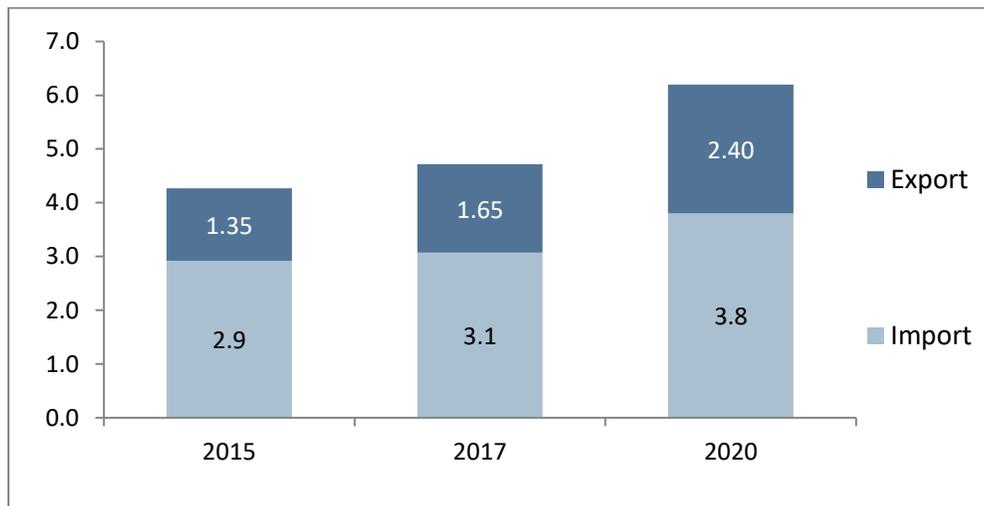


Source: Frost & Sullivan Primary Research & Analysis

The development of specialty intermediates is driven by the need for application-specific chemicals of various industries. Dynamic advancements in end-user industries demand for a change in product using different stages of intermediates. In India, with emphasis on product innovation, brand building and environmental friendliness, the industry especially that of specialty intermediates is moving toward greater customer orientation. India’s strengths in organic chemicals’ synthesis and process engineering along with global reliance on Intellectual property protection are key aspects of differentiation

Imports and Exports:

Exhibit 5.8: India API-RM/KSM, Trade, 2015, 2017, 2020, USD Bn



Source: Frost & Sullivan, World Trade Statistics & HSIE Research, *Estimates from speciality chemicals trade based on Primaries with experts

5.5 Trade Scenario of API

Domestic Consumption vs. Exports

Of the total domestic API demand, about 32–35% was imported in 2019. India imported USD 3.5 Bn worth of bulk drugs in FY19. Of the overall imports, 57-60% of the imported APIs originate from China alone. Countries such as Italy, Germany, Malaysia and others are the other countries of origin. These facts suggest that the domestic API market has enough potential to be self-reliant if manufacturers are willing to produce the required quantity of APIs on their own instead of importing them from other countries.

Exhibit 5.9: Major Imports of India (USD Mn)

Commodity	Mar 2014	Mar 2015	Mar 2016	Mar 2017	Mar 2018	Mar 2019	CAGR
Petroleum Crude & Products	164,765	138,326	82,944	86,964	108,659	140,884	-3.1%
Gems & Jewellery	58,436	62,351	56,509	53,739	74,668	64,666	2.0%
Electronic Items	32,384	36,857	40,022	41,930	51,541	55,476	11.4%
Chemical & Related Products	35,645	38,554	36,888	33,681	40,393	47,803	6.0%
-Bulk Drugs, Drug Intermediaries	3,147	3,246	3,248	2,738	2,993	3,560	2.5%
-Drug Formations, Biologicals	1,492	1,563	1,583	1,662	1,841	2,019	6.2%
Machinery (Capital Goods)	31,103	32,023	33,217	32,769	39,149	46,052	8.2%
Ores & Minerals	24,604	26,918	20,684	21,637	31,744	33,623	6.4%
Base Metals	21,563	27,047	24,704	21,552	27,429	32,364	8.5%
Transport Equipments	16,168	15,288	15,394	19,560	19,175	19,762	4.1%
-Auto Equipments	4,264	4,668	4,885	4,571	5,632	5,860	6.6%
-Vehicles	339	336	337	369	385	413	4.0%
Agri & Allied Products (FMCG)	13,492	19,004	20,674	23,211	22,223	18,560	6.6%
Plastic & Rubber Articles	12,769	14,327	13,761	14,020	17,038	18,469	7.7%
Total Imports of Merchandise	450,200	448,034	381,007	384,356	465,581	507,410	2.4%
Total Imports of Services	78,700	81,600	84,600	95,900	117,500	125,500	9.8%
Total Imports	528,900	529,634	465,607	480,256	583,081	632,910	3.7%

Source: Frost & Sullivan, World Trade Statistics & HSIE Research

For bulk drugs, the import substitution had begun to progress in FY16 to FY18, however it spiked again in FY19. Nevertheless, the Government of India has launched initiatives and feasible government policies to encourage domestic production of bulk drugs and import levels reduce gradually. Going forward the share of imports in bulk drug is expected to reduce with increased local production

Exports: Formulations and API

India is one of the largest distributors of bulk drugs and formulations globally. Pharmaceuticals export from India stood at USD 20.7 Bn in 2019-20. Moreover, India is the largest supplier of generic medicines globally (20 to 22% of the global export volume). India accounts for 44% of global Abbreviated New Drug Applications (ANDA). The country also has the largest number of US FDA approved plants (total 665 outside of the US). The Indian generics industry can benefit substantially from the patent cliff as patents for branded molecules with cumulative global sales of over USD 251 billion are expected to expire between 2018 and 2024, opening new opportunities for the industry.

Imports: Bulk Drugs & API

While India is one of the world's leading exporters of formulated drugs, its pharmaceutical industry relies heavily on bulk drug exports. As the industry matured and grew, compared to the API, Indian players graduated to the highly lucrative formulation portion of the value chain. At present, the bulk drug industry accounts for around one-fourth of the overall pharmaceutical market in India and formulations dominate the remainder.

The Indian Pharma industry is highly dependent on imports from China for some of the key APIs: penicillin G, levodopa, streptomycin, meropenem, carbidopa, vancomycin, gentamicin and progesterone. Domestically produced APIs account for 60 – 70% of the total quantity; however, key starting material (KSMs) for some key APIs like caffeine, chloramphenicol, azithromycin, sulfadoxine, ciprofloxacin, metformin, ciprofloxacin, levofloxacin, ofloxacin, ampicillin, amoxicillin and cephalosporins are sourced from China. All fermentation-based products like penicillin G, amoxicillin and tetracycline, which are used as base chemicals for most antibiotics, have a very high dependence on China.

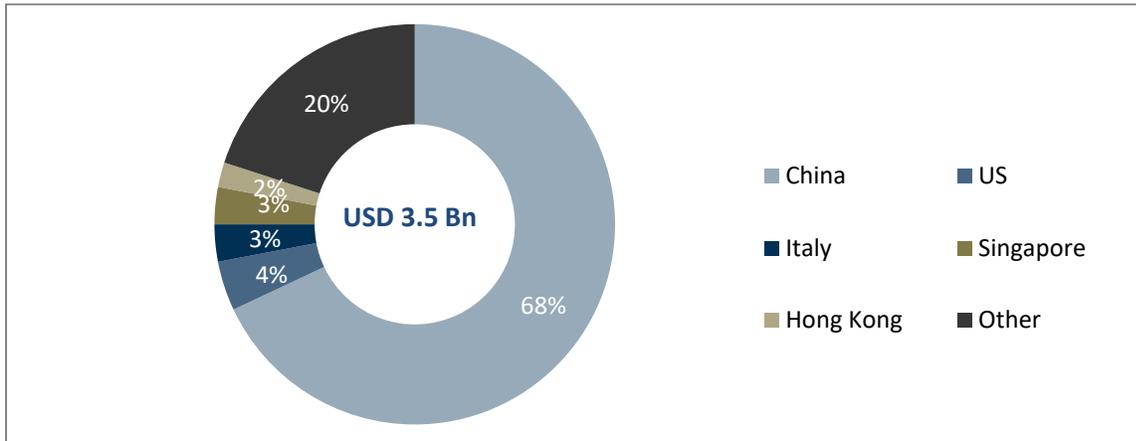
Exhibit 5.10: Key Intermediates / KSMs from China having high demand in India

Name of intermediate	Name of API synthesized	Therapeutic
Cyanoacetic Acid	Caffeine	Caffeine is a stimulant drug used in multiple API / drugs Caffeine is most commonly used to improve mental alertness, for treating migraine headaches, among others
L-aminodiol	Chloramphenicol	Antibiotic (eye and ear infections)
Azithromycin amine	Azithromycin	Antibiotic (chest infections)
MCPSA and DCMP	Sulfadoxine	Sulfa drug to treat malaria
Cyclopropylamine DCFA – 2, 4-Dichloro-5-flourobenzoyl Chloride Ethyl 3-(N,N dimethyl amino) acrylate	Ciprofloxacin	Fluoroquinolones antibiotics to treat chest infections (including pneumonia)

DCDA	Metformin	Type 2 diabetes
2, 3, 4, 5-tetrafluoro benzoyl chloride	Levofloxacin ester Ofloxacin ester	Quinolone antibiotics to treat bacterial infection
L-Alaninol	Levofloxacin ester	Quinolone antibiotics to treat bacterial infection
DL-Alaninol	Ofloxacin ester	Treatment of respiratory tract and skin, for gonorrhea, and several urinary tract conditions.
6 APA	Ampicillin and Amoxicillin	Penicillin-type antibiotics used to treat bacterial infections of the middle ear and respiratory tract, tonsils, throat, larynx (laryngitis), urinary tract, skin, and gonorrhoea.
7 ACA	Cephalosporins	Beta-lactam antimicrobials used to manage a wide range of infections from gram-positive and gram-negative bacteria.
(S,S)-2, 8 Diazabicyclo [4, 3, 0] Nonane	Moxifloxacin	Treat certain infections caused by bacteria such as pneumonia, and skin, and abdominal (stomach area) infections
4-Cyanopyridine	Ethionamide Protionamide	Treat tuberculosis (TB)
4-Amino-5-(aminomethyl)-2-methyl pyrimidine	Vitamin B1 Hcl	Treat or prevent a lack of thiamine (deficiency)
4-Methyl-5-ethoxyloxazole 2-isopropyl-4, 7-dihydro-(1,3)-dioxepin	Vitamin B6 Hcl	n/a
2-mercaptothiazoline	Cysteamine Hc	Treat eye problems in people with cystinosis
3-Cyanopyridine Beta Picoline	Niacin	Prevent and treat pellagra (niacin deficiency)
	Penicillin G	Essential API for manufacturing several antibiotics

Source: IDMA, Frost and Sullivan Analysis

Exhibit 5.11: India's Bulk Drugs import by Country, 2019, USD Bn



Source: CII, Frost & Sullivan Analysis

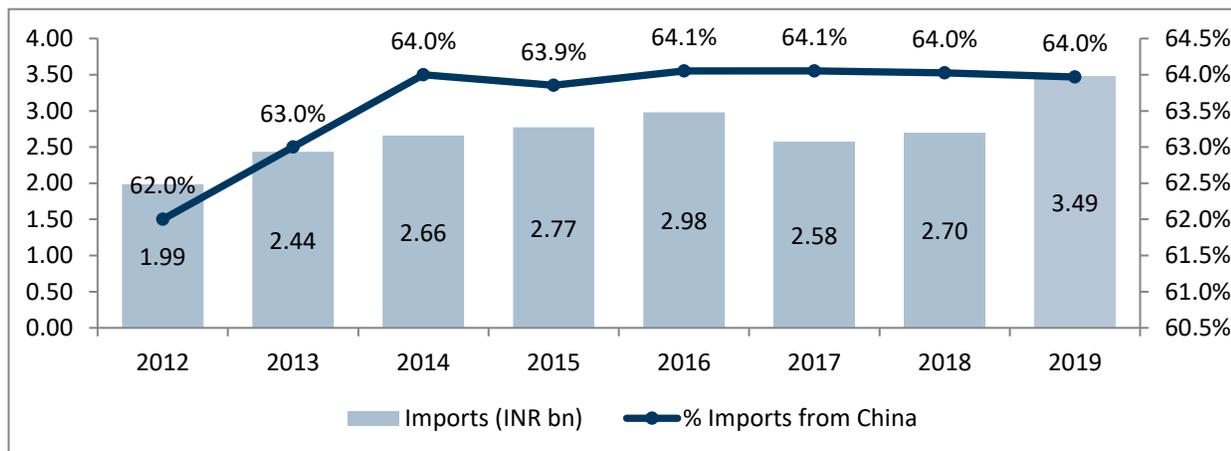
India imported around USD 2.9 Bn worth of bulk drugs in FY19 which is y-o-y increase of ~30% from FY18

Exhibit 5.12: India's import by Country, 2015-2025F, USD Bn

CAGR	China	USA	Italy	Others	Total
2015	1.77	0.17	0.14	0.69	2.8
2016	1.91	0.15	0.15	0.78	3.0
2017	1.65	0.13	0.10	0.70	2.6
2018	1.73	0.14	0.11	0.73	2.7
2019	1.85	0.14	0.10	0.85	2.9
2020	2.23	0.14	0.10	1.01	3.5
2025F	1.12	0.21	0.11	0.98	2.4

Source: CII, Frost & Sullivan Analysis

Exhibit 5.13: India's import dependency, % being imported from China, India, 2012 to 2019



Source: CII, Frost & Sullivan Analysis

Imports from China have been on a steady rise over the years (from 62% in FY12 to 64% in FY19) due to the low-cost advantage enjoyed by Chinese manufacturers. In FY19, India imported USD 2.23 billion worth of APIs from China while exporting merely USD 0.224 billion worth of APIs to China. However India is trying to reduce its dominance on China for APIs. India plans API production push and hopes to challenge Chinese dominance. India is reportedly working on a plan to supersize its own ingredient manufacturing to combat Chinese dominance in the market. The Indian government is planning to escalate domestic production of pharmaceutical ingredients to counteract a perceived over-reliance on Chinese imports now hampered by COVID-19 shutdowns. India has identified and prioritized production of 53 raw materials and active pharmaceutical ingredients (APIs) as part of its "China-plus-one" policy to fill in supply gaps of affordable medicines.

5.6 How is the KSMs/Intermediates market growing in India and becoming self reliant

Over 70% of India's KSM/API import requirement is satisfied by China, mostly for antibiotics and vitamins. India's dependence on China for APIs and bulk drugs can be attributed to the fact that Chinese imports are 20%-30% cheaper than their Indian counterparts. According to data from the Trade Promotion Council of India (TPCI), India currently imports 53 APIs and KSMs from China. In 2018-19, India's Pharma companies imported Chinese-made bulk drugs and intermediates worth ~USD 2.4 Bn, highlighting the industry's large dependence on China

Key starting material (KSMs) for some key APIs like caffeine, chloramphenicol, azithromycin, sulfadoxine, ciprofloxacin, metformin, ciprofloxacin, levofloxacin, ofloxacin, ampicillin, amoxicillin and cephalosporins are sourced from China.

Covid-19 highlighted the loopholes of the Indian Pharmaceutical market. The irregularities in supplies not only skyrocketed the domestic prices for certain medicines but also disturbed foreign trade due to the restrictions on exports. The low availability of Key Starting Material (KSM) in India has highlighted the weak points of India's pharmaceutical sector. After Covid-19 pandemic, India decided to have higher

focus on reducing import dependence of Active Pharmaceutical Ingredients (APIs) and key starting material (KSM) for drug manufacturing.

The DSA (Drug Security Authority) aims to make India self-sufficient and also help it become a global leader in manufacturing of APIs, key starting materials, intermediate and chemicals for domestic as well as export. The aim is to ensure India becomes a USD 120 billion industry in 10 years and transforms itself into a huge pharmaceutical market.

CSIR-NCL (Council of Scientific and Industrial Research–National Chemical Laboratory) has plans to scale-up research on drug intermediates to cut imports from China. NCL is working on molecules that can be key ingredients for making various kinds of drugs as a part of Prime Minister Narendra Modi's approved special package for the Promotion of Bulk Drugs Parks, announced on March 21.

The Government of India announced INR 9,940 crores packages to boost the domestic API manufacturing industry. The package is divided into two parts – INR 6,940 crores has been allocated for the PLI Scheme and INR 3,000 crores will be spent on setting up three bulk drug parks. Out of the total allocation of INR 6,940 crores for the PLI Scheme, INR 4,600 crores will be earmarked for fermentation-based products and INR 2,340 crores for chemical synthesis products. The PLI scheme is applicable to 41 critical KSMs/APIs and aims to address the supply issue of 53 identified critical APIs. The list has been classified into two broad categories – chemical synthesis products comprising of 27 KSM/APIs and fermentation-based products comprising of 14 KSM/APIs. Under the fermentation-based category, two companies per product will benefit from the incentives, while four companies per product will benefit under the chemical synthesis category.

The national scheme for promotion of bulk drug parks focuses on the reduction of the manufacturing cost of bulk drugs in the country and dependency on other countries for its availability. In line with this, CSIR-NCL has undertaken research work in the area of chemical synthesis of drug intermediates. More than 27 or so bulk drugs cover different therapeutic classes such as anti-viral, retro-viral, antibiotics, anti-bacterial, anti-fungal, cardiovascular, diabetes, cholesterol-lowering, anti-cancer to simple painkillers like paracetamol, are synthesised from about 10-12 simpler building blocks or KSMs/ drug intermediates.

These initiatives and government support will help India attain self-sufficiency in the drug supply chain. Advancements in chemical processes will bring down the cost of production through continuous flow synthesis, process optimisation, and reaction engineering which would help India is more self-reliant.

5.7 India: Well placed to see growth in this market

The key strategy of the Indian manufacturers till date has been to do a higher value addition to the products and then explore markets across the globe for better realization. As such most companies focused on producing speciality products and started importing the basis key starting materials and intermediates. Many of the key starting materials and intermediates thus have been imported to large extent from over a decade from China, which has been an economical sourcing option. Almost 80% of the intermediates as of 2019 were imported.

Cost Head	China Advantage
Raw Material	Cheaper by 25-30% as compared to India
Cost of production	~20-30% lower than in India
Set-Up Costs	15-20% lower set-up costs due to economies of scale
Logistics Costs	1% of total costs in China vs. 3% for India
Electricity	Lower by 20-30% compared to India; Steam is 40–50% cheaper compared to India
Financial Assistance	~13% tax incentives for the export of APIs and soft loans; Exemption from various taxes and low to no import duties
Other Costs	Cheaper by 25-30%

Source: Industry Input

The Government of India's proposition to support local manufacturing of many possible raw materials and intermediates especially in the Pharmaceutical space will enhance the growth in the domestic market and reduce imports, especially from China. With a shift in investments from regulated markets like Europe to developing countries like India, domestic production is expected to increase, reducing dependency on imports encouraging the current trend of exports of intermediates to grow substantially.

India plans to set up a nearly Rs 1 lakh crores (USD 1.3 Bn) fund to provide boost to companies to manufacture pharmaceutical ingredients domestically by 2023. Government of India unveiled 'Pharma Vision 2020' to make India a global leader in end-to-end drug manufacture. The approval time for new facilities has been reduced to boost investment.

With many global end users looking for an alternative to China, India stands as an immediate alternate due to its significant years of experience in handling global regulatory requirements, strong process know how, strength in R&D and low cost. India has a good number of well-trained chemists and R&D scientists to support the ever-evolving Pharmaceuticals Industry.

The cost of setting up a fully FDA-inspected plant in India is on an average 50% less when compared to the developed countries. The production and operation costs have been found to be 40-70% lower when compared to the developed nations. Labour costs in India are on average 60-70% less than those in developed nations.

5.8 Drivers & Challenges in Indian API Industry

Key Drivers:

Increased Consumption of Generic Drugs

India is a developing country in which a large part of the population lives below the poverty line. The poverty rate in India is 12.4%, according to the World Bank. These people and many others need cost-effective treatment. Consequently, the market for generic drugs, which are made with the aid of APIs, has increased. The growth of the Indian API market will be fuelled by a further rise in demand for generic medicines.

Invention of New Generation of APIs

There is an urgent need for new research developments in the pharmaceutical industry in India that will yield ground-breaking and successful drugs and therapies. This need is an important factor driving the growth of the country's API industry, which has led to a new generation of APIs being invented. Ionic liquids are one example of the latest age of APIs. Used as APIs are ionic liquids with biological activity. Ionic liquids are organic salts with melting points below 100°C, and composed entirely of ions

Outsourcing

It plays the major role for India's API industry and hence the country has the biggest number of USFDA-approved plants outside the US and the trend is expected to continue with China also facing environmental and stability crisis. Also, the cost of setting up and running a new manufacturing facility in India is one-fifth of the cost of western countries thus attracting investments in the space

Other Drivers

- Increasing disposable income and health care awareness is encouraging multinational and domestic Pharma companies to invest in R&D and new facilities in India
- Local companies with indigenous manufacturing capability, 100% FDI in Pharma through automatic route, a front runner in a wide range of specialties involving complex drugs' manufacture, development, and technology

Key Challenges:

India relies primarily on China to import APIs which form a major pharmaceutical ingredient for some of the main drugs. Around 64% of India's APIs are imported from China.

Inadequate infrastructure

Indian API manufacturers are facing higher operating costs largely because of insufficient funding for infrastructure. There is a shortage of clusters of bulk drugs, access to low-cost services (waste management systems, steam, water, power, etc.), funding for R&D and skilled staff. Moreover, inadequacy of infrastructure for proper transportation and storage of drugs is a major hurdle in proper functioning of the supply chain in Pharma which is one of the essential requirements especially with biologics based products

Environmental clearances issues

The clearance process is complex as approvals need to be obtained from several authorities, such as the State Environmental Impact Assessment Authority 's Prior Environmental Clearance; the Coastal Regulation Zone (CRZ) clearance from the Coastal Zone Management Authority of the State / Union Territory concerned (CZMA); the State Pollution Control Board's authorization for the handling of hazardous waste; from State Pollution Control Board; evaluation of groundwater abstraction from Central Groundwater Authority and Ministry of Environment, Forests and Climate Change (MoEF&CC)

Complex approval process for setting up a manufacturing plan

There are several regulatory bodies that frame rules and guidelines for the pharmaceutical and bulk drug industries, directly or indirectly. This multiplicity can lead to inefficiencies in resource distribution at the policy-making level and also generates a fragmented agenda. The challenges pertaining to regulations, at times, can take longer to resolve due to multiple decision makers. The approval timelines are lengthy (takes about two– three years) and voluminous (about 20–25 approvals) with multiple stakeholders

Coronavirus outbreak and impact on supply chain

Pharmaceutical players in India are closely monitoring China's coronavirus outbreak and its effect on the country's supply of KSMs and APIs, especially antibiotics and vitamins. Compared to larger companies with diversified drug portfolios, the effects of China's production slowdown has been more detrimental to smaller players. The price of some pharmaceutical ingredients has spiked, at least in the short term, for Indian drug manufacturers. Since January 2020, the price of various mainstream antibiotics such as Azithromycin has increased by at least 50 %. The Indian government had moved to set limits on the export of around 26 pharmaceutical ingredients to counter the domestic shortage of essential medicines

Other Challenges

- Inadequate R&D, Lack of required high end product development capable Human resource, insufficient cold storage facilities are some of the key challenges from manufacturing perspective.
- Absence of a well-structured healthcare System in rural India which is a significant segment of population. According to estimates, urban centres are home to almost 70% of the doctors and almost 65% of the country's hospital beds despite having less than 30% of the total population. This has resulted in high level imbalance when it comes to providing proper healthcare services and products to rural India, which in turn has impacted the Pharmaceutical segment.
- Recently, there have been many issues faced by Indian companies due to non-adherence of US FDA norms in manufacturing. The problem faced by Indian companies is not because of the quality issues but more from the documentation maintenance irregularities. Whenever there is a quality issue with the product, Indian companies have voluntarily recalled back the products.
- Fragmented and unorganised distribution system and very less penetration of IT solutions has made the entire process more cumbersome, however it is starting to change.

5.9 Government Initiatives

China's outbreak of COVID-19 has affected the world economy hard, and one of the worst-hit manufacturing sectors is the Indian pharmaceutical industry. The price of some of the essential medicines in India has shot up, such as Paracetamol. Fearing that the supply disruption from China will continue for an extended period of time, on 3 March 2020, the Directorate-General of Foreign Trade (DGFT) of India amended the Export Policy 2018 (Amendment to the Export Policy of APIs and Formulation of APIs) with a view to limiting expenditure of certain pharmaceutical products from India.

This restriction extends to 26 active pharmaceutical ingredients (APIs) and their formulations, including paracetamol, vitamins, hormones and antibiotics, which account for approximately 10% of total pharmaceutical exports to India. The Export Policy (Amendment to the Export Policy on Hydroxychloroquine and its Formulations) was subsequently amended on 25 March 2020 to limit the export of APIs and 'wonder drug' formulations of hydroxychloroquine for the treatment of COVID-19 conditions.

These initiatives are aimed at ensuring that drugs are available in India. As India is the world's largest supplier of generic drugs, a range of countries have introduced initiatives to determine the effect on their public health programmes of this restriction.

The Indian government had tasked the Katoch Committee to recommend steps to ensure the self-sufficiency of bulk drugs in the country. India has plans to give impetus to domestic API production. The report released in 2015 by the committee made recommendations as follows: Setting up of six large API manufacturing clusters or mega parks in five to six states. These clusters would be equipped with facilities such as common effluent plants, testing facilities, assured power supply, and IPR management

- **Provision of financial benefits to producers:** A 15-year tax holiday for developers / participants of clusters
- The government is also considering exempting producers from the Drug Price Control Order (DPCO) if a drug is made from a locally produced API⁵⁷⁷
- Land and other infrastructure installations at concessional rates, interest subsidies on bank loans (up to 7.5% interest subsidy)
- **Single-window environmental clearance** of all drugs to API manufacturers until the plant is authorised by the Ministry of the Environment
- **Income tax advantages** for an initial duration of 10 years from the date of launch of the product for each product
- A plan to provide a corpus of about INR 5 Bn in venture capital funding to support pharmaceutical SMEs was also submitted
- **Liberalize FDI policies:** 100% FDI in the pharmaceutical industry - 74% under the automatic route for brownfield projects and 100% under the automatic route for greenfield projects have been adopted by the government

Unique zones and bulk drug parks- A cluster structure specific to bulk drugs was created by the Department of Pharmaceutical in 2016. It proposed a public-private partnership (PPP) model for setting up a cluster with government funding of up to 70% of the project cost, subject to an INR 0.2 Bn cap. A sum of INR 1.25 Bn was allocated for this cluster creation scheme in the 2012-17 five-year plans.

5.10 Global and India Anti-Hypertensive Drugs Market Overview

Global Anti-Hypertensive Drugs Market Overview

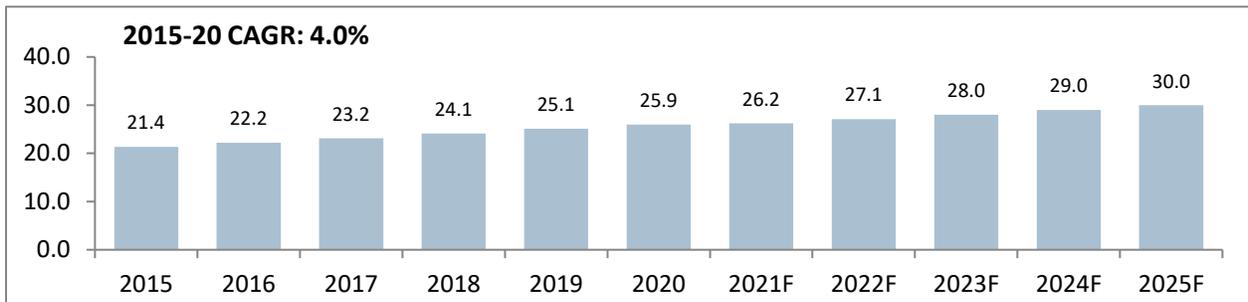
The global antihypertensive drugs market accounted for USD 25.9 Bn in 2020, and is expected to reach USD 30 Bn by 2025, registering a CAGR of 2.9% from 2020 to 2025.

The anti-hypertensive drugs market consists of sales of anti-hypertensive drugs and related services. These drugs are used to prevent heart failure, kidney failure and acute stroke induced by hypertension. Some of the major anti-hypertensive drugs include diuretics, angiotensin-converting enzyme (ACE) inhibitors, and angiotensin II receptor antagonists. The market is segmented by therapeutics into diuretics, angiotensin receptor blockers (ARBs), angiotensin converting enzyme (ACE) inhibitors, beta blockers, alpha blockers, calcium channel blockers, renin inhibitors, vasodilators; by disease source into primary hypertension, secondary hypertension.

On the basis of therapeutics type, diuretics segment held the major share of the market in terms of revenue and is anticipated to grow with a CAGR of 3.8% (2021-2026). The reason is attributed to the fact that in most patients thiazide diuretics are the cornerstone of hypertension treatment. Hydrochlorothiazide is the diuretic with thiazide most commonly used, resulted in the hike in demand for Anti-Hypertensive Drugs'. In addition, the US Joint National Committee on the prevention, detection, evaluation and treatment of high blood pressure recommends thiazide-type diuretics as one of the preferred hypertension drug treatments and these continuous advancements in this field is anticipated to augment the diuretics segment.

Apart from this, calcium channel blockers are poised to set the fastest growing segment in the forecast period 2020-2025. This is increasing the global demand owing to lesser side effects of these medicinal products compared with other antihypertensive drugs. In addition, the benefits offered such as positive effects on overall health and reductions in the progression of kidney diseases.

Exhibit 5.14: Global Anti-Hypertensive Drugs Market (USD Bn), 2015 - 2025F



Source: Frost & Sullivan Primary Research & Analysis

Drivers and Restraints

The factor that contributes highly toward the growth of antihypertensive drugs market is the surge in incidence of hypertension across the globe. Furthermore, rise in awareness related to complications associated with hypertension is a major factor that fuels the growth of the market. Moreover, an increase in geriatric population and sedentary lifestyle boosts the growth of the market.

A sedentary lifestyle is another major driver for the growth of the anti-hypertensive drugs market. Consumption of junk food, lack of proper healthy and balanced diet, lack of proper sleep due to irregular work shifts have contributed to the increase in hypertension. Hypertension is the underlying factor for at least 45% of deaths due to heart disease and 51% of deaths due to stroke. Once the patient is diagnosed of hypertension, patients are required to use the drugs to control hypertension based on the severity of the condition. This creates a sustainable demand for the product and acts as a prominent driver for the growth of the market.

However, recent patent expirations are anticipated to hinder the growth of the antihypertensive market. Conversely, rise in research related to antihypertensive drugs is expected to offer lucrative opportunities during the forecast period. Low awareness of the antihypertensive drugs amongst the population is one of the major restraints in the anti-hypertensive drugs market. Firstly, most of the people in developing nations neglect their health-check-ups and are not aware about the existing hypertension condition in them until they detect extreme symptoms. Secondly, persons diagnosed with hypertension do not adhere to their medication schedule and stop taking medication after 1-2 weeks until symptoms return, thereby posing a huge challenge to the anti-hypertensive drugs market.

Of late, there has been a rise in the use of combination therapies compared to a mono-therapy treatment. Mono-therapy is the treatment of a hypertension with a single drug, while the use of combinations of drugs (Combination Therapy) allows for action on several different hypertensive mechanisms. When we combine the two drugs with different mechanisms of action, the effect is two to five times greater than mono-therapy. Increasing the dose of mono-therapy reduces coronary events by 29% and cerebrovascular events by 40%, while combining two antihypertensive agents with a different mechanism of action reduces coronary events by 40% and cerebrovascular events by 54%. Thus, the use of combination therapy provides greater protection to a target organ than increasing the dose of mono-

therapy. The trend of using combination therapy is thus more effective and is being widely accepted as well.

The US Food and Drug Administration (FDA) issued guidance on developing fixed-combination drugs to treat hypertension. This primarily focuses on the clinical development of two-drug combinations of previously approved products. US FDA expects to see a reduction in adverse effects for combinations that include doses below each drug's maximum dose compared to single drug regimens at their maximum dose. Earlier physicians typically started a patient on a single drug and titrated up to a maximum dose before adding additional drugs to their programme, current guidelines recommend starting patients on two drugs at less than their full doses. Hence, this guidance would keep a check on the fixed-combination drugs.

Key Players

Major players in the anti-hypertensive drugs market are Merck & Co, Astra Zeneca, Daiichi Sankyo Company, Johnson & Johnson, Pfizer, Novartis, Sanofi, United Therapeutics, Ranbaxy Laboratories, Bayer, Lupin, Boehringer Ingelheim, Ranbaxy Laboratories, Takeda, Actelion, JW Pharmaceutical, Gilead, CJ Healthcare, Boryung Pharmaceutical, and Cipla among others.

In May 2017, Mankind Pharma, a global Pharma company that manufactures and markets a broad range of healthcare products launches anti-hypertensive drug, Zolahart (Azilsartan), a new generation anti-hypertensive drug, offers potent and persistent 24 hours' blood pressure control. It is proven to be safe for hypertensive patients with comorbid conditions like diabetes or chronic kidney disease (CKD).

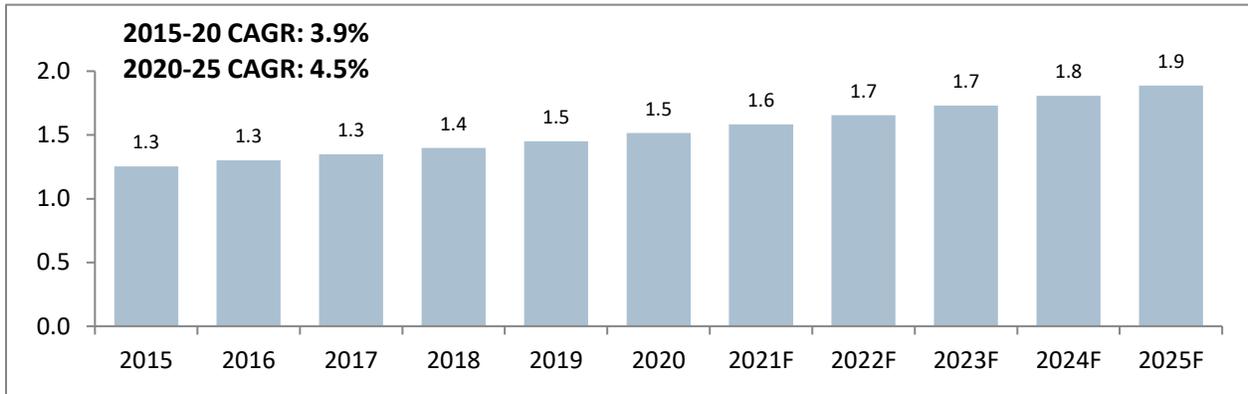
In April 2015, The US arm of the drug maker, Lupin Pharmaceuticals Inc., launched Amlodipine and Valsartan tablets in various strengths in the US market, for the treatment of hypertension and to lower blood pressure after getting final approval from the United States Food and Drug Administration (USFDA).

Split by Geography

North America is expected to capture the largest market share of 35% (2021) owing to the high prevalence of hypertension related to renal and cardiovascular disorders in this region. Running drives by non-government and government organizations for spreading awareness among people are mostly bottling revenue generation opportunities in North America. As per the American Heart Association, under the updated guideline, more people will be diagnosed with hypertension, nearly half of American adults (46%), up from 32% under the previous definition in 2021. Europe is expected to capture the second position due to the prevalence of cardiovascular diseases, improper diet habits, increasing obesity in children as well as in adults and high prevalence of hypertension that leads to death or disabilities in people. Asia-Pacific region will witness the highest growth in the antihypertensive drugs market owing to the high incidences of cardiovascular diseases, government initiatives taken for healthcare sector and high population pool. In addition, the ever-evolving life science industry is driving market growth in developing economies such as India, China and Malaysia.

5.11 India Anti-Hypertensive Drugs Market Overview

Exhibit 5.5 India Anti-Hypertensive Drugs Market (USD Bn), 2015 - 2025F

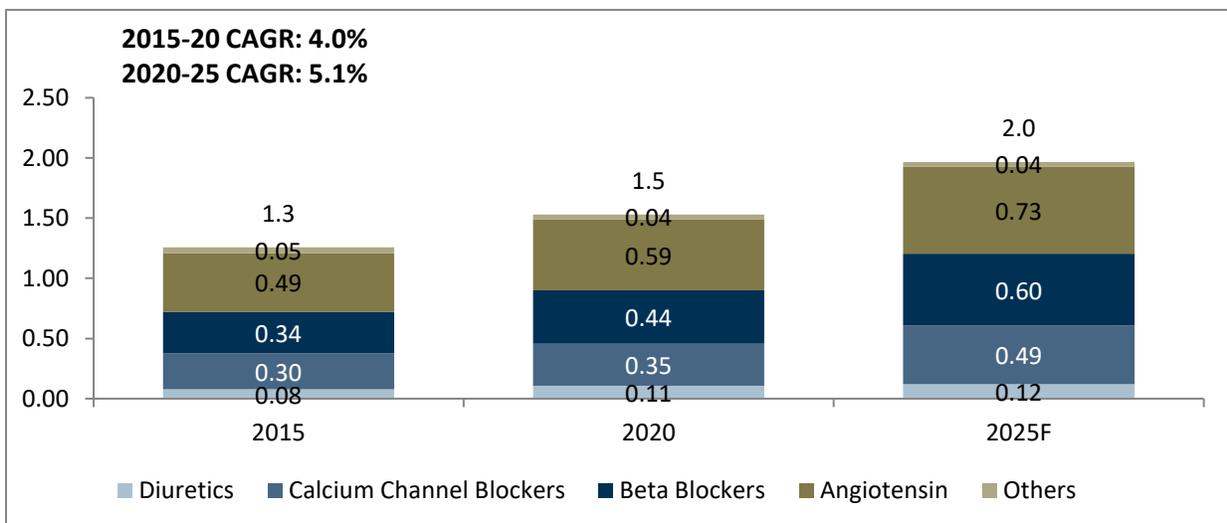


Source: Frost & Sullivan Primary Research & Analysis

Hypertension is an important public health problem in India and leads annually to over 1.5 Mn deaths. Several guidelines published have re-focussed international attention on hypertension. A crucial focus in all these guidelines is both the achievement of optimum blood pressure (BP) as well as overall reduction in cardiovascular (CV) risk. These can be achieved by combination of a range of interventions:

- Lifestyle changes (increased physical activity, increased consumption of fruits and vegetables, sodium restriction, weight management, alcohol abstinence and smoking/tobacco cessation)
- Drugs to lower BP (calcium channel blockers-CCBs, diuretics, angiotensin converting enzyme inhibitors-ACEI, angiotensin receptor blockers-ARBs, beta-blockers, etc.) and to lower lipids using statins

Exhibit 5.16: India Anti-Hypertensive Drugs Market by Class, 2015, 2020, 2025F, USD 1.3 Bn, USD 1.5 Bn, USD 2.0 Bn



Source: Frost & Sullivan Primary Research & Analysis

Angiotensin had the highest market share in the hypertension drug segment in India and was worth USD 0.57 Bn in 2019. Beta Blockers had the second highest market value among the drug classes in hypertension that same year.

Sartans Overview

Sartans are the latest generation of anti-hypertensive drugs, which have good anti-hypertensive effect and drug tolerance, less adverse reactions, and have protective effect on target organs. Sartans have less reactions on internal organs and therefore, its use is increasing consistently. There are more than 1 Bn patients with hypertension in the world as of now. Long term treatment drives the demand for Sartans and intermediates. Due to the shortage of key intermediates, the tightening of environmental protection and the incident of Sartan impurities, the supply of Sartan products is in short supply and the price continues to rise. The Sartans can be divided into 5 categories: Valsartan, Irbesartan, Telmisartan, Losartan and Others. The global market is expected to grow by an around 3.2% from 2019-20 and the revenue will be around USD 15.6 Bn in 2019 to ~USD 16.1 Bn in 2020. The market size of Sartans will reach USD 16.7 Bn by 2025, with a CAGR of 1.4% from 2020 to 2025F.

Valsartan API

Valsartan, sold under the trade name Diovan among others, is a medication used to treat high blood pressure, heart failure, and diabetic kidney disease. It is a reasonable initial treatment for high blood pressure. It is taken by mouth. Versions are available as the combination valsartan/hydrochlorothiazide, valsartan/amlodipine, valsartan/amlodipine/hydrochlorothiazide, or valsartan/sacubitril. Valsartan makes up for the largest market share contributing to ~USD 6.5-7 Bn.

The India valsartan market is driven by the growing geriatric population in the country susceptible to various chronic diseases such as cardiovascular diseases including heart failure, myocardial infarction, hypertension, diabetes, among others. This has drastically increased the patient pool. This in turn is expected to positively influence the market growth through 2025. Additionally, valsartan also reduces hospitalizations in patient with heart failures thereby fuelling the market growth over the next few years.

Based on source, the market can be split in in-house and contract manufacturing organizations. The contract manufacturing organizations segment is expected to witness significant growth during the forecast period on account of the increasing outsourcing being done by the major pharmaceutical companies for the manufacturing of APIs and drugs so that they can focus on their R&D activities and expansion plans. Additionally, these organizations have the capability to produce and provide bulk quantities of formulation to their clients at affordable prices and in lesser time.

Irbesartan API

Irbesartan, sold under the brand name Avapro among others, is a medication used to treat high blood pressure, heart failure, and diabetic kidney disease. It is a reasonable initial treatment for high blood pressure. It is taken by mouth. Versions are available as the combination irbesartan/hydrochlorothiazide.

The increasing prevalence of high blood pressure is driving the Irbesartan market. Hypertension is a primary contributor to heart disease and stroke, the first and third leading causes of death worldwide. ~29% of the world's population is expected to suffer from hypertension by 2025, accelerated largely by increase in instances in economically developing nations. The high prevalence of hypertension creates a huge public health burden. In the past three decades, the highest global blood pressure levels have moved from high-income countries to low-income countries in South Asia and sub-Saharan Africa due to opposite trends, while blood pressure has been determinedly high in central and Eastern Europe. FDA's voluntary recalls owing to suspects of cancer-causing chemicals and contamination are hindering the growth of the irbesartan market of ~USD 2-2.5 Bn.

Telmisartan API

Telmisartan, sold under the trade name Micardis among others, is a medication used to treat high blood pressure, heart failure, and diabetic kidney disease. It is a reasonable initial treatment for high blood pressure. It is taken by mouth. Versions are available as the combination telmisartan/hydrochlorothiazide and telmisartan/amlodipine.

Availability of better treatment options for hypertension has lead substantial portion of the hypertensive population with controlled blood pressure. But rising population with cardiovascular and associated disorders urges the need for different antihypertensive drugs in the global market. Telmisartan is a non-peptide angiotensin receptor blocker intended for treatment of hypertension and other cardiovascular disorders. Telmisartan was approved by the US Food and Drug Administration (USFDA) in 1998, for the treatment of hypertension alone or in combination with other compounds. The global telmisartan market size was valued at ~USD 3 Bn in 2019, and is expected to witness a CAGR of 1.2% over the forecast period (2019 – 2025) to reach ~USD 3.04 Bn.

Losartan API

Losartan, sold under the trade name Cozaar among others, is a medication mainly used to treat high blood pressure. It is also used for diabetic kidney disease, heart failure, and left ventricular enlargement. It is taken by mouth. It may be used alone or in addition to other blood pressure medication. Up to six weeks may be required for the full effects to occur.

The global losartan market was valued at USD 3.8 Bn in 2019 and is expected to grow at a formidable rate of 7.81% during the forecast period. The global losartan market is driven by the growing prevalence of hypertension, stroke and diabetic nephropathy across the world. Losartan is a medication that is used to treat high blood pressure. Furthermore, losartan is widely used in slowing down long-term kidney damage due to type II diabetes which is further expected to propel the market growth through 2025.

The sudden outbreak and spread of the COVID-19 pandemic has resulted in the loss of jobs for many people due to which the level of anxiety and hypertension has increased among the people. This has, in turn, increased the demand for losartan, thereby fuelling the market growth during the forecast period. Many major biotechnology and pharmaceutical companies are working on manufacturing in-house losartan tablets which are expected to create lucrative opportunities for the market growth over the next few years.

Regionally, North America is expected to dominate in the overall losartan market owing to the well-established healthcare infrastructure and presence of major pharmaceutical and biotechnology giants in the region. However, Asia-Pacific is expected to witness robust growth in the market owing to the presence of a large pool of patients suffering from various life-threatening conditions in economies such as China and India.

India losartan market is expected to grow at a steady rate during the forecast period. The India losartan market is driven by high growth in incidence of cardiovascular diseases in India. Additionally, favourable schemes by the government for manufacturing, promotion and development of drugs, intermediates, and active pharmaceutical ingredients are estimated to drive the market growth further. Also, the dose recommended for treating diabetic nephropathy with higher serum creatinine and proteinuria in patients with type 2 diabetes will further boost the demand through 2025.

Others

The other sartans include Azilsartan, Olmesartan, Candesartan, etc.

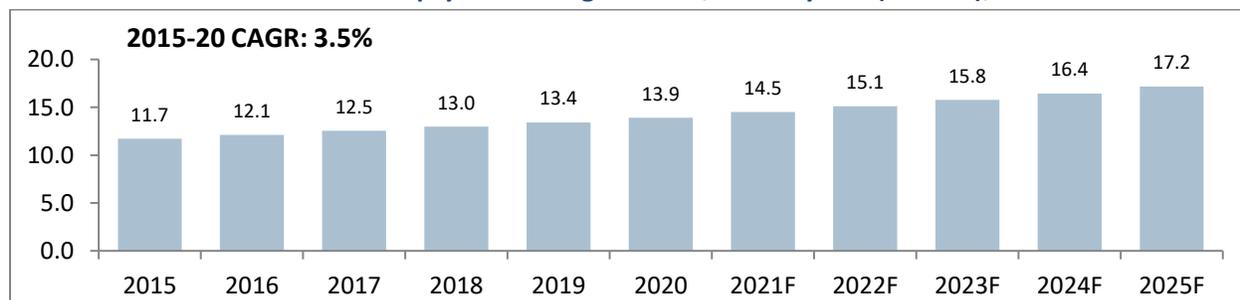
Ortho Toly Benzo Nitrile / o-Toly benzonitrile (OTBN) is the common building block for the synthesis of the sartan series of drug molecules (ARBs), such as candesartan, irbesartan, losartan, tasosartan, and valsartan.

5.12 Global Antipsychotic Drugs Market

Psychosis is a disorder where the person may face serious distortion of behavior, thought, perception and recognition of reality. The patients may experience hallucinations and delusions along with having wrong evaluation and misperception of other people, facts or situations. Psychosis is not a condition but rather gets triggered due to other conditions such as stress, traumatic experiences or physical conditions namely brain tumor, Parkinson’s disease or due to alcohol or drug misuse. The Global Antipsychotic Drugs Market was valued at USD 13.9 Bn in 2020 and is expected to grow at 4.3% over the forecast period till 2025

Due of lack of insight, the person is unaware that he/she is acting and thinking strangely. Antipsychotic drugs also known as neuroleptics or major tranquilizers are used primarily for treating psychosis. Such drugs help in blocking the dopamine receptors in the brain’s dopaminergic pathways, thus repressing the dopamine’s effect that is linked directly to psychotic experiences. These drugs are used to treat common psychotic disorders including bipolar disorder, delusions, hallucinations, schizophrenia and others.

Exhibit 5.15: Global Antipsychotic Drugs Market, Industry size (USD Bn), 2015-2025F



Source: Frost & Sullivan Primary Research & Analysis

Global estimates suggest that over 1.25% of the global population suffers from psychosis and related disorders. This translates into a potential market of about 7.5 mn people as target consumers for antipsychotic drugs. Although the potential consumer base for the market is relatively much smaller than that for diseases such as cancer and diabetes, the high costs of antipsychotic drugs make the market one with promising returns. The market holds immense growth promise for future years as the patient pool of psychotic conditions rises at an alarming rate across the globe. The introduction of newer antipsychotic compounds and the vast funds poured in for research and development activities are also expected to have a significant positive impact on the overall development of the market in the near future.

Rising in number of people suffering from psychosis and associated disorders will result in substantial market growth in the upcoming years. Continuous investment in research and development activities with respect to mental health will augment the industry growth in the near future. Rise in need and demand for more effective and target oriented treatment to make progress in treating mental disorder treatment will generate immense opportunities for the growth of antipsychotic drugs market.

Global Antipsychotic Drugs Market – By Drug Class

The antipsychotics are segmented into three classes: first generation, second generation, and third generation. First generation antipsychotic drugs are expected to witness lucrative growth in the forecast timeframe. These drugs are mainly used for the treatment of schizophrenia and other related psychotic disorders. Since the first-generation antipsychotic drugs are less expensive than the new generation drugs, they remain as a very valuable option in the treatment of mental disorders. Hence, the aforementioned factors will enhance the demand and adoption rate, boosting the segment growth in the near future.

The second generation holds the largest share in the market. This class named as atypical antipsychotics includes clozapine, risperidone, sertindole, asenapne, olanzapine, paliperidone, quetiapine. These are used for treatment of schizophrenia and have quickly begun replacing the older, first-generation antipsychotics.

The third generation, aripiprazole (Abilify) is indicated for the treatment of schizophrenia and is also used as maintenance therapy for this disease. The clinical advantages of safety and tolerability of aripiprazole contribute to the segment's growth. Thus, it is expected to be the fastest growing segment in the forecast period.

Key APIs by Drug Class

First Generation Antipsychotics

- Chlorpromazine
- Droperidol
- Fluphenazine
- Haloperidol
- Loxapine
- Perphenazine

- Pimozide
- Prochlorperazine
- Thioridazine
- Thiothixene
- Trifluoperazine

Second Generation Antipsychotics

- Aripiprazole
- Asenapine
- Clozapine
- Iloperidone
- Lurasidone
- Olanzapine
- Paliperidone
- Quetiapine
- Risperidone
- Ziprasidone

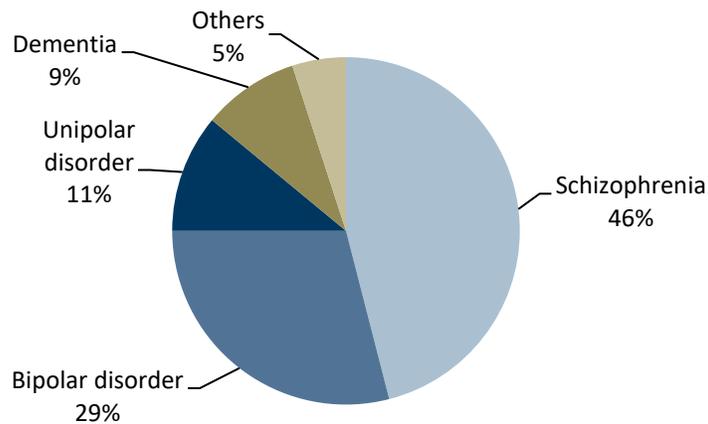
Third Generation Antipsychotics

- Aripiprazole

Global Antipsychotic Drugs Market – By Product Segment

The global antipsychotic drugs market, based on therapeutic applications, has been segmented into schizophrenia, anxiety, bipolar disorder, depression, dementia, and others. The schizophrenia segment emerged dominant in the global antipsychotic drugs market and has acquired an astonishing 45.2% of the global Antipsychotic.

Exhibit 5.16: Global Antipsychotic Drugs Market – By Product Segment, 2020 (in %)



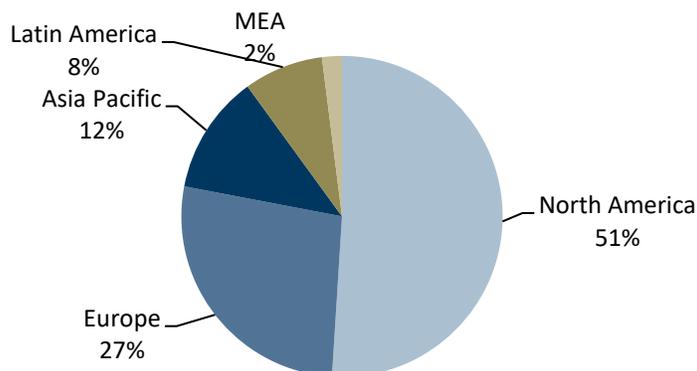
Source: Frost & Sullivan Primary Research & Analysis

Application of antipsychotic drugs in schizophrenia will witness substantial amount of growth over the forecast period. According to National Institute of Mental Health, schizophrenia is considered to be one of the leading causes of mental disability across the world. Co-occurring chronic diseases such as diabetes, cardiovascular and liver diseases contribute to increase in mortality rate among the individuals with schizophrenia. Aforementioned factors will be responsible for the industry growth in the upcoming years.

Global Antipsychotic Drugs Market – By Geography

Geographically, North America had acquired USD 7,090 Mn antipsychotic drugs market revenue in the year 2020. U.S. is dominates the North America antipsychotic drugs in the year 2020 and will show similar trend over the forecast period. Asia-Pacific is expected to witness the fastest growth rate during the forecast period. The healthy CAGR is expected due to rising social awareness regarding psychotic disorders and other associated disorders, such as mania, anxiety, and depression.

Exhibit 5.17 Global Antipsychotic Drugs Market – By Geography, 2020 (in %)



Source: Frost & Sullivan Primary Research & Analysis

According to the National Alliance on Mental Illness (NAMI), around 1 in 5 American adults experience mental illness annually and about 1 in 25 American adults experience serious mental disorders in a particular year. Presence of enhanced technology, favorable reimbursement policies, proper insurance coverage and high prevalence of people suffering from mental disorders will lead to market expansion in the country.

The growth is attributed to the increasing patient pool suffering from psychotic disorders in the region. Recent studies have stated that antipsychotics are one of the top-selling and most widely prescribed drugs for managing psychotic conditions in the United States. Although earlier prescribed only for such psychotic conditions, a vast variety of antipsychotics are also prescribed as a supplement to antidepressant medications and for routine complaints such as insomnia. Records demonstrate that antipsychotics such as Abilify are outselling other drug varieties and are becoming one of the key and high-profit drug classes of the Pharma industry.

Europe is the second-largest regional antipsychotic drugs market share due to the high density of population and other reasons being the same as in North America. It is expected that Europe would follow the footsteps of North America and would remain in the second position throughout the forecast period. The growth is attributed to a rise in the patient population and increasing incidence of psychotic diseases. The most powerful country-specific markets in Europe are France, Germany, Italy, Spain, and the UK.

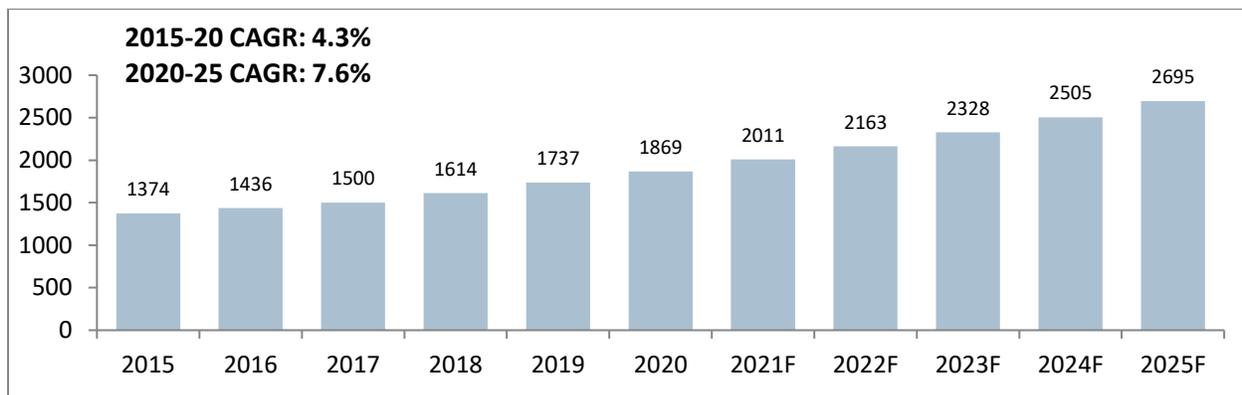
In Asia Pacific, emerging countries, such as India, China, and other Southeast Asian countries have a large patient pool who is suffering from various disorders, especially schizophrenia. China antipsychotic drugs market will experience considerable growth in the near future owing to rise in geriatric population suffering from mental disorders. According to a recent research study, the prevalence of mental illness and disorders was estimated to be quite in the old age people in China. Increasing healthcare expenditure along with growing awareness regarding the provision of healthcare service and innovations in manufacturing of antipsychotic will propel the industry growth in the country.

5.13 Global Antiplatelet Drugs Market

Antiplatelet drugs are often called as platelet agglutination inhibitor is a class of therapeutics that helps in reducing or preventing the blood coagulation by limiting the activity of platelets to stick or bind together. Clotting of blood is physiological action of the body which helps in controlling external bleeding during the time of injuries. But this tendency of blood clotting may not be useful when there are no injuries or cuts. Hence antiplatelet drug agents are therapeutically used to stop clotting when not required. However, limitations in efficacy, safety, and tolerability of some antiplatelet drugs have precluded their use in patients. For instance, antiplatelet drugs can irritate the lining of the stomach that leads to gastrointestinal side effects such as indigestion and stomach aches. Moreover, patients using these drugs can be more prone to nosebleeds, bruising, or bleeding for longer than usual since they reduce the ability of the blood to clot.

The global antiplatelet drugs market is being driven by the rising prevalence of thrombotic cardiovascular disease. The increasing cases of cardiac and cancer diseases in the populations is one of the factors which is expected to drive the overall anti-platelet drug market. The significant growth in a market over a forecast period is also attributed due to hereditary diseases. Changing lifestyles and lack of physical activity is one of the factors which affects the growth of the market moderately. Failure to take antiplatelet drugs as prescribed can possess an increased risk of thrombotic complications, owing to rebound platelet activation.

Exhibit 5.18: Global Antiplatelet Drugs Market, Industry size (USD Mn), 2015-2025F

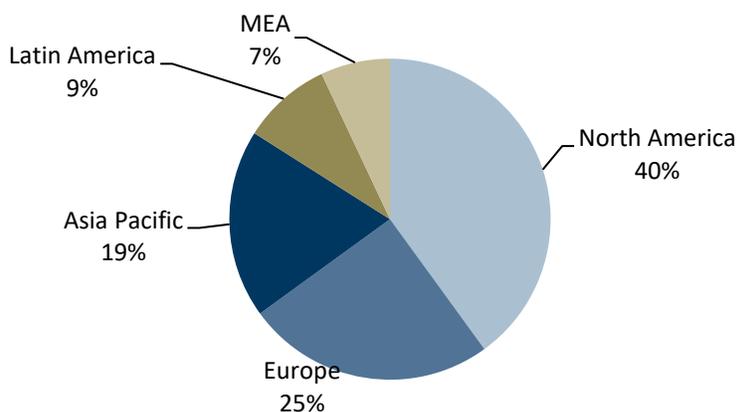


Source: Frost & Sullivan Primary Research & Analysis

The global antiplatelet drugs market on the basis of drug class can be segmented into:

- 1 Platelet Aggregation Inhibitors – API Clopidogrel falls under this therapeutics and (T2E) Thiophene-2-Ethanol is required to produce the same. Aether Industries is leading manufacturer of T2E.
- 2 Glycoprotein Platelet Inhibitors
- 3 Protease-Activated Receptor-1 Antagonists
- 4 Others

Exhibit 5.19: Global Antiplatelet Drugs Market – By Geography, 2020 (in %)



Source: Frost & Sullivan Primary Research & Analysis

Due to increased cases of cardiovascular diseases, sedentary lifestyles, the market is expected to witness a healthy growth growing at a CAGR of 7.6%.

5.14 Global Antihistamine Drugs Market

Antihistamines are a class of drugs that inhibit the action of histamine by attacking the specific cell receptors meant for histamines. Histamine is an immune substance released by body's immune system when attacked by allergens or due to intake of histamine-deficient food, some food items also trigger

their excessive production which creates immune response. Histamine attaches to specific receptors of body cells which results in symptoms such as running nose, watery eyes, pain, itching, redness, and wheezing. Antihistamines are used to relieve the symptoms of seasonal allergies, motion sickness, nausea, cold and cough, anxiety.

Antihistamines are representative of a class of drugs that inhibit the histamine type 1 (H1) receptors. H1 receptor is present on smooth muscle of bronchi, gastrointestinal tract, uterus, and large blood vessels.

The global antihistamine drugs market is segmented as;

- a) [sedating] brompheniramine,
- b) [sedating] chlorpheniramine,
- c) [sedating] diphenhydramine,
- d) [sedating] doxylamine,
- e) [sedating] carbinoxamine
- f) [sedating] anticholinergic – API Hydroxyzine falls under this therapeutics and 1-[2-(2-Hydroxyethoxy)Ethyl]Piperazine is required to produce the same. Aether Industries is leading manufacturerer of 1-[2-(2-Hydroxyethoxy)Ethyl]Piperazine
- g) [non-sedating] fexofenadine,
- h) [non-sedating] loratadine, loratadine odt,
- i) Others.

Exhibit 5.19: Global Antihistamines Drugs, Industry size (USD Mn), 2015-2025F



Source: Frost & Sullivan Primary Research & Analysis

5.15 Global NSAID Drug

Non-steroidal anti-inflammatory drugs (NSAIDs) is a class of powerful analgesics, distinguished by their non-steroidal chemical structure. These drugs are frequently prescribed to reduce pain caused due to inflammation. These are considered the first line of treatment in pain management due to three basic properties: analgesic, antipyretic, and anti-inflammatory.

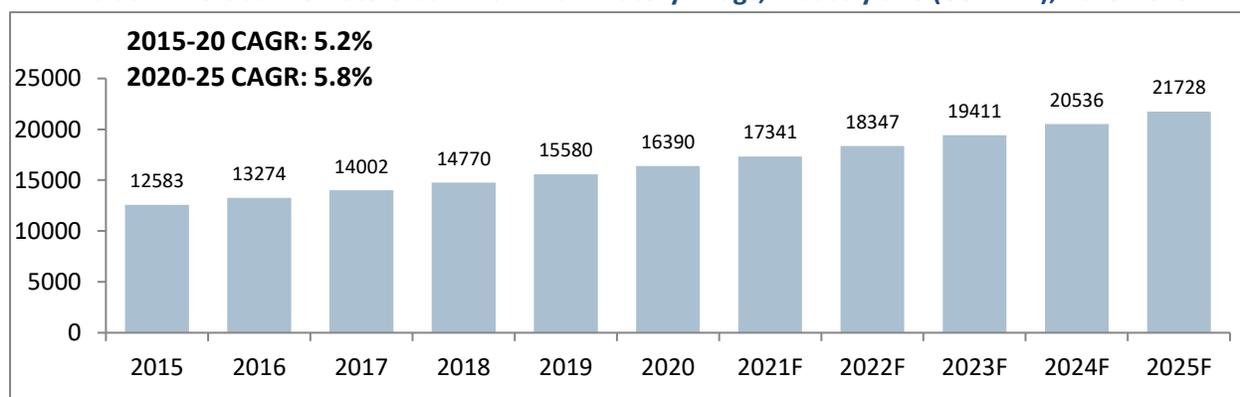
Non-steroidal anti-inflammatory drugs are categorized into various groups:

- a. salicylates (diflunisal, salsalate, and acetylsalicylic acid),
- b. acetic acid derivatives (diclofenac, ketorolac, indomethacin, and etodolac),
- c. selective COX-2 inhibitors (celecoxib),
- d. proprionic acid derivatives (ibuprofen, naproxen, ketoprofen, and fenoprofen), - API Dexketoprofen and Naproxen fall under this category. The intermediate N-Octyl-D-Glucamine / 1-Deoxy-1-(Octylamino)-D-Glucitol required to produce both these APIs is being manufactured by Aether Industries.
- e. fenamic acid derivatives (meclofenamic acid, tolfenamic acid, and mefenamic acid),
- f. enolic acid derivatives (oxicam, piroxicam, tenoxicam and lornoxicam).

However, entry of new innovative therapeutic analgesics, stringent government regulations, and side effect associated with non-steroidal anti-inflammatory drugs restrain the non-steroidal anti-inflammatory drugs market.

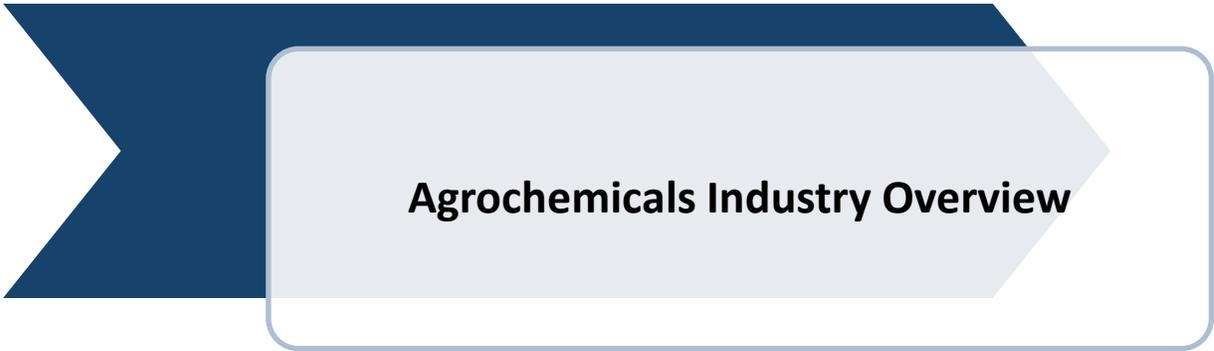
In terms of region, the non-steroidal anti-inflammatory drugs market has been classified into North America, Latin America, Europe, Asia Pacific, and Middle East & Africa. North America dominates the non-steroidal anti-inflammatory drugs market, followed by Europe, due to increase in geriatric population suffering from bone and joint disorders, rising junk food habits & sedentary lifestyle, and increase in incidence and prevalence of bone and joint disorders. Asia Pacific is an emerging market for non-steroidal anti-inflammatory drugs owing to rising health care infrastructure, gradual development of medical infrastructure, growing awareness, and large patient pool. However, lack of proper treatment and low patient awareness are factors restraining the non-steroidal anti-inflammatory drugs market in regions such as Middle East & Africa and Latin America.

Exhibit 5.17: Global Non-Steroidal Anti-Inflammatory Drugs, Industry size (USD Mn), 2015-2025F



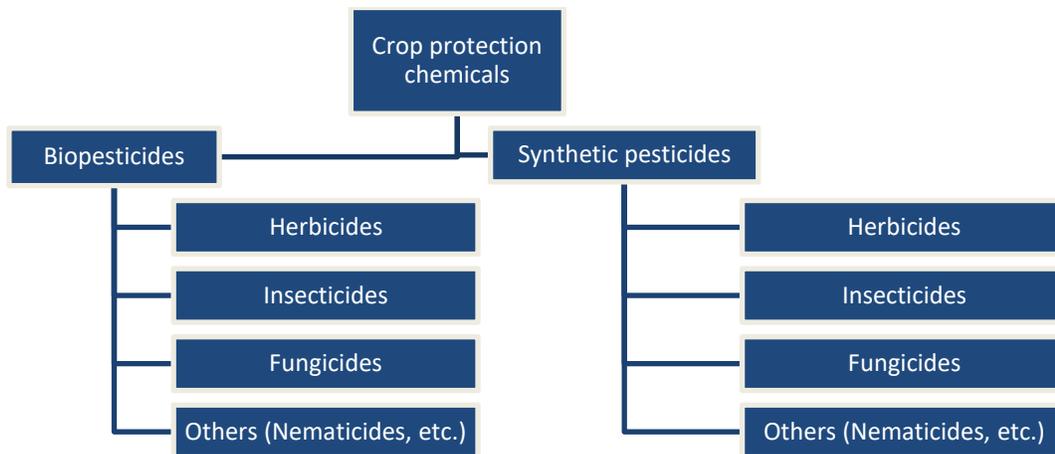
Source: Frost & Sullivan Primary Research & Analysis

Section 6: Agrochemicals Industry Overview



6.1 India Agrochemicals Market Overview

Crop protection chemicals are segmented based on product types like insecticides, herbicides, fungicides, etc. or depending on the biodegradability index associated with the chemicals.



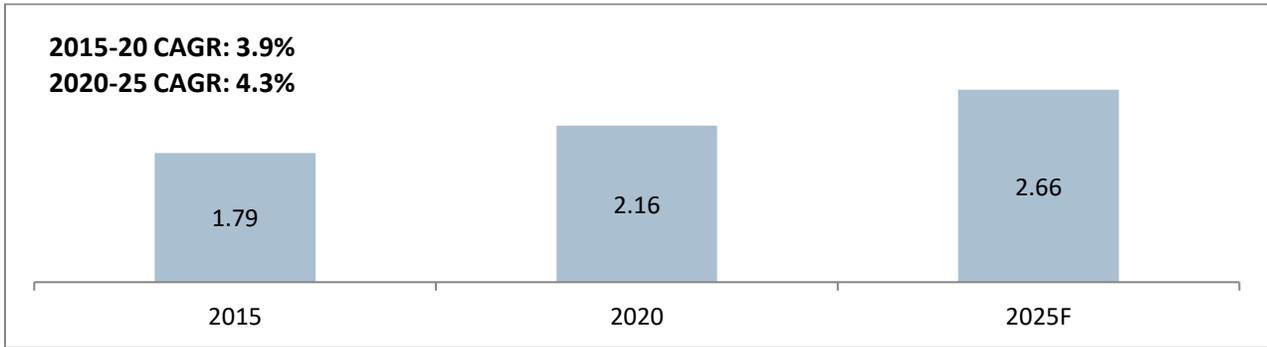
Globally, synthetic pesticides are consumed widely compared to bio-pesticides which are under developmental phase.

India crop protection chemicals exports have grown with the CAGR of almost 7% during the year 2015-20. The actual export contribution of crop protection chemicals was ~50% of total domestic production (by value) in the year 2020. Exports are projected to grow to almost 55% in the year 2025 (by value). This means, USD 2.16 billion was export from India and an equal amount of crop protection chemicals were meeting domestic demand in the year 2020. In the year 2025, exports will grow to USD 3.4 billion contributing 55% of total domestic production which is valued at USD 6.1 billion.

India ranks 13th in the imports of pesticides globally with Brazil leading the imports of crop protection chemicals having 7% market share in the world imports (2018, by volume). Brazil is followed by France (5%), Canada (5%), US (4%), Germany (4%), Thailand (4%), Australia (3%), Belgium (3%), UK (3%), Nigeria (3%), Spain (3%), Italy (3%) followed by India (2%).

India was world's 3rd largest pesticide exporter by volume in 2018. China leads the exports of pesticides with 27% market share in the world exports followed by Germany (8.3%), India (8%), US, Belgium, France, etc.

Exhibit 6.1: Indian crop protection chemicals domestic market (in USD Bn)



Source: Frost & Sullivan Primary Research & Analysis

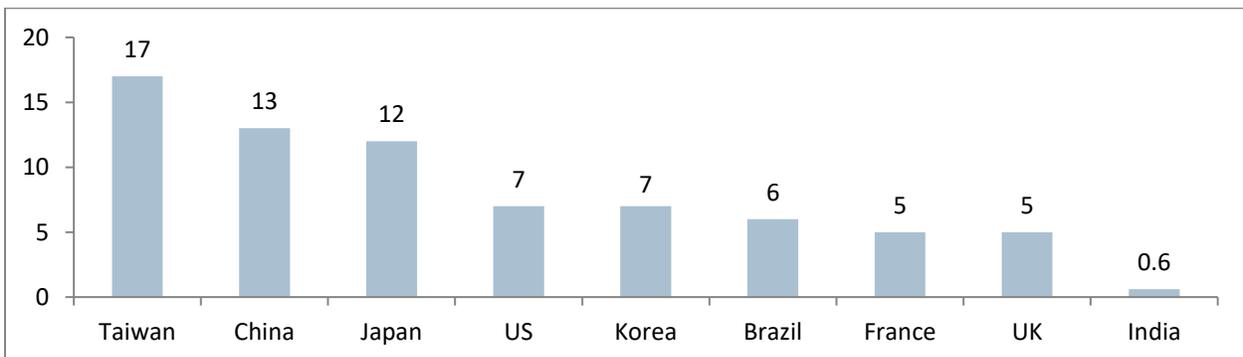
India per capita arable land is decreasing in order to accommodate housing needs for growing population. Although arable land availability is huge compared to some smaller countries like Israel, there have been low crop yield trends seen in India due to low level of mechanisation, erratic climate conditions, huge dependence on monsoon, poor logistics infrastructure, poor post-harvest support, etc.

In 2019, India has been ranked fourth globally in the production of agrochemicals (crop protection chemicals/ pesticides) after USA, Japan and China, as per IBEF (India Brand Equity Foundation) report 2019. Indian crop protection chemicals market is valued at USD 2.16 billion in the year 2020 which is anticipated to grow at 4% in the next 6 years to USD 2.7 billion by 2025.

Per hectare crop protection chemicals consumption in India

India has one of the lowest per capita consumption of crop protection chemicals per hectare. This consumption per hectare is way higher in developed nations like United States or Japan. Countries like Taiwan, China, Japan, etc. use double digit kilograms per hectare of crop protection chemicals compared to just 0.6 Kilogram per hectare in India (2019). This suggests, there is tremendous scope of growth for the crop protection chemicals in India, ramping agricultural productivity and compensating the shortage of farm labour by extensive use of herbicides, etc.

Exhibit 6.2: Per hectare crop protection chemicals consumption (in Kg/hectare, 2019)



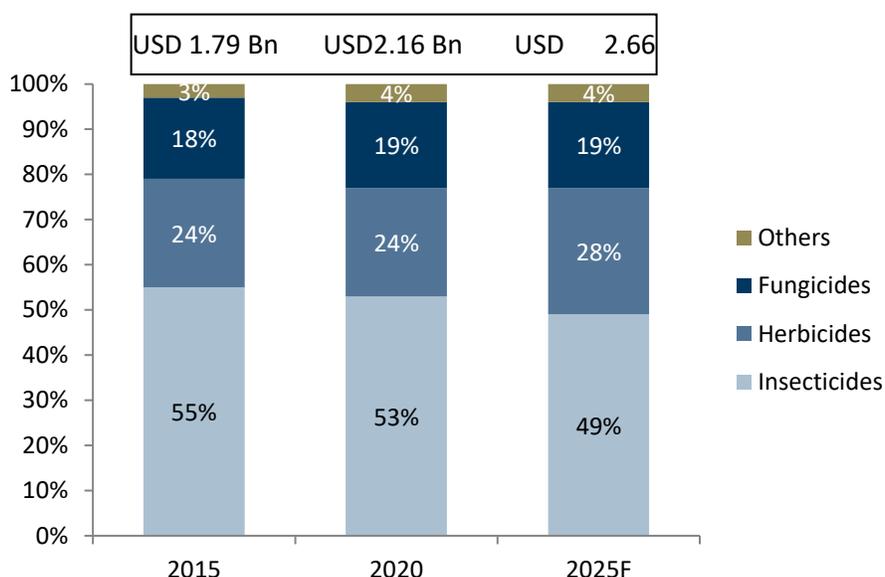
Source: Care Ratings

Indian crop protection chemicals value chain includes intermediate suppliers, pesticide technical materials producers and formulators. Many players have been vertically integrated in the value chain, in order to take advantage of reaching to the customers by aggressive sales and marketing. Few players are backward integrated as well, taking advantage of raw material prices in the market. Some of the distributors like Sharda Cropchem, etc. are exclusively involved in sales and marketing function, taking the advantage of contract manufacturing in the India.

Indian crop protection chemicals market segmentation – by product type

Insecticides contribute highest market share in the Indian crop protection chemicals market accounting slightly more than half of the total market. India has almost 10,000 types plant eating insects. In the agriculture value chain, Agrochemicals are the final external stimulus provided to the plants.

Exhibit 6.3: India crop protection market by product type (domestic), 2015-25F



Source: FICCI, Industry research

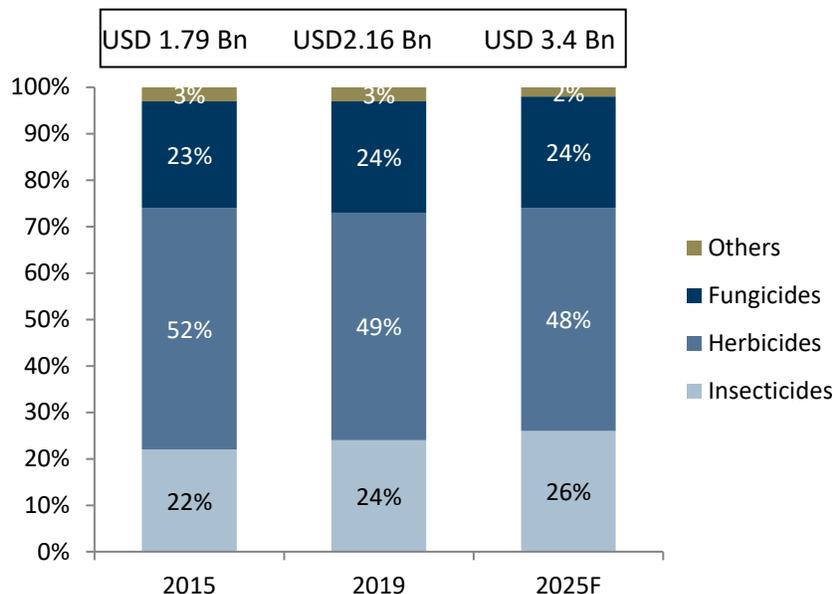
	Insecticides	Herbicides	Fungicides
2015-20	3.0%	3.9%	5.3%
2020-25F	2.9%	7.0%	4.3%

Crop protection chemicals like bio-pesticides, plant growth regulators, etc. will account for a larger market share in the India crop protection chemicals market by 2025, since bio-pesticides are anticipated to grow at higher CAGR during 2020-25.

Bio-pesticides are expected to record a double digit growth till 2025 occupying more than 10% market share. India will see increased usage of herbicides over coming decade due to extreme farm labour shortage in the country. Herbicides will be compensating as cost effective measure to the farm labours

in India, recording decent growth rate till 2030. Bio-herbicides will also be gaining traction over the forecast period. Their share in exports is significant as well.

Exhibit 6.4: India crop protection market by product type (exports), 2015-25F



Source: FICCI, Industry research

	Insecticides	Herbicides	Fungicides
2015-20	9.4%	5.5%	8.2%
2020-25F	9.8%	8.0%	8.4%

Demand drivers for technical market

1) Supply chain interruptions with China amid COVID-19 crisis

Due to on-going pandemic, supplies of agrochemical actives were severely impacted in the country. Majority of the agrochemical industry in the country was dependent on China for supply of raw materials and intermediates. In order to reduce the import dependence on China, several initiatives like Aatma-Nirbhar Bharat, etc. are adopted by Government in India. This is going to boost the domestic manufacturing over coming half decade.

2) Incentive program by GOI for manufacturing of actives

Recent border issues with China have triggered the self-reliant India initiative, reducing the sourcing dependence on China by the Indian agrochemical industry. Similar incentive schemes were also launched by ministry of pharmaceuticals, GOI for the domestic production of key starting materials for bulk drugs used in pharmaceutical industry. These incentive programs will be boosting domestic manufacturing of agrochemical technical in the country.

3) Increase in export led demand

Increase in CSM/CRAMS activities in the country has fuelled the increase in domestic manufacturing of pesticide technical materials. Players from developed countries are looking to collaborate with Indian players for manufacturing of active ingredient and/or formulations, leveraging cost effective manufacturing supported by cheaper labour force and stronger R&D capabilities.

For example, in March 2021, UPL Ltd. entered into long-term strategic collaboration with FMC Corporation (American chemical manufacturing company). The agreement provides UPL access in key markets to commercialize Rynaxypyr active, FMC's leading insecticide. As per the agreement, UPL will toll manufacture and supply Rynaxypyr to FMC in India, and FMC will supply the active ingredient to UPL depending on the markets. The deal adds a key portfolio of products to UPL's business and supports FMC in maximizing the penetration of this important active ingredient. Such collaborations drive the growth for Indian Agrochemicals market.

4) Shift to Asset Light Model

Asset-heavy, vertically integrated models offer superior control, but they tie up significant capital and frequently prove less flexible in a fast-changing environment. By contrast, asset-light business models confer greater flexibility. Owing to this many formulators both globally and domestically are focusing on asset light model, which has less capex and helps to focus on building their brands - thereby increasing the demand for sales of technical.

5) Contract manufacturing boost

Contract manufacturing and export opportunities for off-patent molecules are areas of major boost expected as about 26 technicals are about to go off patent in 2022. The production of these molecules are expected to come to India considering various advantages listed above that India has to lead the contract manufacturing space.

Demand drivers for formulation market

Need for increase in crop yield, crop mix

The Indian pesticides market has a capacity in excess of the demand. Further, high seasonal dependence means that there is unused capacity in the lean demand periods. Consequently, all major players are looking at export markets to increase capacity utilization and survive in this competitive industry. India is the largest producer of generic pesticides and is utilizing its position as a low-cost producer to increase exports.

In India only around 20-25% of the cultivated area is treated with pesticides, also the per capita consumption is around 300-400gm/ hectare as against that of 3000g/ hectare in developed countries; hence there is a lot of scope to increased consumption.

Indian agriculture has the daunting task of feeding and clothing 18% of the world's population on less than 2 per cent of the total landmass. With already maximum gross cultivated area, the scope for bringing new areas under cultivation is severely limited. Thus, the growth will have to come from increased productivity. Under the same existing acreage higher yielding varieties of crops are being

produced using new variety seeds. This will require more pesticide per hectare than that being used earlier; also farmers will have to compulsorily improve productivity by improving yield per hectare to meet the growing population needs. This will require more and appropriate usage of pesticides.

There is a shift in cropping pattern from food grains to F & V (fruits & vegetables) as farmers are seeing more value gain under this segment, hence the pesticide consumption has increased and is expected to further increase with horticulture picking up.

Other drivers for formulation market

- There is a significant increase in the global food demand on account of growing population. The Global Agricultural Productivity Index suggests that the growth is not accelerating fast enough to sustainably meet the food requirements in 2050. Accordingly, available agrarian land would have to double its output to meet the demand in 2050. There is an urgent requirement to increasing crop yields and requires higher investments in improving R&D capabilities in crop protection. This requirement to improve crop yields would also lead to increased usage of crop protection chemicals. The global crop protection market is expected to grow at a CAGR of 6.6% from 2020 to 2025 and reach US\$ 92 billion.
- With favourable initiatives by the Government of India, including new legislations on farms and schemes such as Fasal Bima Yojna and Kisan Credit Card that benefit farmers, it is expected that spending on crop protection chemicals is likely to grow.
- Promotion of higher margin businesses such as horticulture and floriculture is likely to ensure that farmers are more prone to use crop protection measures. Efforts are being made to ensure continuous power supply and water at farms. A national agriculture market is proposed that will enable e-commerce of agricultural products that will in turn improve the prospect of crop-production and crop protection products.

Government initiative to double farmer's income

Government of India is proactively looking for measures to significantly improve the farmer's income in coming decade. There have been budgetary provisions announced in the recent budget 2020-21 for farmer's welfare where INR 1,42,762 Crores were allocated to the Ministry of Agriculture & Farmer's Welfare. This allocation is 30% higher than the revised estimate for 2019-20. Crop protection chemicals market will have positive impact of huge government spending to protect the crop from losses. Government has decided to hike MSP (Minimum Support prices) on Rabi crops from 50% to 109%, which are to be marketed in RMS (Rabi Marketing Season) 2020-21.

Rabi crops Commodity (Fair Average Quality)	MSP for RMS 2020-21 (Rs/quintal)	MSP for RMS 2021-22 (Rs/quintal)	Cost of production 2020-21	Increase in MSP (Rs/ quintal)	Return over cost (%)
Wheat	1925	1975	960	50	106
Barley	1525	1600	971	70	65
Gram	4875	5100	2866	225	78

Lentil	4800	5100	2864	300	78
Rapeseed & Mustard	4425	4650	2415	225	93
Safflower	5215	5327	3551	112	50

Source: Ministry of agriculture & farmers welfare

Increase in horticulture & floriculture production

Fruits & vegetables contribute almost 90% of the total horticulture produce in India. Government has been promoting export of horticulture products, which will be boosting farmer's income. In order to avoid horticulture crop losses, crop protection chemicals market will be boosted over coming half decade. Horticulture is a higher margin business and thus will contribute more to the growth of crop protection chemicals. Floriculture is another segment which goes hand in hand with horticulture (in terms of providing growth avenues resulting in increased demand of crop protection chemicals in India).

Increasing shortage of labour

Urban population in India will cross 40% by the year 2030, according to a survey conducted by UN department of population. This percentage will further go up to 50% in India by the year 2050. Increasing urbanization has led to shortage of labour in the rural agriculture sector. This has further led to increase in wages for the labour. Due to this change, herbicidal usage will be boosted in order to improve the soil fertility, as against the traditional usage of labour for herb removal from farms.

Increasing food demand due to increasing population

India population is estimated at 1.35 Billion in the year 2019 which is almost 18% of the world population. This population is growing with the rate of 1.32% per year, according to the World Bank sources. For such an increase in population, food security is important. In order to meet the food demand, usage of crop protection chemicals would be boosted in coming half decade.

Shrinking agriculture land

Due to improved urbanization, agricultural land is shrinking. Growing urbanization has led to more amount of agricultural land being used to construct more residential and commercial complex. With growing population and growing food requirements coupled with shrinkage in agricultural land demands for improving the crop production per hectare. In order to have improved crop yield in the shrinking agricultural land, crop protection chemicals (herbicides, insecticides, fungicides, etc.) will be used extensively.

Increased usage of bio-pesticides

The current market size of Indian bio-pesticides is less than 4% of the total crop protection market in India. This approximately equals to market size of less than USD 84 mn. The bio-pesticide market will witness double digit growth in India in the next five years (2019-24). The Bio-pesticides are pesticides with biodegradable content in it which avoids crop losses by means of not affecting the soil fertility.

These bio-pesticides are witnessing the increase in the usage due to large scale awareness and promotion funded by the government.

Pros of bio-pesticides –

- Bio-pesticides are degradable naturally or are less harmful to the environment. Hence are more eco-friendly compared to synthetic pesticides.
- Bio-pesticides decompose quickly. They are equally effective as that of synthetic pesticides with no harm to the ecosystem. These bio-pesticides can be a combination of 100% natural ingredients & synthetic ingredients to enhance the effect in the field.

Future prospects –

Bio-pesticides are rapidly growing pesticides due to their eco-friendly nature. The bio-pesticides demand is growing at the rate of 16% y-o-y and is the matter of preference in the developed countries. These bio-pesticides will not completely replace the synthetic pesticides fleet in coming decade; however its usage will be significant in even developing countries like India. This is due to awareness among the farmers about bio-pesticides which maintains the soil fertility in longer run.

6.2 Indian crop protection chemicals market challenges (Both Technical & Formulation)

Every industry has a set of challenges to overcome and agrochemical has no exception. On the face of it, poor uptake of farm input materials, lack of awareness and knowledge about them, no big innovation, and investment in R&D in the sector, and markets flooded with spurious materials seem to be the issues at hand. The advent of GM products and meeting strict regulatory needs are the sticking points. With a new era of governance and a new government in place, it is necessary to draw the attention of the policymakers to the issues that are dragging agriculture back and impeding its momentum.

Traditional farming

Professionals who work with the people in the grassroots can that the problem is at a deeper level – the reluctance of farmers in adopting anything that counters their traditional understanding of farming. Most farmers are not aware of the right product for the crops and absence of know-how, right time and amount for the type of crops grown. Farmer's concern with the crops volume as struggle is against the volatile market prices is genuine. However, lack of awareness and understanding is harming the prospects more than the prices. Hence, many companies have initiated the efforts of training the farmers along with the government.

Over-reliance on Generic Agrochemicals

Insecticides dominate the crop protection industry in India with more than 50 per cent market share while other segments such as herbicides, fungicides, and other element's sufficient distribution such as micronutrients, plant growth regulators (PGR), and bio-stimulants hold the balance share. A bulk of domestic consumption of insecticides and herbicides is generic in nature and this demand is likely to grow northward in future, mainly due to the price difference with the branded ones.

Generic agrochemicals are popular among farmers, being comfortable using tried, off-patented agrochemicals – in absence of new, patented products in the market, farmers grow dependent on

generic products. Companies like India Pesticides Ltd, PI Industries, Insecticides (India) Ltd., etc. are continuously trying to reverse this trend by bringing in products from other countries to allow variety to the Indian farmers and introduce better products in the market and has entered into partnerships and tie-ups with foreign-based MNCs to hasten the process.

Poor supply chain management and the problem of counterfeit products

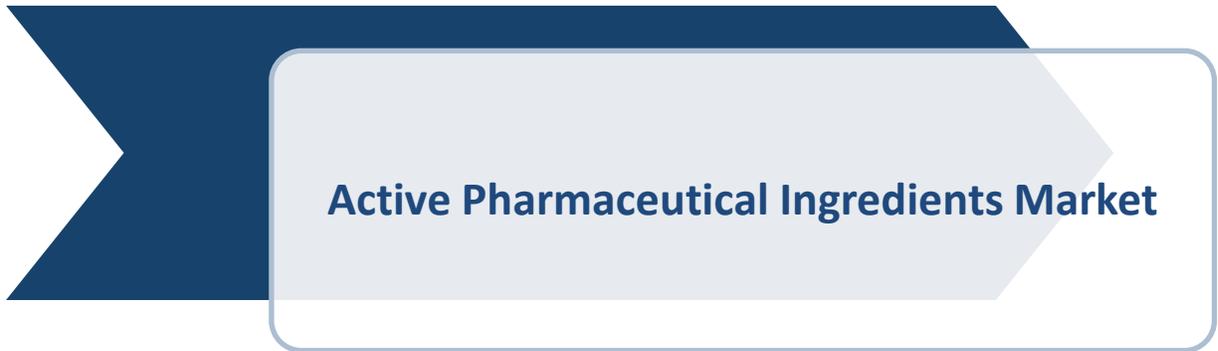
There is a need for more efficient distribution systems to let more farmers' access genuine products. Problems of supply chain inefficiencies and inadequate infrastructure have plagued the agrochemical industry which results in post-harvest losses estimated at Rs. 45,000 Crores every year. The lack of efficient distribution system also makes it difficult for the agrochemical companies to reach the farmers to promote their products and educate them about their usage and benefits.

Besides, generic products are prone to counterfeiting. These sub-standard products not only prove to be effective but also harm the crops at many times, hurting the laboriously-built reputation of the agrochemical companies. A poor supply chain and ignorance of the farmers facilitate the entry of counterfeit products, especially in remote areas.

Ban on Pesticides

The long-pending ban on 27 widely-used pesticides, which includes 12 insecticides, 8 fungicides and 7 herbicides, is poised to be concluded anytime soon. The Centre has already issued a draft order banning the manufacturing and sale of these on grounds of the grave risk they pose to humans and animals. The ban will shrink India's export capability by more than 50 per cent and will also hand over INR 12,000 crores market to China. This can adversely impact the market.

Section 7: Active Pharmaceutical Ingredients Market



7.1 Aether's Portfolio

Key products manufactured by Aether and their downstream finished products along with its global market sizing and growth rate are described below.

Aether is among the few companies globally focused on the core competencies model of Chemistry and Technology. Aether is among the few Indian specialty chemical company to have successfully launched three separate business models viz. Large-Scale Manufacturing, Contract Research / Exclusive Manufacturing, and CRAMS (Contract Research and Manufacturing Services), in just 5 years into commercial manufacturing. It is one of the few companies, domestically, in the specialty chemicals who has deployed continuous reaction technology at all stages i.e., R&D, Pilot Plant and Large-Scale Manufacturing. Aether has one of the largest pilot plants in the world with 106 numbers of reactors installed, for both batch as well as continuous reaction technology. Total capacity of batch reactor varies from 50 lit to 6000 lit which includes column, condenser, receiver etc. *(Source: Frost and Sullivan Primary Research)*

Aether's strategic investments in R&D have been critical to their success and a differentiating factor for Aether to attain leading market position for certain products. Initially, for first three years from inception Aether was focused on R&D, built a sound team of PhD scientists who could achieve initial breakthrough work on the CRAMS business. Peculiarity of Aether has been it had not taken support from any clients for the R&D whereas usually the industry practice is that supplier supports the client in new product development, which showcases the innovation and research strength of Aether.

Usually, chemical companies have single or couple of chemistry competencies for their entire product portfolio; however Aether has eight chemistry competencies used for their wide bouquet of products. Having multi-chemistry competencies enables the company to cater to niche and advanced intermediate requirements of wider end-products & applications.

For the Intermediates for Pharma and even agrochemicals, the customer engaged in manufacturing the finished goods are subjected to various stringent norms or standards like United States Food and Drug Administration. Hence the customers require the necessary Regulatory and documentation from the intermediate manufacturer which requires substantial efforts and both the customer and intermediate player is not interested to redo the process hence prefer to establish a long term relationship with each other.

Aether's manufacturing principles and core competencies in technologies embody the core tenets of sustainable chemistry. Principles of energy saving and conservation, atom economy, and the 4R strategy of reduce / recover / recycle / reuse are inherent in their manufacturing designs and engineering. Aether has innovated the manufacturing process / product recipe for most of their products, thus making them leaders in quite many products they are operative into. Aether is one of the fastest growing Specialty Chemical companies domestically, growing at a CAGR of 49.53% from FY19 to FY21.

For the competency of tandem Grignard and ethylene oxide chemistry, Aether has been a pioneer in Indian Specialty Chemicals Market (there are 4 Indian Companies in Grignard chemistry only and other 6 Indian companies are in ethylene oxide). Aether is one of the largest manufacturers in India for this extremely versatile chemistry. Expertise in large range of chemistries allows Aether to support multiple

end use industries. All the chemistry and technological competencies have been developed in-house which is huge strength of Aether’s R&D team. (Source: Frost and Sullivan Primary Research)

Based on the technical expertise Aether has developed over the years, the company is able to carry out innovative processes at global scale, which is difficult to replicate, and create significant barriers for new entrants.

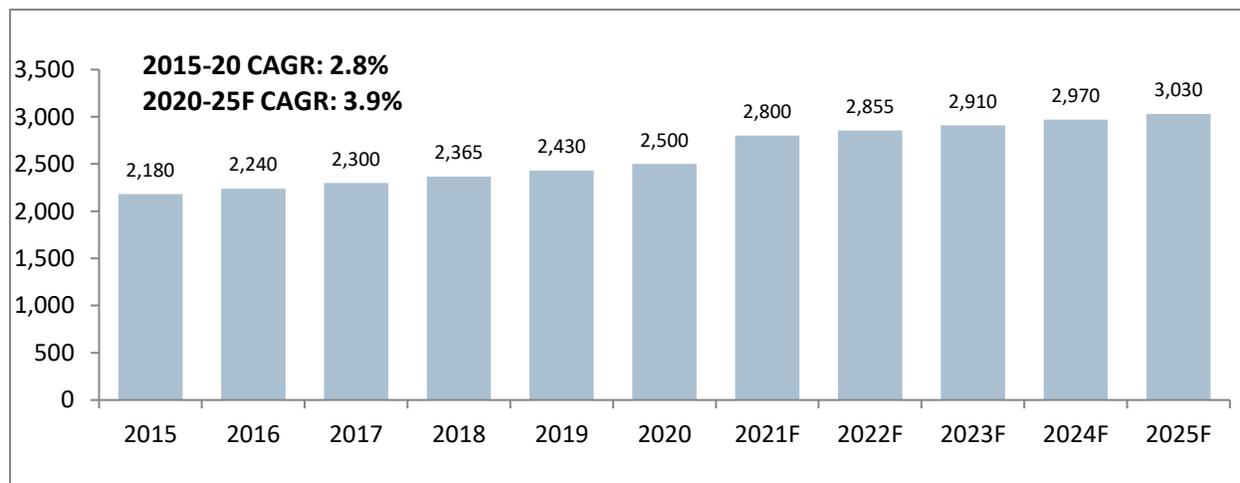
Aether has strategically curated product portfolio benefitting from both, import substitution as well as China+1 tailwind hence expected to grow in volume terms and value terms.

7.2 API – Metoprolol

Metoprolol is a beta-blocker that affects the heart and circulation (blood flow through arteries and veins). Metoprolol is used to treat angina (chest pain) and hypertension (high blood pressure). Metoprolol is also used to lower risk of death or needing to be hospitalized for heart failure. Metoprolol injection is used during the early phase of a heart attack to lower the risk of death.

Metoprolol is a selective beta-1 blocker commonly employed as the succinate and tartrate derivatives depending if the formulation is designed to be of immediate release or extended release. The possibility of the generation of these formulations comes from the lower systemic bioavailability of the succinate derivative. To this date, it is one of the preferred beta-blockers in general clinical guidelines and it is widely prescribed in the Netherlands, New Zealand, and the US. Metoprolol was developed since 1969 by US Pharmaceutical Holdings and FDA approved in 1978.

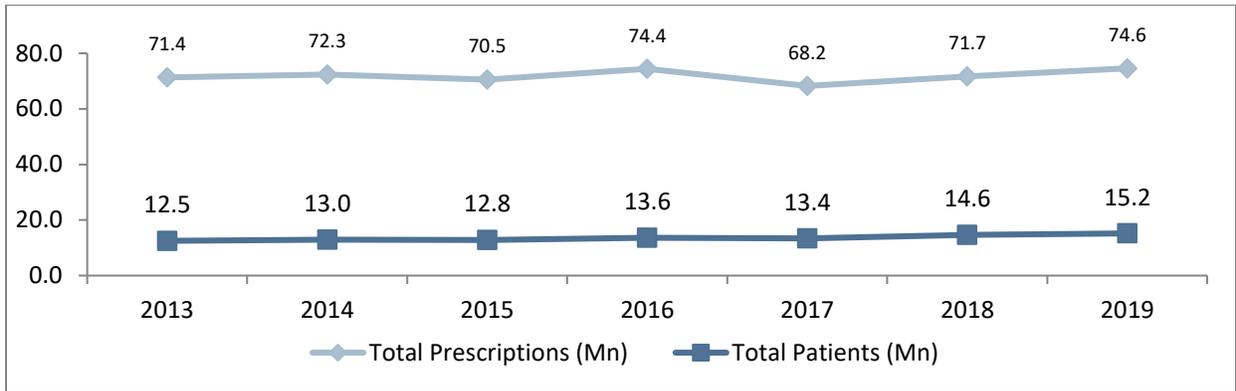
Exhibit 7.1: Global Metoprolol Industry size (MT), 2015-2025F



Source: Frost & Sullivan Primary Research & Analysis

Metoprolol prescription in USA increased by 0.7% between 2013-19 and by nearly 1.4% between 2015 to 2019. The total patients consuming Metoprolol increased by 3.3% between 2013 to 2019, whereas it grew by 4.3% between 2015 to 2019. This indicates that the market has been steadily growing at 2-3% over the last couple of years.

USA Metoprolol - Total Prescriptions and Patients Per Year (2013 - 2019)



Source: www.clincalc.com

Some key manufacturers in the space are:

Key Manufacturer	Country
Societa Italiana Medicinali Scandicci Sims Srl	Italy
Moehs Catalana	Spain
Teva Pharmaceutical Industries Ltd	India
Moehs Iberica SI	Spain
Ipca Laboratories Ltd	India
Sun Pharmaceutical Industries Ltd	India
Medichem SA	Spain
Dr Reddys Laboratories Ltd	India
Aurobindo Pharma Ltd	India
Aarti Drugs Ltd	India
Zhejiang Apeloia Jiayuan Pharmaceutical Co Ltd	China
Cadila Healthcare Ltd	India
Ctx Life Sciences Pvt. Ltd	India
Zhejiang Hisoar Pharmaceutical Co Ltd	China
Alembic Pharmaceuticals Ltd	India
Yung Zip Chemical Ind Co Ltd	China
Zhejiang Huahai Pharmaceutical Co Ltd	China
Hec Pharm Co Ltd	China
Astrazeneca Pharmaceuticals LP	USA
Zhejiang Yongtai Pharmaceutical Co Ltd	China
Unichem Laboratories Ltd	India
Macleods Pharmaceuticals Ltd	India
Granules India Ltd	India
Hetero Drugs Ltd	India
Msn Life Sciences Private Ltd	India
Indoco Remedies Ltd	India
Kopran Research Laboratories Ltd	India
Granules Pharmaceuticals Inc.	USA & India

Intermediate Requirement:

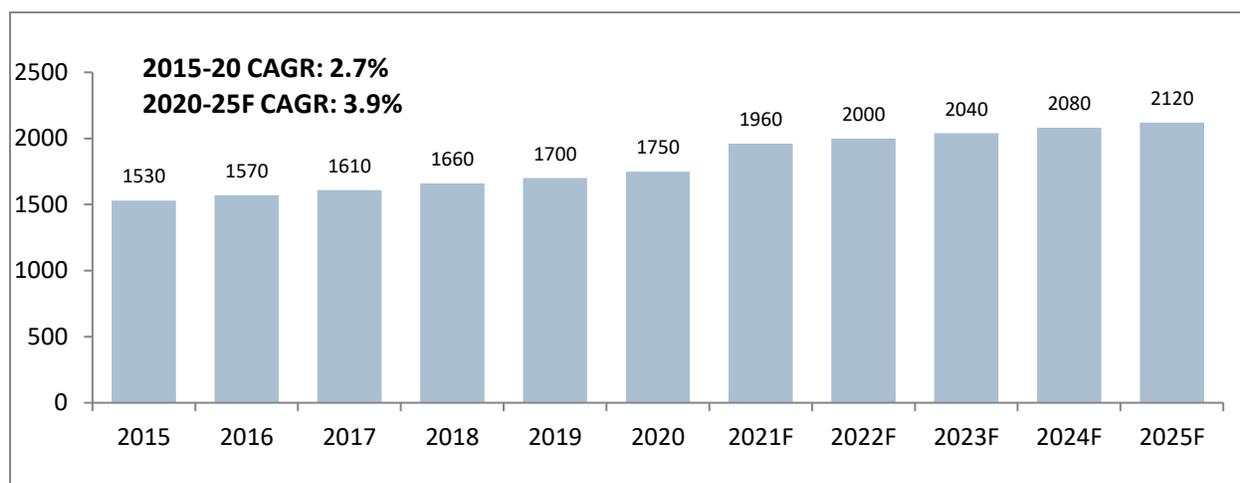
4-(2-Methoxy ethyl) phenol is one of the key intermediates used in production of Metoprolol. Approximately 0.7 MT of 4-(2-Methoxy ethyl) phenol is required to manufacture 1 MT of Metoprolol derivatives.

Intermediate - 4MEP: 4-(2-Methoxyethyl)Phenol

4-(2-Methoxyethyl) Phenol is an advanced intermediate which is used in the preparation of Metoprolol APIs. The appearance is in the form of powder and crystals of white colour or colourless to light coloured transparent liquid which is prepared by chemical synthesis starting from 4-chlorophenol. 4 (2-Methoxyethyl) Phenol has good solubility in methanol and forms almost transparent solution.

Product Application: 4-(2-Methoxyethyl) Phenol is used to manufacture Metoprolol. There is no other key end application of the intermediate.

Exhibit 7.2: Global 4MEP market size (MT), 2015-2025F



Source: Frost & Sullivan Primary Research & Analysis, 4MEP market is arrived at using its consumption of ~0.7kg/kg for metoprolol

For year 2020, Aether is the biggest manufacturer of this product in the world, in terms of production volume and the only manufacturer of this product in India. (Source: Frost and Sullivan Primary Research)

Aether's production volume increased from 308 MT in CY2017 to 488 MT in CY2020 registering a growth rate of 16.5% CAGR. Aether's production volume growth from CY2017 to CY2020, has been much higher as compared to industry growth. Aether Industries employs Grignard chemistry, ethylene oxide chemistry, and isobutylene chemistry as the core chemistry competencies and continuous reaction technology and fractional distillation technology as the core technology competencies for this product.

Aether Industries with production of 488 MT in CY2020 and market share of nearly 28% (2020) is the largest manufacturer of 4-MEP globally. (Source: Frost and Sullivan Primary Research)

Globally this product is produced by Otsuka Chemicals of Japan. It forms part of their Pharmaceutical intermediates portfolio which comprises of β -Lactam compounds (antibiotic intermediates), Aromatic-related compounds (pharmaceutical intermediates), among others. The company manufactures around 450-480 MT of 4-MEP annually, translating to 26% to 27% market share.

Other global manufacturers include Apelo Pharma (Hengdian group) from China which annually manufactures around 420-450 MT, holding 24% to 26% market share. Apelo has witnessed growth in the product demand and they are experiencing market growth of 3%+ which was never the case for them. Their orders are booked for the product till Q2 of 2022.

Other Chinese players account for 390-450 MT, translating 22% to 26% market share. One of the companies in others include Ningbo Dingtai Chemical Co., Ltd. There are high entry barriers for this product as the process is very complex and the demand is quite niche hence not many large players enter the market. It is tightly managed by few players and no new entrants are expected. Demand for product increased in 2021 and any rise in demand is catered by the existing manufacturers with Aether accounting for majority of the new demand. For Chinese companies' Indian counterparts are a major threat as Aether in India is the biggest supplier for 4-MEP and only when India exports reduce China gets to sell more, which has not been the case from past couple of years. Aether is one the biggest competition and threat to their company.

Aether was able to cater to demand of customers who were procuring from Chinese companies which shut down in 2019 and 2020 due to environmental issues. Moreover, there has been an organic growth in demand for API on account of Covid-19 which has led to some organic growth for 4-MEP. As result of all the factors, 4-MEP production volumes of Aether are expected to double in 2021.

In CY2021, Aether produced 1,079 MT of 4-MEP (including 179 MT of the 4-MEP Derivative).

Indian clients are majorly serviced by Aether, however few API manufacturers like Sun Pharma (25-30 MT/year) and IPCA Laboratories (50-70 MT/year) do import some quantities of 4-(2-Methoxyethyl)Phenol from Zhejiang Hengdian Apelo Imp & Exp Co., Ltd. of China. During 2016-18, IPCA Laboratories have also imported intermediate from Ningbo Dingtai Chemical Co., Ltd. in few kilograms.

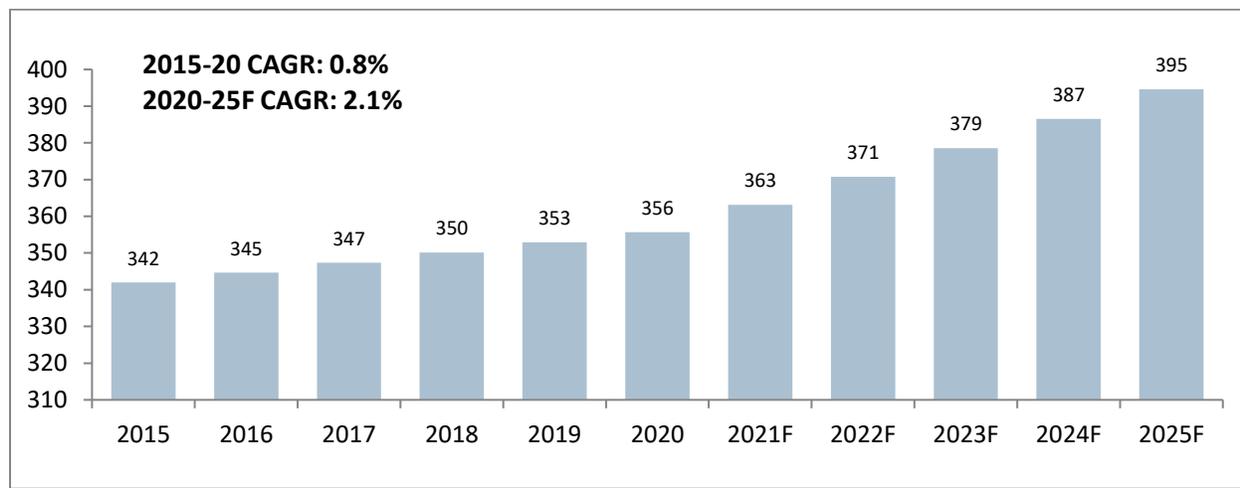
Company	Production Range	% Share
Otsuka Chemicals, Japan	450-480 MT	26% to 27%
Apelo Pharma, China	420-450 MT	24% to 26%
Other Chinese Players*	390-450 MT	22% to 26%

*fragmented supplier base

7.3 API – Quetiapine: Antipsychotic Drug

Quetiapine is an atypical antipsychotic used for the treatment of schizophrenia. It may be used as part of a treatment program to treat bipolar disorder and schizophrenia in children and teenagers. Quetiapine is in a class of medications called atypical antipsychotics. It works by changing the activity of certain natural substances in the brain. The global market of Quetiapine market was around 356 MT in 2020 growing at a rate of 0.8% annually in past five years. However, going forward, the market is expected to register higher growth rate.

Exhibit 7.3: Global Quetiapine Industry size (MT), 2015-2025F



Source: Frost & Sullivan Primary Research & Analysis

Global estimates suggest that over 1.25% of the global population suffers from psychosis and related disorders (as on 2019). This translates into a potential market of about 7.5 Mn people as target consumers for antipsychotic drugs. The market holds immense growth promise for future years as the patient pool of psychotic conditions rises at an alarming rate across the globe. The introduction of newer antipsychotic compounds and the vast funds poured in for research and development activities are also expected to have a significant positive impact on the overall development of the market in the near future.

Some key manufacturers in the space are:

Key Companies	Location
Dr Reddys Laboratories Ltd	India
Teva Pharmaceutical Industries Ltd	India
Mylan Laboratories Ltd	India
Fermion Oy	Finland
Aurobindo Pharma Ltd	India

Zhejiang Supor Pharmaceuticals Co Ltd	China
Olon SpA	Italy
Zhejiang Huahai Pharmaceutical Co Ltd	China
Hetero Labs Ltd	India
Divis Laboratories Ltd	India
IPCA Laboratories Ltd	India
Aarti Industries Ltd	India
FIS Fabbrica Italiana Sintetici SpA	Italy
Par Active Technologies Private Ltd	India
Lupin Ltd	India
Torrent Pharmaceuticals Ltd	India
Megafine Pharma P Ltd	India
Unichem Laboratories Ltd	India
Sun Pharmaceutical Industries Ltd	India
Orchid Pharma Ltd	India
Alembic Pharmaceuticals Ltd	India
Macleods Pharmaceuticals Ltd	India
Zhejiang Apeloa Jiayuan Pharmaceutical Co Ltd	China
Hikal Ltd	India
Moehs Iberica SI	Spain
Jubilant Generics Ltd	India
Piramal Enterprises Ltd	India
Wanbury Ltd	India
Medichem Sa	Spain
Raks Pharma Pvt. Ltd	India
Union Quimico Farmaceutica Sa (Uquifa Sa)	Spain
Zcl Chemicals Ltd	India
Vasudha Pharma Chem Ltd	India
Ind Swift Laboratories Ltd	India

Intermediate Requirement:

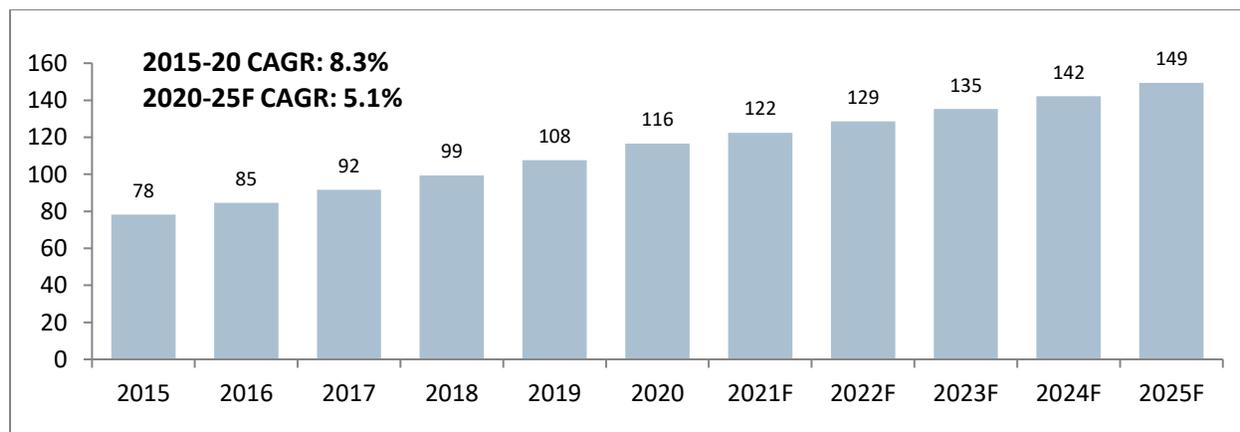
2-(2-piperazin-1-ylethoxy)-ethanol is one of the key intermediates used in production of quetiapine and its salts. In the production process, 6.14 Kg (35.24 molecular weight) of 2-(2-piperazin-1-ylethoxy)-ethanol [CAS: 13349-82-1 synonym to 1-(2-(2-Hydroxy Ethoxy) Ethyl Piperazine)] is added to produce 5.7 Kg (12.91 molecular weight, 91.85%) of quetiapine fumarate. This gives a Stoichiometry of nearly 1.08 kg of 1-(2-(2-Hydroxy Ethoxy) Ethyl Piperazine) for production of 1 kg of Quetiapine

7.4 API – Hydroxyzine: Antihistamine Drug

Hydroxyzine is used in adults and children to relieve itching caused by allergic skin reactions. It is also used alone or with other medications in adults and children to relieve anxiety and tension. Hydroxyzine is also used along with other medications in adults and children as a sedative before and after general anaesthesia for surgery. Hydroxyzine is in a class of medications called antihistamines. It works by blocking the action of histamine a substance in the body that causes allergic symptoms. It also works by decreasing activity in the brain.

Hydroxyzine is also used to treat anxiety and tension associated with psychoneuroses, as well as allergic conditions such as pruritus and chronic urticaria. Hydroxyzine is a first-generation histamine H1-receptor antagonist of the dephenylmethane and piperazine classes that exhibits sedative, anxiolytic, and antiemetic properties. It was first developed in 1955 and has since remained a relatively common treatment for allergic conditions such as pruritus, urticaria, dermatoses, and histamine-mediated pruritus. The active metabolite of hydroxyzine, cetirizine, is also available as an active ingredient in allergic medications and is responsible for much of its hydroxyzine's antihistaminic effect. Hydroxyzine is also used for generalized anxiety disorder, tension caused by psychoneurosis, and other conditions with manifestations of anxiety.

Exhibit 7.4: Global Hydroxyzine Industry size (MT), 2015-2025F



Source: Frost & Sullivan Primary Research & Analysis

Prominent Producers are

Key Companies	Location
Cosma SpA	Italy
Symed Labs Ltd	India
Ipca Laboratories Ltd	India
Calyx Chemicals And Pharmaceuticals Ltd	India
Srikem Laboratories Pvt. Ltd	India

Intermediate Requirement:

1-[2-(2-Hydroxyethoxy) Ethyl] Piperazine is one of the key intermediates used in production of Hydroxyzine. The Stoichiometry is 1 Kg of 1-[2-(2-Hydroxyethoxy) Ethyl] Piperazine for production of 1 kg of Hydroxyzine.

Intermediate: 1-[2-(2-Hydroxyethoxy) Ethyl]Piperazine (HEEP)

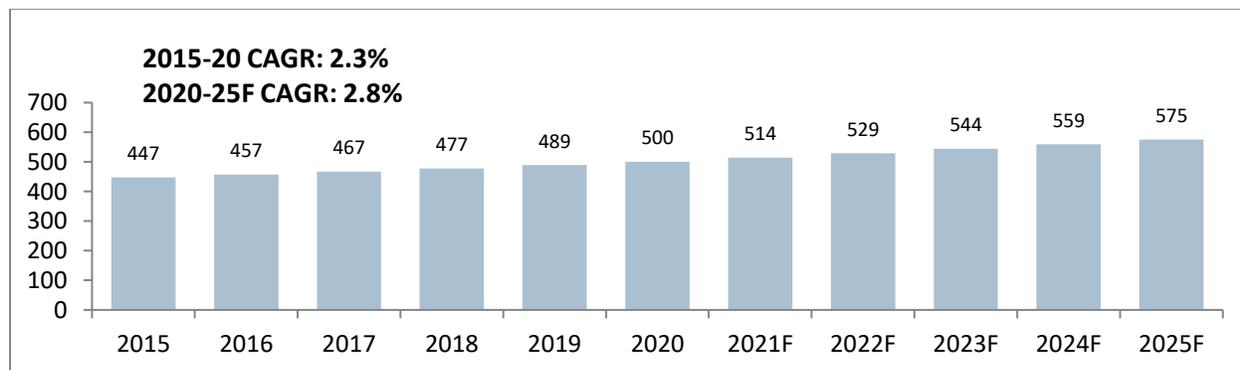
1-[2-(2-Hydroxyethoxy)ethyl]piperazine is used in chemical synthesis for manufacturing API such as Quetiapine and Hydroxyzine. It is one of the key intermediate for manufacturing of Quetiapine drug.

Synonyms:

- 2-[2-(1-Piperazinyl)ethoxy]ethanol
- N-(2-(2-Hydroxyethoxy)ethyl)piperazine

The global 1-[2-(2-Hydroxyethoxy) Ethyl] Piperazine (HEEP) was around 500 MT in 2020. HEEP finds application for production of API such as Quetiapine and Hydroxyzine. Both the products combined together are expected to drive the demand for HEEP at a CAGR of 2.8% between 2020-25

Exhibit 7.5: Global HEEP Industry size (MT), 2015-2025F



Source: Frost & Sullivan Primary Research & Analysis; HEEP market is arrived at using its consumption of ~1.08kg/kg for Quetiapine and ~1kg/kg for Hydroxyzine

The global market is dominated by Indian companies with three major intermediate manufacturers operating in the market. Aether's production volume increased from 76 MT in CY2018 to 171 MT in CY2020 registering a growth rate of 50.6% CAGR. Aether's production volume growth from CY2018 to CY2020 has been much higher as compared to industry growth. Aether Industries deploys ethylene oxide chemistry as the chemistry core competency and continuous reaction technology as the technology core competency for this product, with in-house continuous dry HCl gas generation plant. Amongst all 3 Indian manufacturers of HEEP, Aether Industries is the only manufacturer that is back-integrated into the manufacture of HEEP's key raw material viz. 2-CEE. Aether is the largest manufacturer of HEEP in India and globally with a market share of nearly 34% (2020) in terms of production volume. (Source: Frost and Sullivan Primary Research)

The next largest players are – Allchem Lifescience Ltd. with production of nearly 75-85 MT, holding 15% to 16% market share and Ami Organics with production of nearly 80-85 MT and holding 16% to 17% market share. Apart from Indian players there are Chinese players operating in the market with a total production rate of 150 - 180 MT annually, holding market share of 30-36%. Some of the China companies include Suzhou Jingye Medicine & Chemical Co., Ltd., Zhejiang Supor Pharmaceuticals Co., Ltd., etc.

Company	Production Range	% Share
Allchem Lifescience Ltd, India	75-85 MT	15% to 16%
Ami Organics, India	80-85 MT	16% to 17%
Other Chinese Players*	150-180 MT	30% to 36%

*fragmented supplier base

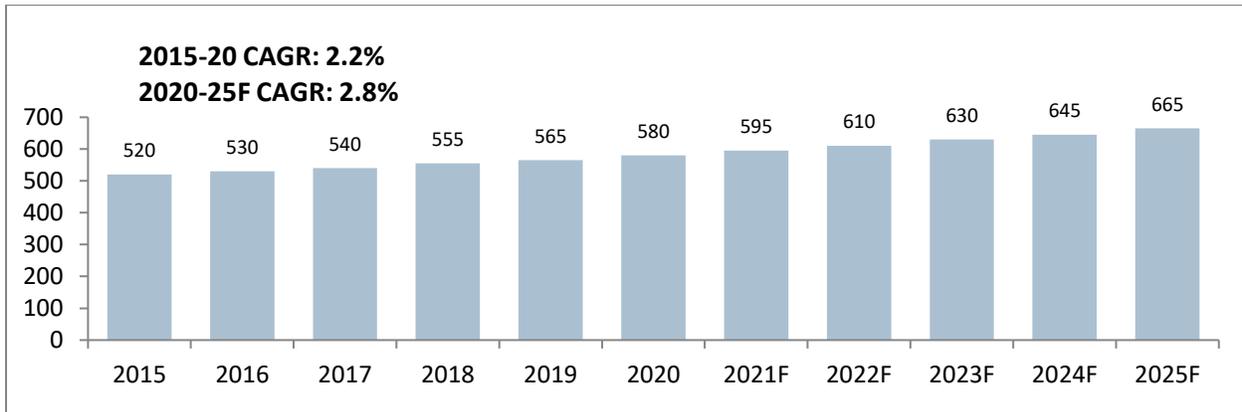
In CY2021, Aether produced 131 MT of HEEP. This makes Aether Industries as the largest manufacturer of HEEP globally. (Source: Frost and Sullivan Primary Research)

Intermediate: 2-(2-chloroethoxy) ethanol (2-CEE)

2-CEE is a raw material used for manufacturing of 1-[2-(2-Hydroxyethoxy) Ethyl] Piperazine (HEEP). It is one of the most important components for manufacturing of HEEP. 2-(2-Chloroethoxy)ethanol is used in the synthesis of o-nitrophenylbromoacetaldehyde bis-2-(2-chloroethoxy)-ethyl acetal, in production of HEEP to be used for quetiapine (an antipsychotic drug), Hydroxyzine, 2-(2-azidoethoxy)ethanol, among others. The typical Stoichiometry of conversion of 2-CEE to HEEP is nearly 1.05.

The global market for 2-CEE was around 580 MT in 2020 registering a historic growth of around 2.2% between 2015-20 and is expected to further grow at around 2.8% between 2020-25 to reach nearly 750 MT by 2025.

Exhibit 7.6: Global 2-CEE Industry size (MT), 2015-2025F



Source: Frost & Sullivan Primary Research & Analysis; 2-CEE market is arrived at using its consumption of ~1.05kg/kg for HEEP

The global market is dominated by Indian and Chinese players. Aether is the biggest manufacturer of this product in the world in 2020, in terms of production volume, and the only manufacturer of this product in India. It currently supplies to other HEEP manufacturers in India such as Ami Organics and Allchem. The market leader is Aether industries with production volume of nearly 275 MT in CY2020 including merchant sales and captive consumption. Aether’s production volume increased from 42 MT in CY2017 to 275 MT in CY2020 registering a growth rate of 86.5% CAGR. Aether’s production volume growth from CY2017 to CY2020 has been much higher as compared to industry growth. Aether accounts for about 47% market share globally. Internationally other manufacturers of 2-CEE include Suzhou Jingye Medicine & Chemical Co., Ltd. among others producing 300-310 MT for CY2020. Chinese players account for the balance 53% of the market.

Company	Production Range	% Share
Other Chinese Players*	300-310 MT	52% to 53%

*fragmented supplier base

In CY2021, Aether produced 257 MT of 2CEE.

In India, Symed Labs Ltd. and Teva API India Limited are the major importers of 2-CEE with Teva importing nearly 35 MT of 2-CEE annually. The average realization of Chinese players is around USD 18-19 per kg.

7.5 API – Clopidogrel : Antiplatelet Drug

Clopidogrel is an antiplatelet medicine. It prevents platelets (a type of blood cell) from sticking together and forming a dangerous blood clot. Taking clopidogrel helps prevent blood clots. Persons who had a heart attack, unstable angina, a stroke or "mini-stroke" (transient ischaemic attack or TIA), peripheral arterial disease, an operation on your heart or blood vessels, such as a coronary stent insertion, are at increased risk of having blood clots.

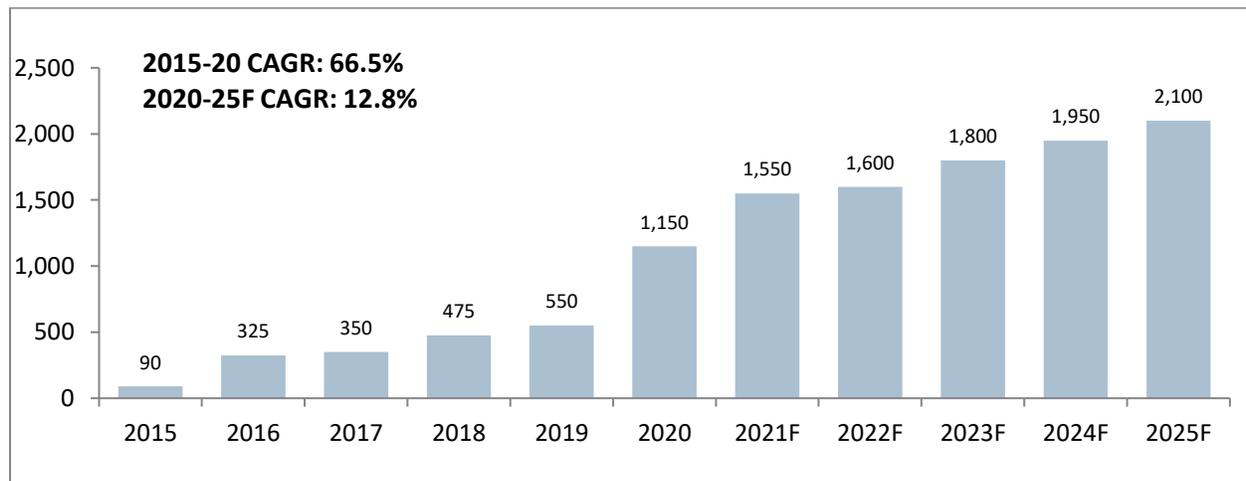
Clopidogrel was the second most successful drug trailing behind Pfizer's Lipito in 2010. Sold under the brand name Plavix, and marketed by Sanofi and Bristol-Myers Squibb, the demand for clopidogrel is escalating due to the increasing number of heart attack cases across the globe

Clopidogrel reduces the stickiness of platelets, and this helps prevent the platelets from sticking to the inside of an artery and forming a thrombus. This reduces the risk of having a heart attack or stroke.

There has been an increase in the incidence and prevalence of cardiovascular disease (CVD) in the past few decades, including acute coronary syndrome (ACS), which has become a leading cause of mortality and morbidity worldwide [1–5]. The number of CVD-related deaths has increased by 12.5% during the past decade, accounting for approximately one-third of all deaths globally, mainly because of population growth and aging.

Clopidogrel is a second-generation thienopyridine that was introduced in the United States (US) in 1998. It is administered as an inactive prodrug, with approximately 50% being absorbed through the gastrointestinal tract by the drug efflux transporter P-glycoprotein.

Exhibit 7.7: Global Clopidogrel Industry size (MT), 2015-2025F



Source: Frost & Sullivan Primary Research & Analysis

The global Clopidogrel market was around 1,150 MT in 2020 registering a good growth rate of 66% between 2015-20. The drug was jointly researched and developed by Bristol-Myers Squibb and Sanofi. Prior to the patent expiration in 2012, Plavix was ranked after Lipitor for many years and was the second best-selling drug in the world. After the patent expired, a global wave of biosimilar boomed. Quite many

Indian companies developed biosimilar owing to which the market picked up from 2015 onwards. In future the market is expected to grow by nearly 13%

Clopidogrel has remained, ever since its first approval in 1997, the antiplatelet therapy of choice among physicians for the treatment of patients with conditions such as acute coronary syndrome or percutaneous coronary intervention. The drug was the first thienopyridine to hit the market, which gave it an excellent head start over a number of drugs for these conditions that are either available in the market or are in clinical trials. As a result, the drug did not face much competition and has taken over the global market, with its array of application constantly expanding.

The substantial and high-level evidence gathered over the years support the use of Clopidogrel for reduction of mortality and morbidity patients with acute coronary syndrome, myocardial infarction, and a number of other indications. As a result, the drug has developed a formidable presence in the global market over the years. Moreover, the drug's relative ease of use, low rate of incidence of adverse reactions, and good tolerability have made it the de-facto antiplatelet agent for the reduction of atherosclerotic events in patients.

The primary factor for the increased demand for clopidogrel is the mounting population across the world who are suffering from cardiovascular diseases and related problems. Additionally, the changing lifestyle and increase in number of patients related with cardiovascular diseases among the emerging economies in the Asia Pacific region are also expected to be the major consumers for clopidogrel in the next six years

According to the World Heart Federation, nearly 15 million people suffer from heart attack or related problems globally. Out of these, roughly six million of these patients die while another five million are disabled permanently. This vast patient base is the primary factor that will sustain the demand during the forecast period.

Clopidogrel is marketed by Sanofi and Bristol-Myers Squibb under the trade name Plavix. In 2010, it was the second-best selling drug with \$ 9.4 billion in global sales but generics are now on the market.

Prominent Producers are

Key Companies	Location
Sanofi Chimie	France
Signa Sa De Cv	Mexico
Dr Reddys Laboratories Ltd	India
Teva Pharmaceutical Industries Ltd	India
Wockhardt Ltd	India
Aurobindo Pharma Ltd	India
Vitalife Laboratories Div Arch Pharmalabs Ltd.	India
Sun Pharmaceutical Industries Ltd	India
Msn Laboratories Private Ltd	India
Yung Zip Chemical Ind Co Ltd	China
Macleods Pharmaceuticals Ltd	India
Jubilant Generics Ltd	India
Hetero Drugs Ltd	India
Orchid Pharma Ltd	India
Zhejiang Apeloia Jiayuan Pharmaceutical Co Ltd	China
Arch Pharmalabs Ltd	India
Zhejiang Huahai Pharmaceutical Co Ltd	China
Msn Pharmachem Private Ltd	India
Msn Organics Private Ltd	India
Zhejiang Charioteer Pharmaceutical Co Ltd	China
Raks Pharma Pvt. Ltd	India
Vasudha Pharma Chem Ltd	India
Cadila Healthcare Ltd	India
Chemeca Drugs Private Ltd	India
Msn Life Sciences Private Ltd	India
Metrochem Api Private Ltd	India
Innovare Labs Private Ltd	India
Zhejiang Lepu Pharmaceutical Co Ltd	China

Intermediate Requirement:

Thiophene-2-Ethanol is one of the key intermediate for manufacturing of Clopidogrel. In the production process, 115 Kg of Thiophene-2-ethanol is added to produce 180 Kg (12.91 mol, 91.85%) of Clopidogrel. This gives a Stoichiometry of nearly 0.65 kg of Thiophene-2-Ethanol for production of 1 kg of Clopidogrel.

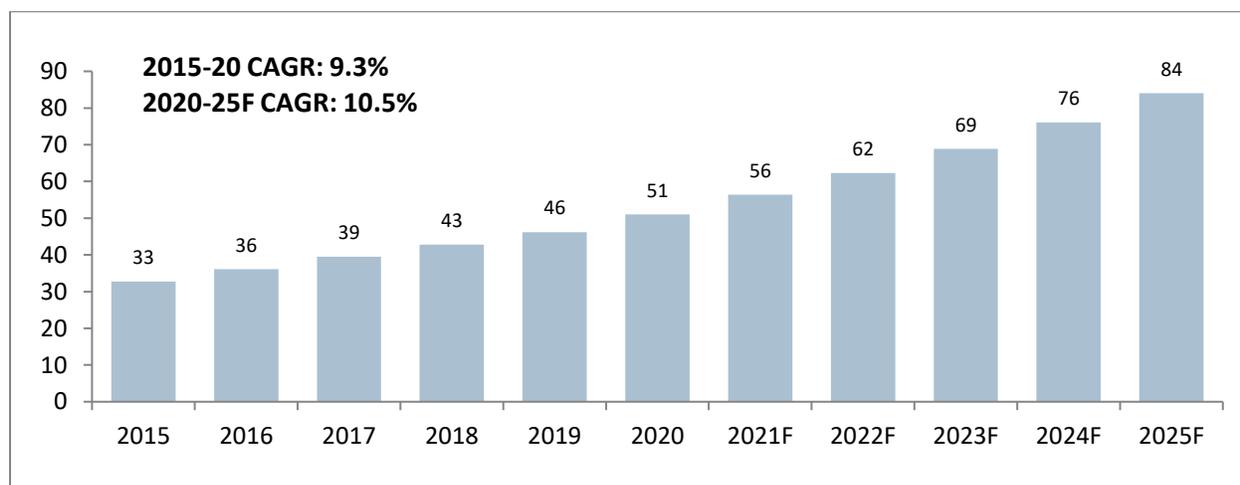
7.6 Ticlopidine: Antiplatelet Drug

Ticlopidine is a medicine used to reduce the risk of thrombotic stroke. It is an antiplatelet drug of the thienopyridine family and an adenosine diphosphate receptor inhibitor. Ticlopidine is FDA approved for the prophylaxis of thromboembolic stroke, and subacute stent thrombosis in patients undergoing successful coronary stent implantation. The prominent brand is Ticlid

It causes a time and dose-dependent inhibition of platelet aggregation and release of platelet factors, as well as prolongation of bleeding time. Ticlopidine interferes with platelet membrane function by inhibiting ADP-induced platelet-fibrinogen binding and subsequent platelet-platelet interactions. The effect of ticlopidine on platelet function is irreversible. Template bleeding time is usually prolonged by 2 to 5-fold of baseline values with the therapeutic dose of ticlopidine hydrochloride. In many cases where patients who showed clopidogrel resistance, ticlopidine treatment is used.

The global Ticlopidine market was around 51 MT in 2020 registering a good growth rate of 9.3% between 2015-20.

Exhibit 7.8: Global Ticlopidine Industry size (MT), 2015-2025F



Source: Frost & Sullivan Primary Research & Analysis

Prominent Producers are

Key Companies	Location
Societa Italiana Medicinali Scandicci Sims Srl	Italy
Teva Pharmaceutical Industries Ltd	India
Erregierre SpA	Italy
Amri Italy Srl	Italy

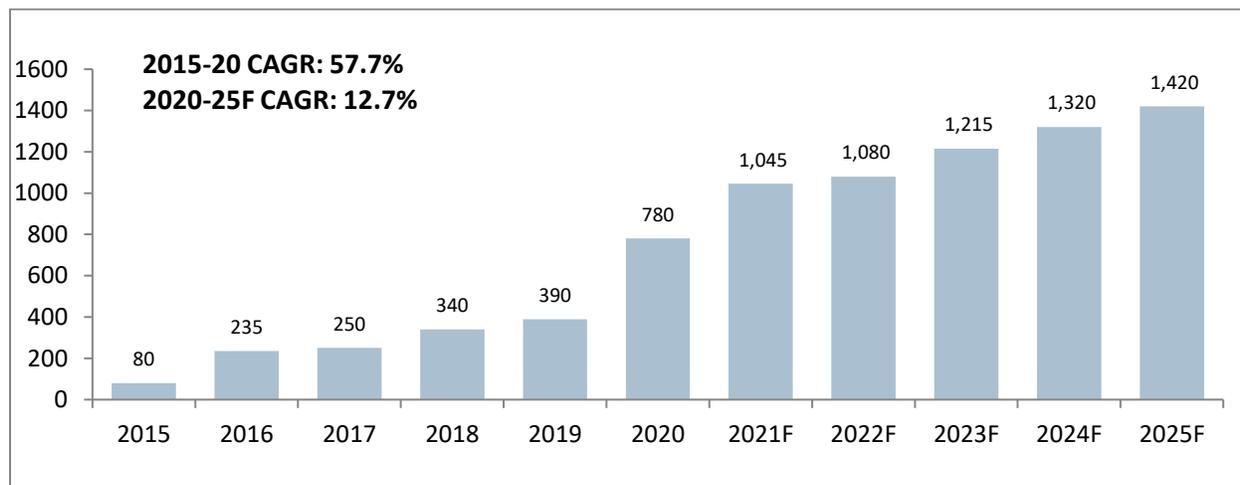
Intermediate Requirement:

Thiophene-2-Ethanol is one of the key intermediate for manufacturing of Ticlopidine. As per Stoichiometry nearly 0.65 kg of Thiophene-2-Ethanol for production of 1 kg of Ticlopidine.

Intermediate: Thiophene-2-Ethanol (T2E)

Thiophene-2-Ethanol is one of the key intermediate for manufacture of Clopidogrel and Ticlopidine. The global market of the intermediate was around 780 MT in 2020 and is expected to grow at nearly 13% in the near future of 2020-25

Exhibit 7.9: Global T2E Industry size (MT), 2015-2025F



Source: Frost & Sullivan Primary Research & Analysis, T2E is arrived at using its consumption of ~0.65kg/kg each for Clopidogrel and Ticlopidine

Aether is the biggest manufacturer of Thiophene-2-Ethanol (T2E) in the world in 2020, in terms of production volume and the only manufacturer of this product in India. Aether is the market leader in the Thiophene-2-Ethanol (T2E) market with production volume of over 392 MT in 2020. (Source: Frost and Sullivan Primary Research)

The company has achieved production volume growth of 75.7% from 2017. The company recorded production volume of 72 MT in 2017 which grew to 392 MT in 2020. The company holds nearly 50% market share globally in 2020 making it the largest producer in the World. The company has deployed Grignard chemistry and ethylene oxide chemistry as the chemistry core competencies and continuous reaction technology and fractional distillation technology as the core technology competencies for this product.

In CY2021, Aether produced 453 MT of T2E.

Apart from India, China is the major manufacturer of this intermediate producing 380-400MT and holding 49%-50% market share. Zhejiang Liaoyuan Pharmaceutical Co., Ltd. is one of the key manufacturers located in China. It is headquartered in Zhejiang - Linhai Industrial Zone, covering an area of 136,000 square meters with a total investment of RMB 200 million. Liaoyuan focuses on manufacturing APIs and intermediates for anticoagulants, antidepressants and cardiovascular drugs. The leading products include Clopidogrel, Ticlopidine Hydrochloride, Mirtazapine, and etc. Liaoyuan enjoys a good reputation as a manufacturer of thiophene derivatives; it is a well-known manufacturer of

thiophene derivatives in the international market. Some of the other manufacturers include Shandong Xinhua Pharmaceutical I&E Co.,Ltd., among others.

India imports few hundreds of tons of T2E every year majorly imported by IOL Chemicals And Pharmaceuticals Limited, Shree Raj Corporation, Vijeta Life Sciences Pvt. Ltd., Praveen Laboratories Pvt. Ltd., Arene Life Sciences Limited, Aptuit Laurus Pvt. Ltd., Hetero Drugs Limited, Cadchem Laboratories Ltd., Ind-Swift Laboratories Ltd., Chandra Life Sciences Pvt. Ltd, among others.

Company	Production Range	% Share
Other Chinese players*	380-400 MT	49% to 50%

*fragmented supplier base

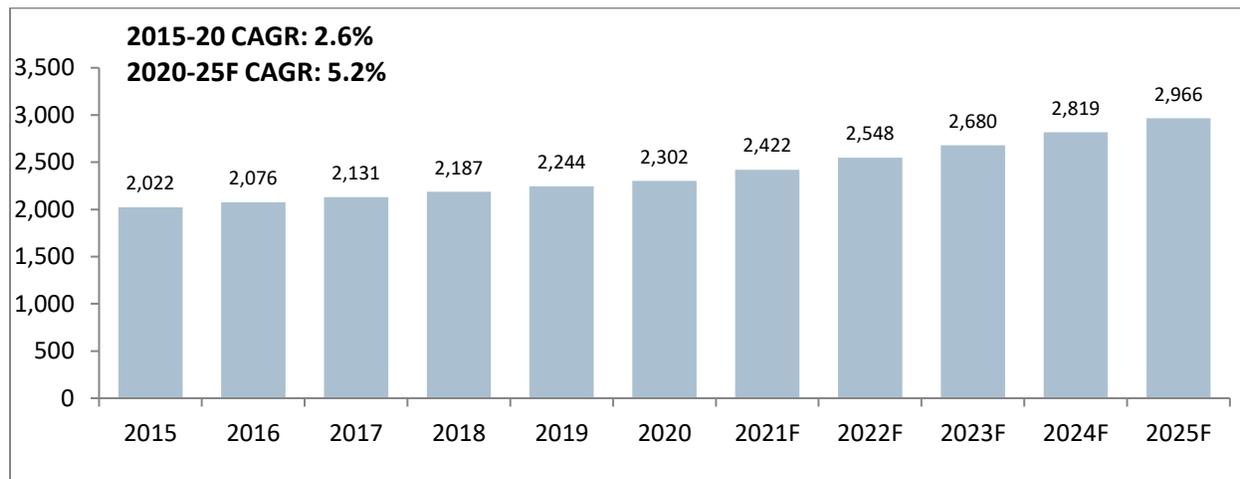
7.7 API Naproxen: NSAID Drug

Naproxen is a non-steroidal anti-inflammatory drug (NSAID) as an over-the-counter (OTC) as well as prescription drug. Naproxen is used in low to moderate pain management and a few times used for fever reduction. Naproxen was first marketed by Syntex in 1976.

Naproxen belongs to heterogeneous set of compounds known to be non-steroidal anti-inflammatory drug (NSAID), which are used as analgesics, anti-inflammatory, and anti-pyretic.

Few major drivers for growth of naproxen market are its availability as non-prescription drug and well established profiling of its benefits and risks. Growth of pharmaceutical industries has led to increase in the naproxen market. Also the increase in geriatric population and in arthritis cases has further boosted the naproxen market.

Exhibit 7.14: Global Naproxen Industry size (MT), 2015-2025F



Source: Frost & Sullivan Primary Research & Analysis

Prominent Producers are

Key Companies	Location
Dr Reddys Laboratories Ltd	India
Teva Pharmaceutical Industries Ltd	India
Corden Pharma Bergamo Spa	India
Zhejiang Charioteer Pharmaceutical Co Ltd	China
Divis Laboratories Ltd	India
Solara Active Pharma Sciences Ltd	India
Almatica Pharma Llc	India
Aurobindo Pharma Ltd	India
Granules India Ltd	India

Intermediate Requirement:

NODG is one of the key intermediate for manufacture of Dexketoprofen and Naproxen. The Stoichiometry is 0.2 kg of NODG for production of 1 kg of Naproxen

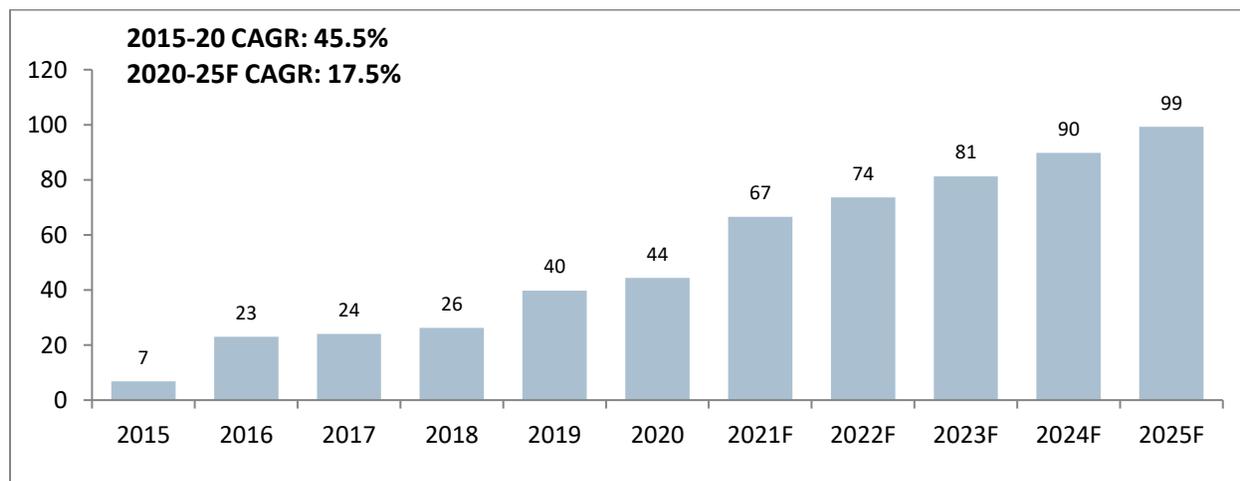
7.8 API Dexketoprofen: NSAID Drug

Dexketoprofen is an Anti-inflammatory painkiller also called non-steroidal anti-inflammatory drugs (NSAIDs), or sometimes just 'anti-inflammatories'. Dexketoprofen is used to treat short-term painful conditions such as muscular sprains and strains, period (menstrual) pain, and toothache.

Dexketoprofen works by blocking the effect of natural chemicals called cyclo-oxygenase (COX) enzymes. These enzymes help to make other chemicals in the body, called prostaglandins. Some prostaglandins are produced at sites of injury or damage, and cause pain and inflammation. By blocking the effect of COX enzymes, fewer prostaglandins are produced, which means the pain is eased.

With increased population, better access to medical & dental cares the overall market for NSAIDs is expected to grow. Dexketoprofen is one of the key NSAIDs and hence expected to grow over time.

Exhibit 7.14: Global Dexketoprofen Industry size (MT), 2015-2025F



Source: Frost & Sullivan Primary Research & Analysis

Prominent Producers are:

Key Companies	Location
Saurav Chemicals Ltd.	India
Metrochem Api Private Ltd.	India
Enaltec Labs Private Ltd.	India
Emcure Pharmaceuticals Ltd.	India
A. Menarini Asia-Pacific Holdings Pte Ltd	Singapore
Wuxi Hexia Chemical Company	China

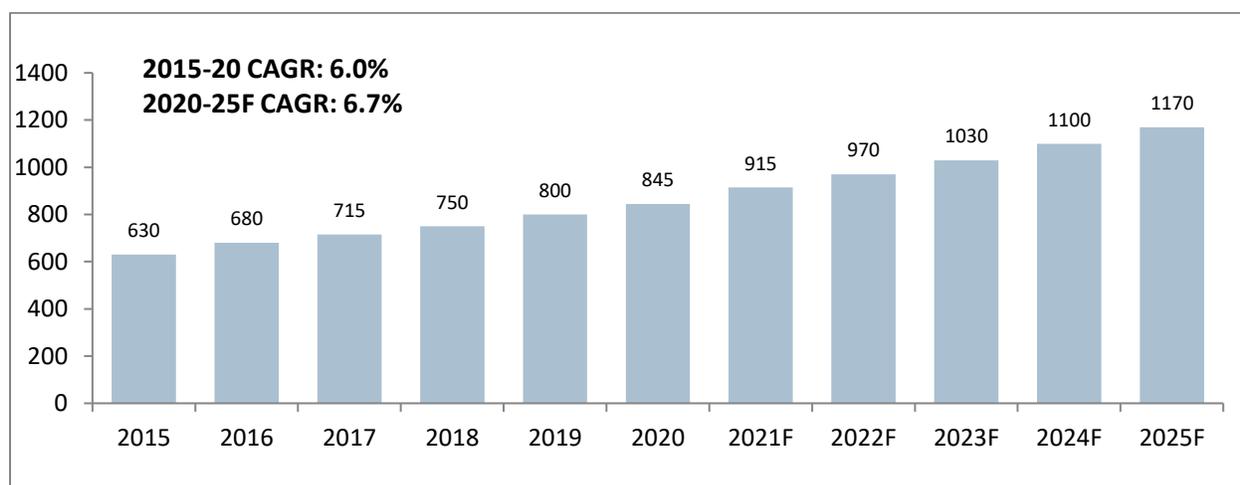
Intermediate Requirement:

NODG is one of the key intermediate for manufacture of Dexketoprofen and Naproxen. The Stoichiometry is 0.99 kg of NODG for production of 1 kg of Dexketoprofen

Intermediate: N-Octyl-D-Glucamine (NODG) / 1-Deoxy-1-(Octylamino)-D-Glucitol

NODG is a key intermediate for manufacturing of Naproxen & Dexketoprofen. The global market of the intermediate was around 845 MT in 2020 and is expected to grow at nearly 6.7% in the near future of 2020-25

Exhibit 7.15: Global NODG Industry size (MT), 2015-2025F



Source: Frost & Sullivan Primary Research & Analysis; NODG market is arrived at using its consumption of ~0.2kg/kg for Naproxen and ~0.99kg/kg for Dexketoprofen

Aether is the biggest manufacturer of NODG in the world in 2020, in terms of production volume and the only manufacturer of this product in India. Aether is the market leader in the NODG market with production volume of nearly 396 MT in 2020 with a market share of approximately 47% globally. (Source: Frost and Sullivan Primary Research)

The company has achieved production volume growth of 51.5% from 2017 with production of around 114 MT in 2017, which increased to 396 MT in CY2020. In CY2021, Aether produced 406 MT of NODG.

The production process includes hydrogenation of n-octylamine with D-glucose to produce N-n-octyl-D-glucamine. The company has superior hydrogenation and high-pressure chemistry core competencies which helps the company to have edge over other companies in this product.

Apart from India, China is the major manufacturer of this intermediate manufacturing 420-500 MT in CY2020 holding 49% to 58% market share. Some of the Key manufacturers include Suzhou Jingye Medicine & Chemical Co., Ltd., Aeochem, Apeloa Pharma, Suzhou Tianma Specialty Chemicals, among others.

Company	Production Range	% Share
Other Chinese Players*	420-500 MT	49% to 58%

*fragmented supplier base

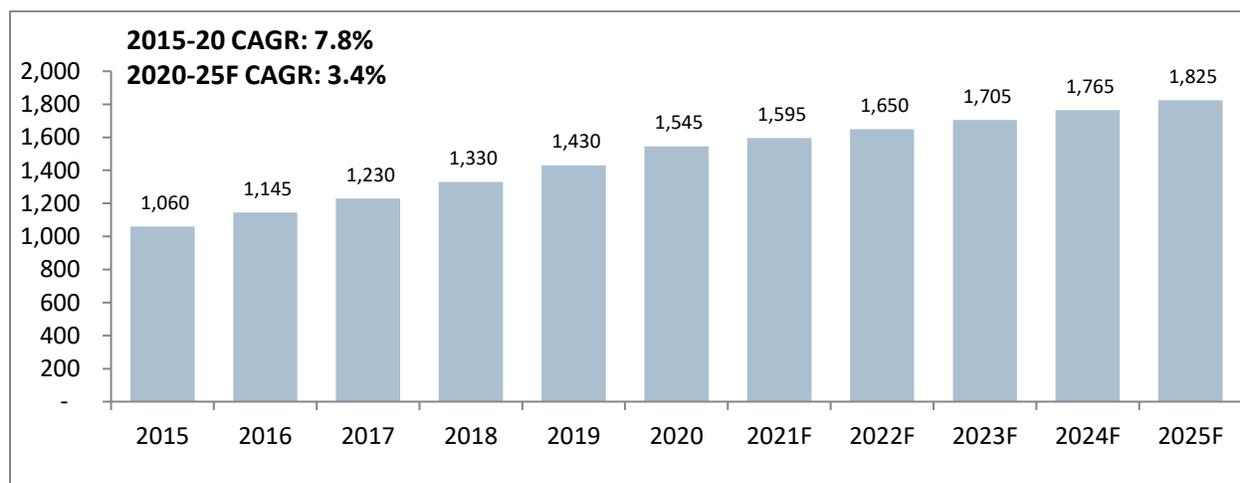
7.9 API Valsartan : Hypertension Drug

Valsartan is the generic name for N-(1-oxopentyl)-N-[[2'-(1H-tetrazol-5-yl)[1,1'-biphenyl]-4-yl]methyl]-L-valine

Valsartan is used to treat high blood pressure and heart failure. It is also used to improve the chance of living longer after a heart attack. In people with heart failure, it may also lower the chance of having to go to the hospital for heart failure. Valsartan belongs to a class of drugs called angiotensin receptor blockers (ARBs). It works by relaxing blood vessels so that blood can flow more easily. Lowering high blood pressure helps prevent strokes, heart attacks, and kidney problems.

The Global Valsartan Market has been growing at 7.8% faster pace with substantial growth rates over the last few years, however the growth is expected to flatten and on conservative side expected to grow minimum of 3.4% per annum.

Exhibit 7.16: Global Valsartan Industry size (MT), 2015-2025F



Source: Frost & Sullivan Primary Research & Analysis

Prominent Producers are

Key Companies	Location
Teva Pharmaceutical Industries Ltd	India
Mylan Laboratories Ltd	India
Jubilant Generics Ltd	India
Lupin Ltd	India
Dr Reddys Laboratories Ltd	India
Signa Sa De Cv	Mexico
Zhejiang Huahai Pharmaceutical Co Ltd	China
Alembic Pharmaceuticals Ltd	India
Novartis Pharmaceuticals Corp	India
Macleods Pharmaceuticals Ltd	India
Aurobindo Pharma Ltd	India
Divis Laboratories Ltd	India
Second Pharma Co Ltd	India
Cadila Pharmaceuticals Ltd	India
Ipca Laboratories Ltd	India
Hetero Labs Ltd	India
Msn Life Sciences Private Ltd	India
Zhejiang Tianyu Pharmaceutical Co Ltd	China
Zhuhai Rundu Pharmaceutical Co Ltd	China
Biocon Ltd	India
Synthon Bv	Netherlands
Sun Pharmaceutical Industries Ltd	India
Harman Finocem Ltd	India
Cadila Healthcare Ltd	India
Biophore India Pharmaceuticals Pvt. Ltd	India

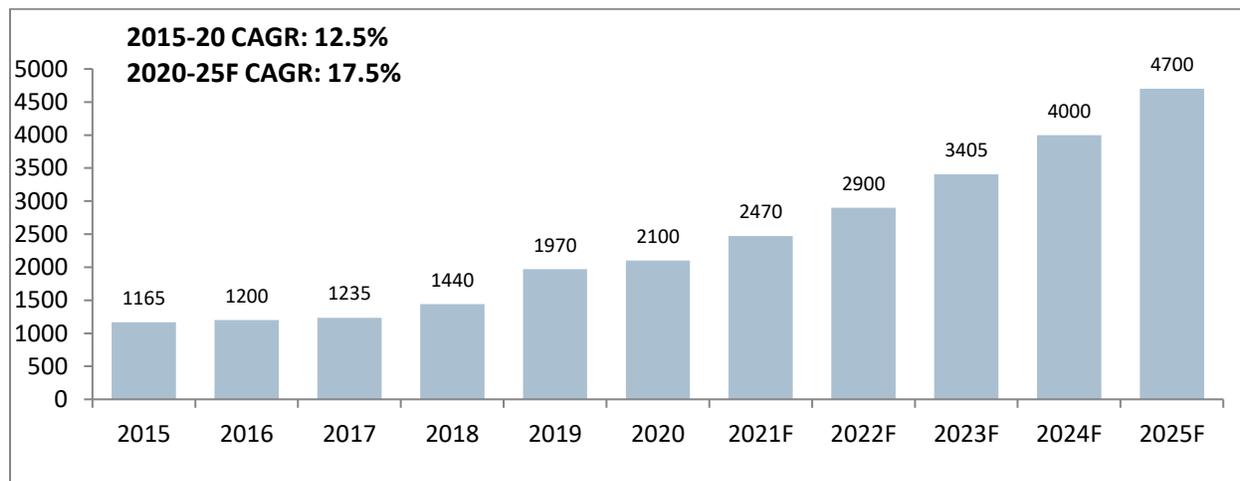
Intermediate Requirement:

O-Tolyl Benzonitrile (4'-methyl-2-cyanobiphenyl) is a key intermediate for manufacturing of Valsartan by certain routes. Around 100 Kg of O-Tolyl Benzonitrile will give a yield of 85.7 Kg of Valsartan. Hence the Stoichiometry of O-Tolyl Benzonitrile to Valsartan is 1.15

7.10 API Losartan: Hypertension Drug

Losartan is a medication that is used to treat high blood pressure. Losartan is widely used in slowing down long-term kidney damage due to type II diabetes. With growing prevalence of hypertension, stroke and diabetic nephropathy across the world, the market growth for Losartan through 2026 is expected.

Exhibit 7.17: Global Losartan Industry size (MT), 2015-2025F



Source: Frost & Sullivan Primary Research & Analysis

Prominent Producers are;

Key Companies	Location
Teva Pharmaceutical Industries Ltd	India
Ipca Laboratories Ltd	India
Cadila Healthcare Ltd	India
Lupin Ltd	India
Aurobindo Pharma Ltd	India
Hetero Labs Ltd	India
Dr Reddys Laboratories Ltd	India
Jubilant Generics Ltd	India
Calyx Chemicals And Pharmaceuticals Ltd	India
Orchid Pharma Ltd	India
Zhejiang Huahai Pharmaceutical Co Ltd	China
Alembic Pharmaceuticals Ltd	India
Unichem Laboratories Ltd	India
Granules India Ltd	India
Divis Laboratories Ltd	India
Suven Life Sciences Ltd	India
Micro Labs Ltd	India
Zhejiang Tianyu Pharmaceutical Co Ltd	China
Vasudha Pharma Chem Ltd	India
Macleods Pharmaceuticals Ltd	India

Aurore Life Sciences Private Ltd	India
Msn Life Sciences Private Ltd	India

Intermediate Requirement:

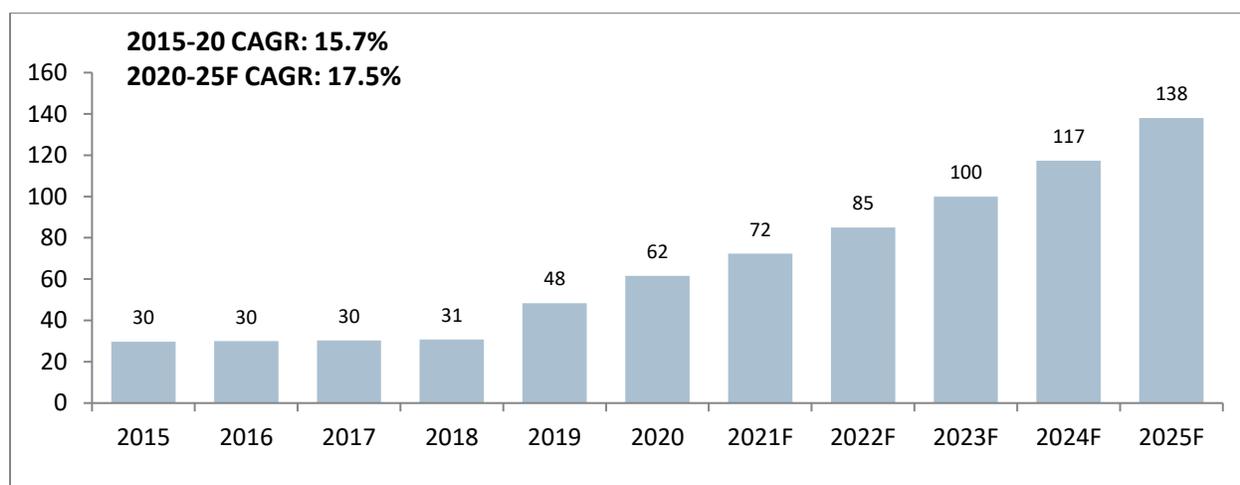
2-cyano-4'-methyl-1,1'-biphenyl (OTBN) is a key intermediate in manufacturing of Losartan where Bromination of OTBN with 1,3-dibromo-5,5-dimethylhydantoin in presence of Dichloromethane (MDC) is done in 1st stage. In the production process, 141.2 Kg of OTBN will give a yield of 120 Kg of Losartan base. The Stoichiometry of O-Tolyl Benzonitrile to Losartan is 1.18.

7.11 API Olmesartan: Hypertension Drug

Olmesartan is a medication used to treat high blood pressure, heart failure, and diabetic kidney disease. Olmesartan was developed by Sankyo and Forest Laboratories, olmesartan medoxomil was approved to the U.S.A. in April 2002 with the trade name "Benicar" and was approved to Europe in October 2002. Olmesartan can take effect very soon with low dosage, and it has strong and lasting antihypertensive effect with few adverse reactions, especially dry cough.

Because of more comfortable easy standard of living and changing lifestyle, incidence of hypertension is estimated to grow in the coming few years.

Exhibit 7.18: Global Olmesartan Industry size (MT), 2015-2025F



Source: Frost & Sullivan Primary Research & Analysis

Prominent Producers are

Key Companies	Location
Daiichi Sankyo Co Ltd	Japan
Glenmark Life Sciences Ltd	India
Mylan Laboratories Ltd	India
Teva Pharmaceutical Industries Ltd	India
Cadila Pharmaceuticals Ltd	India
Venkata Narayana Active Ingredients Private Ltd	India
MSN Laboratories Private Ltd	India
Torrent Pharmaceuticals Ltd	India

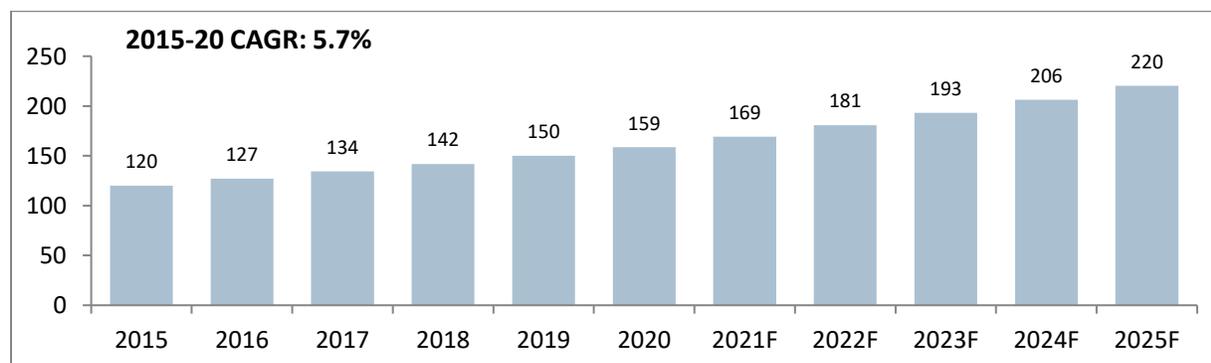
Cadila Healthcare Ltd	India
Alembic Pharmaceuticals Ltd	India
Ulkar Kimya Sanayii Ve Ticaret As	Turkey
Aurobindo Pharma Ltd	India
Zhejiang Huahai Pharmaceutical Co Ltd	China
Macleods Pharmaceuticals Ltd	India
Jubilant Generics Ltd	India
Hetero Labs Ltd	India
Amoli Organics Pvt. Ltd	India
Micro Labs Ltd	India
Divis Laboratories Ltd	India
Chinoin Pharmaceutical And Chemical Works Private Co Ltd	China
Shandong Anxin Pharmaceutical Co Ltd	India
Hec Pharm Co Ltd	India
Zhejiang Tianyu Pharmaceutical Co Ltd	China
Venkata Narayana Active Ingredients Private Ltd	India
Chromo Laboratories India Private Ltd	India
Zhuhai Rundu Pharmaceutical Co Ltd	China

7.12 API Telmisartan: Hypertension Drug

Telmisartan is an angiotensin receptor blocker (ARB) used alone or in combination with other agents for therapy of hypertension, in cardiac arrest, and in stroke management. Other agents such as hydrochlorothiazide and amlodipine are often used along with Telmisartan.

Increase in prevalence of high blood pressure (hypertension), surge in geriatric population, and rise in government initiatives for spreading awareness about blood pressure diseases are the factors that are expected to drive the growth of the market. The rise in marketing approvals for generic versions of telmisartan, increase in sedentary lifestyle, and surge in incidences of chronic diseases such as diabetes and kidney disease, are expected to drive the growth of the Telmisartan market.

Exhibit 7.19: Global Telmisartan Industry size (MT), 2015-2025F



Source: Frost & Sullivan Primary Research & Analysis

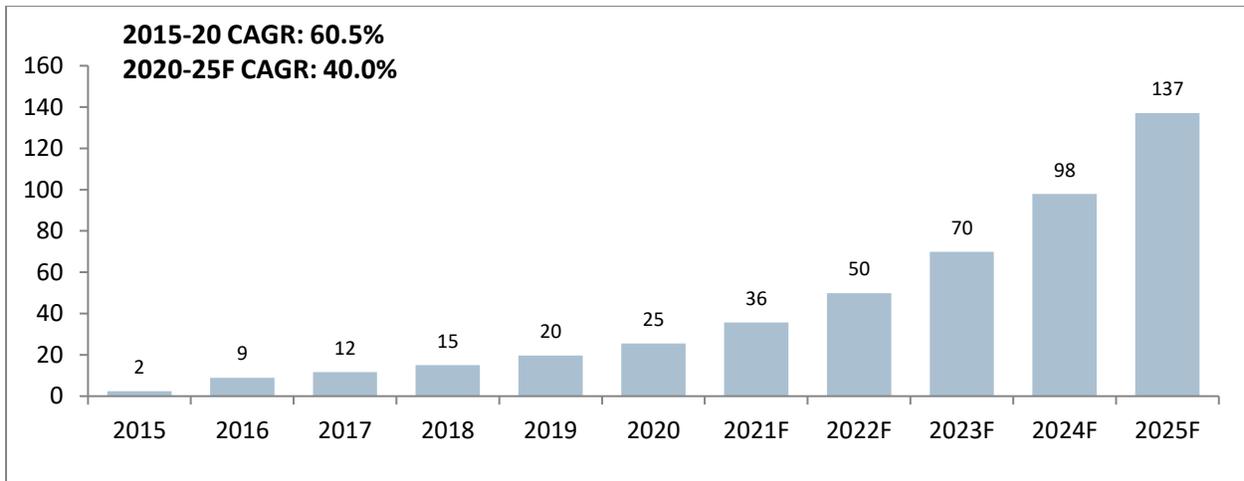
Prominent Producers are

Key Companies	Location
Cipla Ltd	India
Mylan Laboratories Ltd	India
Alembic Pharmaceuticals Ltd	India
Amino Chemicals Ltd	India
Zhejiang Huahai Pharmaceutical Co Ltd	China
Teva Pharmaceutical Industries Ltd	India
Cadila Healthcare Ltd	India
Msn Pharmachem Private Ltd	India
Dr Reddys Laboratories Ltd	India
Zhejiang Apeloia Jiayuan Pharmaceutical Co Ltd	China
Jubilant Generics Ltd	India
Macleods Pharmaceuticals Ltd	India
Torrent Pharmaceuticals Ltd	India
Signa Sa De Cv	Mexico
Aurobindo Pharma Ltd	India
Divis Laboratories Ltd	India
Sharon Bio Medicine Ltd	India
Micro Labs Ltd	India
Glenmark Life Sciences Ltd	India
Ipca Laboratories Ltd	India
Topharman Shandong Co Ltd	India
Uquifa Mexico Sa De Cv	Mexico
Fdc Ltd	India
Unichem Laboratories Ltd	India
Chromo Laboratories India Private Ltd	India

7.13 API Candesartan : Hypertension Drug

Candesartan is an angiotensin receptor blocker used mainly for the treatment of high blood pressure and congestive heart failure. Candesartan has an additive hypertensive effect when combined with a diuretic, such as chlorthalidone. Angiotensin receptor blockers such as candesartan and valsartan have been demonstrated in randomised controlled trials to reduce heart failure hospitalisations and cardiovascular deaths for chronic heart failure patients.

Exhibit 7.20: Global Candesartan Industry size (MT), 2015-2025F



Source: Frost & Sullivan Primary Research & Analysis

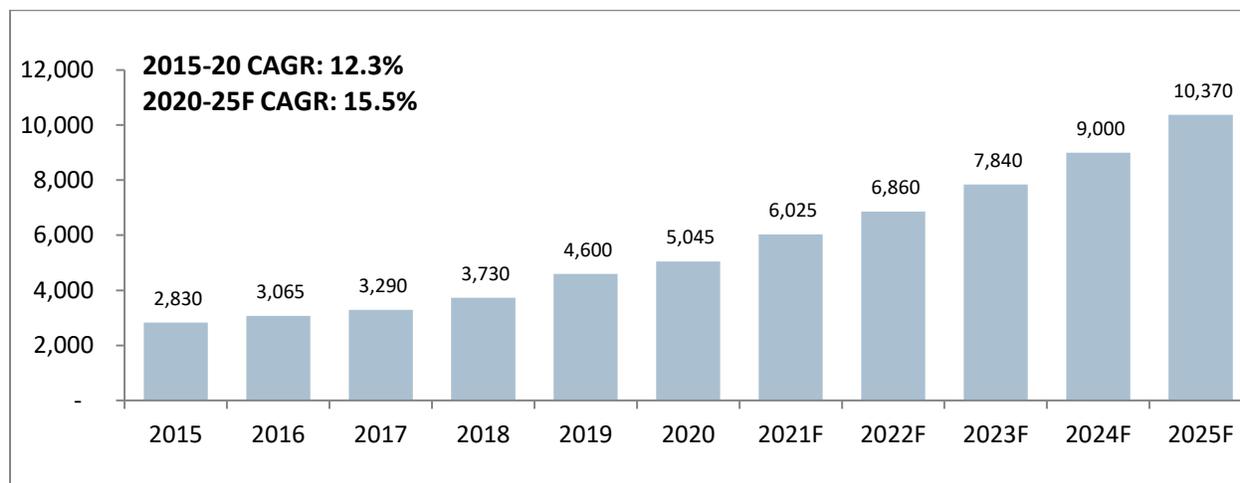
Prominent Producers are;

Key Companies	Location
Cadila Healthcare Ltd	India
Dr Reddys Laboratories Ltd	India
Mylan Laboratories Ltd	India
Torrent Pharmaceuticals Ltd	India
Cadila Healthcare Ltd	India
Macleods Pharmaceuticals Ltd	India
Ulkar Kimya Sanayii Ve Ticaret As	India
Zhejiang Huahai Pharmaceutical Co Ltd	China
Chromo Laboratories India Private Ltd	India
Ulkar Kimya Sanayii Ve Ticaret As	Turkey
Alembic Pharmaceuticals Ltd	India

Intermediate: Ortho Toly Benzo Nitrile / 4'-Methyl-2-Cyanobiphenyl

OTBN is a key intermediate for manufacturing of variety of Sartan drugs. o-tolylbenzotrile (OTBN) is a common intermediate for the production of hundreds of tons of an entire family of Sartan derivatives as blood pressure lowering agents. Some companies undertake bromination of OTBN to convert into Bromo OTBN and sell forward again for application in Sartan series of drugs. The global market of the intermediate was around 5,045 MT in 2020 and is expected to grow at nearly 15.5% in the near future of 2020-25

Exhibit 7.21: Global OTBN Industry size (MT), 2015-2025F



Source: Frost & Sullivan Primary Research & Analysis; OTBN market is arrived at using its consumption of ~1.18 kg/kg for Losartan, ~0.83kg/kg for Telmisartan, ~0.85kg/kg for Irbesartan, ~1.15kg/kg each for Candesartan, Valsartan, Olmesarta, Azilsartan

Aether is the only manufacturer of this product in India and has production of about 417 MT in CY2020 with a market share of 8% globally in terms of production volume. The company started production in 2018. The production reached 308 MT in CY2019 and increased by 35% to 417 MT in CY2020. In CY2021, Aether produced 205 MT of OTBN. The company has deployed Grignard chemistry and coupling chemistry as the core chemistry competencies and continuous reaction technology and fractional distillation technology as the core technology competencies for this product. The company has improved the Grignard reaction and also established a continuous recovery and recycle process for the THF solvent, to increase the yield of production and to improve the overall process economics

China is the major manufacturer of this intermediate, in the year 2020, it produced 4,615-4,630 MT, holding a share of 91% to 92%. Some of the Key manufacturers include Tianyu Pharmaceutical Co., Ltd, Yancheng Donggang, Apelo Pharma, among others. Total production volume of China would be around 4,500 MT (2021). There are many manufacturers in China and many manufacturers use OTBN for captive consumption. China was facing quite many issues due to environmental norms. In 2019 government of China has implemented some strict safety laws owing to which many small manufacturers shut their

production as they could not comply with the new regulations. The prices of OTBN had skyrocketed in 2019 as there were issues earlier due to environment norms; however in 2020 the prices had stabilized.

Company	Production Range	% Share
Other Chinese players*	4,615-4,630 MT	91% to 92%

*fragmented supplier base

Europe and India are the major consumption centres for Sartan APIs. Europe earlier was a lower demand region however there were some instances of Sartan impurity issues in India and there were multiple recalls owing to which some production shifted back to Europe.

New Business

7.14 API – Dolutegravir

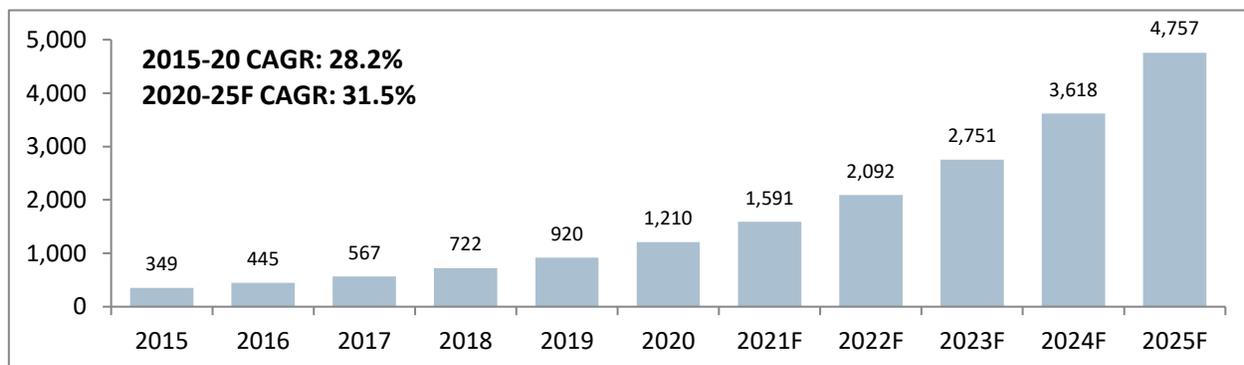
Dolutegravir (DTG), is an API for antiretroviral medication used, together with other medication, to treat HIV/AIDS. It may also be used, as part of post exposure prophylaxis, to prevent HIV infection following potential exposure. It is an oral medication.

In August 2013, dolutegravir was approved for medical use in the United States followed by Canada and the European Commission. In 2019, a triple-combination therapy, with dolutegravir replacing efavirenz, was introduced as the first-line treatment for all people (pregnant excluded) with HIV by the South African Government (public) sector.

In June 2020, dolutegravir was approved in the US with an indication to treat HIV-1 infection in children at least four weeks old and weighing at least 3 kg (6.61 pounds) in combination with other antiretroviral treatments. It is intended to treat children at least 4 weeks old and 3 kg who have never been treated for HIV.

It is priced at USD ~600-800 per kilogram. The prices have remained almost the same for the past 2-3 years.

Exhibit 7.23: Global Dolutegravir Industry size (MT), 2015-2025F



Source: Frost and Sullivan Primary Research & Analysis

Being an antiretroviral drug the major market for Dolutagravir is in Africa and Asia. There are over 30 API manufacturers globally with 19 having US DMF. The major API producers for the product are in India. The key ones are as listed below.

Company	Location
GSK	India
Aurobindo Pharma	India
Emcure Pharmaceuticals Ltd	India
Hetero Labs Ltd	India
Laurus Labs Ltd	India

Adcock Ingram	South Africa
Macleods Pharmaceuticals Ltd	India
Micro Labs Ltd	India
Msn Life Sciences Private Ltd	India
Mylan Laboratories Ltd	India
Shanghai Desano Chemical Pharmaceutical Co Ltd	China
Sun Pharmaceuticals	China
Cipla Ltd	India
Cadila Healthcare Ltd.	India
Divis Laboratories Ltd.	India
Styrax Pharma Pvt. Ltd.	India
Intas Pharmaceuticals Ltd.	India

GSK, Aurobindo Pharma, Laurus Labs, Mylan Laboratories, and Shanghai Desano Chemical Pharmaceuticals make up for more than 50% of the market share in 2019 and they are expected to continue to dominate the market in the coming years as well.

As of 2018 over two dozen high-burden HIV markets have already included or are planning to include DTG-based regimens in their national HIV treatment guidelines, a critical first step for new product introduction. At AIDS 2018, the WHO issued new treatment guidance recommending DTG as the preferred adult treatment option, with special considerations for women of childbearing potential.

Aether Industries has intermediates in pipeline which are actively used in production of Dolutegravir. These intermediates are said to have good market growth in future which will be beneficial for Aether's top-line. Aether is known to have strong market positioning in complex intermediates where global competition is intense.

7.15 API – Carbamazepine

Carbamazepine is used to prevent and control seizures. This medication is known as an anticonvulsant or anti-epileptic drug. It is also used to relieve certain types of nerve pain (such as trigeminal neuralgia). This medication works by reducing the spread of seizure activity in the brain and restoring the normal balance of nerve activity. The drug is sold under many brand names such as pitol, Carbatrol, Tegretol, and Tegretol XR, among others. It is also used for schizophrenia as an alternate line of treatment as well as for bipolar disorder.

Antiepileptic Drugs Market – By Drug Type

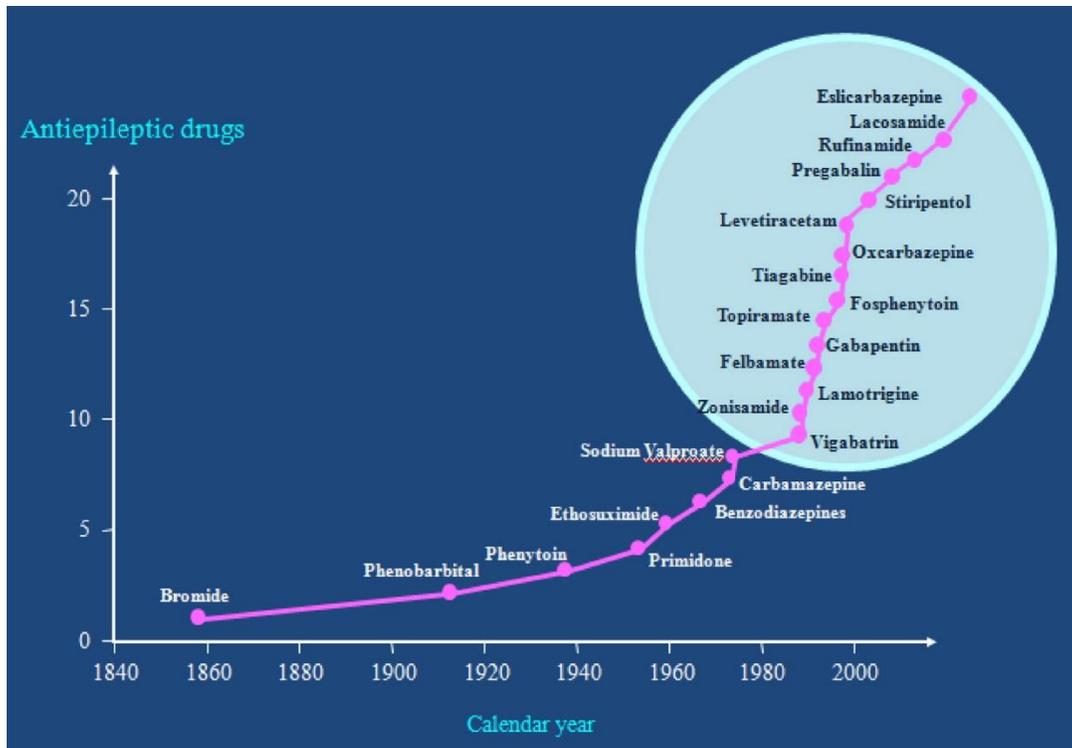
First Generation Drugs

- Valproate (Depakote)
- **Oxycarbazepine (Trileptal)**
- **Carbamazepine (Carbatrol)**
- Phenobarbital (Luminal)
- Primidone (Mysoline)
- Ethosuximide (Zarontin)
- Topiramate (Topamax)

Second Generation Drugs

- Lamotrigine (Lamictal)
- Pregabalin (Lyrica)
- Eslicarbazepine acetate Zonisamide (Zonegran)
- Lacosamide (Vimpat)
- Levetiracetam (Keppra)
- Perampanel (Fycompa)
- Rufinamide (Banzel/Inovelon)
- Ezogabine/retigabine (Trobal/Potiga)

Over the last 30 years, there has been an increase in the number of antiepileptic drugs (AEDs) available for treating patients with seizures. There are more than 25 AEDs in the market that have led to enhanced treatment for many. Carbamazepine (CBZ) became a major licensed drug and became widely available in the mid-1960s. Carbamazepine (Tegretol) is still one of the primary drugs for the treatment of symptomatic epilepsy with partial and generalized tonic-clonic seizures and accounts for good share in the first generation Antiepileptic Drugs Market.

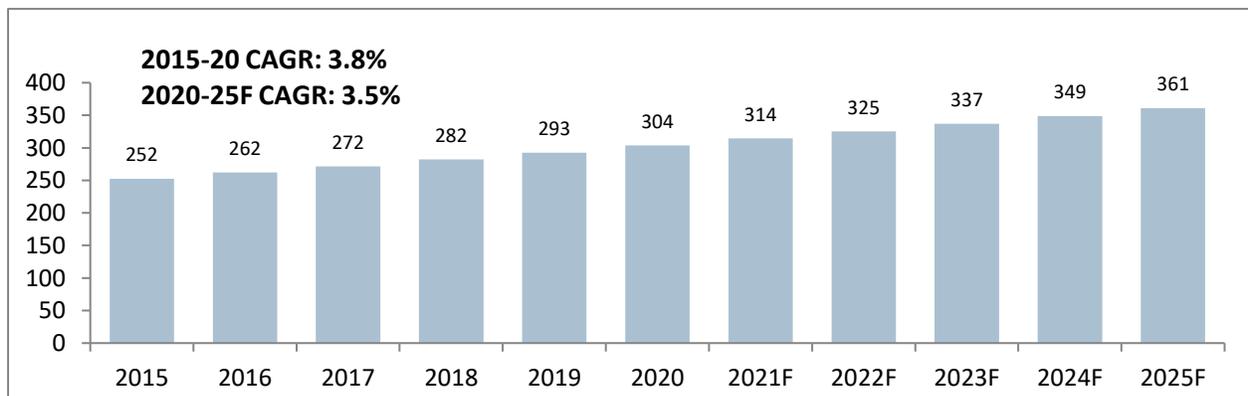


Source: www.seizure-journal.com

The Global Antiepileptic Drugs Market was estimated to be USD 3.45 billion in 2019, growing at a CAGR of 3.8% during the forecast period 2020-2025. The second-generation drugs segment is forecast to be the fastest-growing segment during the forecast period 2020-2025. Second Generation Drugs has been the blockbuster drug for epilepsy treatment and has proved its potential in slowing the impulses of the brain and controlling the seizures.

The Carbamazepine market is estimated to be around 300 MT in 2020. The increasing demand for carbamazepine for the treatment of various types of seizures and bipolar disorders is expected to drive the global carbamazepine market in the next few years.

Exhibit 7.24: Global Carbamazepine Industry size (MT), 2015-2025F



Source: Frost and Sullivan Primary Research & Analysis

The India carbamazepine market is driven by use of these drugs for the treatment of epilepsy and neuropathic pain. Carbamazepine is available as chewable tablet, suspension, tablet, extended release tablet, and extended release capsule. In addition to this, upsurge in the demand for carbamazepine for treating numerous types of seizures and bipolar disorders is expected to rev up the market growth through FY2026. Additionally, supportive government policies and improving healthcare infrastructure are some other reasons that are expected to create lucrative opportunities for the market growth over the next few years.

The major manufacturers are:

Company Name	Location
Siegfried Evionnaz SA	Switzerland
Teva Pharmaceutical Industries Ltd	India
Taro Pharmaceutical Industries Ltd	India
Fis Fabbrica Italiana Sintetici Spa	Italy
Jubilant Generics Ltd	India
Siegfried Evionnaz SA	Switzerland
Amoli Organics Pvt. Ltd	India
Ctx Life Sciences Pvt. Ltd	India
Zaklady Farmaceutyczne Polpharma SA	China
Zhejiang Raybow Pharmaceutical Co Ltd	China

Aether Industries has intermediates in pipeline which are actively used in production of Carbamazepine. These intermediates are said to have good market growth in future which will be beneficial for Aether's top line. Aether is known to have strong market positioning in complex intermediates where global competition is intense.

Growing CRAMS business allows the company to interact directly with the topmost echelons of technical and research teams of the global leading innovator and multi-national companies across the industry spectrum, opening up future contract manufacturing opportunities for Aether.

7.16 API – Oxcarbazepine

Oxcarbazepine is an anticonvulsant. It works by decreasing nerve impulses that cause seizures and pain. This medication is known as an anticonvulsant or anti-epileptic drug. Epilepsy is a disorder of central nervous system which causes abnormal brain activity, periods or seizures of unusual behaviour, loss of awareness at times. This drug API is either used alone or along with other drugs for treating partial seizures which is expected to rev up the market growth through FY2027. Adults and children of at least 4 years of age are given a Trileptal band of oxcarbazepine as a single medicine while adults and children of at least 6 years of age are given oxtellar XR band of oxcarbazepine along with other medicines

Antiepileptic Drugs Market – By Drug Type

First Generation Drugs

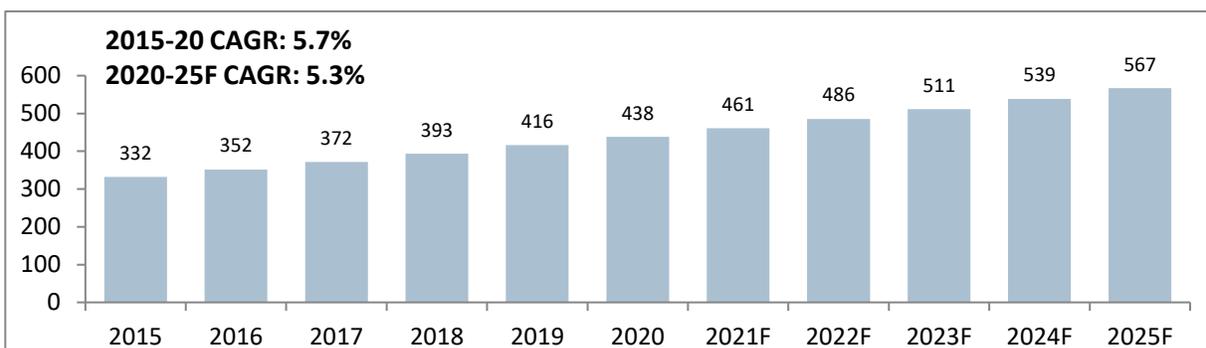
- Valproate (Depakote)
- **Oxcarbazepine (Trileptal)**
- **Carbamazepine (Carbatrol)**
- Phenobarbital (Luminal)
- Primidone (Mysoline)
- Ethosuximide (Zarontin)
- Topiramate (Topamax)

Second Generation Drugs

- Lamotrigine (Lamictal)
- Pregabalin (Lyrica)
- Eslicarbazepine acetate Zonisamide (Zonegran)
- Lacosamide (Vimpat)
- Levetiracetam (Keppra)
- Perampanel (Fycompa)
- Rufinamide (Banzel/Inovelon)
- Ezogabine/retigabine (Trobal/Potiga)

The Oxcarbazepine market is estimated to be around 438 MT in 2020. The increasing demand for Oxcarbazepine for the treatment of various types of seizures and bipolar disorders is expected to drive the global Oxcarbazepine market in the next few years.

Exhibit 7.25: Global Oxcarbazepine Industry size (MT), 2015-2025F



Source: Frost and Sullivan Primary Research & Analysis

The major manufacturers are:

Company Name	Location
Taro Pharmaceutical Industries Ltd	India
Jubilant Generics Ltd	India
Signa Sa De Cv	Mexico
Sun Pharmaceutical Industries Ltd	India
Amoli Organics Pvt. Ltd	India
Ctx Life Sciences Pvt. Ltd	India
Dasami Lab Private Ltd	India
Msn Life Sciences Private Ltd	India
Aurore Life Sciences Private Ltd	India

Aether Industries has intermediates in pipeline which are actively used in production of Oxcarbazepine. These intermediates are said to have good market growth in future which will be beneficial for Aether's topline. Aether is known to have strong market positioning in complex intermediates where global competition is intense.

7.17 API – Imipramine

Imipramine, a tricyclic drug, was introduced in late 1950s. Imipramine (IMI) is a tricyclic synthetic antidepressant that is used to treat chronic psychiatric disorders, including depression and neuropathic pain. IMI also has inhibitory effects against various cancer types, including prostate cancer; however, the mechanism of its anticancer activity is not well understood. It was launched under the brand name Tofranil. It is a prescription medicine used to treat the symptoms of Depression. Imipramine may be used alone or with other medications. Imipramine belongs to a class of drugs called Antidepressants, TCAs. Imipramine Instead of stimulating the central nervous system (which amphetamines do) or inhibiting monoamine oxidase reuptake (a property of the MAGIs), imipramine increases the brain's supply of norepinephrine and serotonin. The introduction of imipramine (brand name Tofranil) in 1958 was soon followed by market introductions of numerous related tricyclic compounds.

The Global Imipramine market is relatively small and is estimated to be around 35-40 MT in 2020.

The major manufacturers are:

Company Name	Location
Teva Pharmaceutical Industries Ltd	India
Corden Pharma Bergamo Spa	Italy
RI Fine Chem Pvt. Ltd	India
Lupin Ltd	India
Lundbeck Pharmaceuticals Italy Spa	Italy

Aether Industries has intermediates in pipeline which are actively used in production of Imipramine. These intermediates are said to have good market growth in future which will be beneficial for Aether's topline. Aether is known to have strong market positioning in complex intermediates where global competition is intense.

7.18 API – Memantine

Alzheimer's Drugs Market size in 2019 is estimated to be USD 3.5 billion, growing at a CAGR of 6.8% during the forecast period 2020-2025. Alzheimer's is a progressive neurological disease and most common form of dementia with symptoms includes memory loss and destroy thinking skills, difficulties with problem-solving or language.

Based on the Drug Class, Alzheimer's Drugs Market is segmented into Cholinergic, Memantine, Combined drug, and other drugs. Memantine, the fifth alzheimer's drug, is an NMDA (N-methyl-D-aspartate) receptor antagonist has dominated the drug class segment due to a large number of patent expiry of major products and a restricted number of drugs to treat alzheimer's disease. The Memantine segment is forecast to be the fastest-growing segment and is projected to grow at a CAGR of 7-8% during the forecast period 2020-2025. This is mainly owing to growing purchasing power and disposable income of the people that are contributing to increased sales of this drug class. Moreover, it is used to treat symptoms like confusion, improves memory and brain function, which further drives the market.

The Global Memantine market is relatively small and is estimated to be around ~65-70 MT in 2020. Increasing number of pipeline studies for use of memantine are expected to boost growth of the memantine market.

The major manufacturers are:

Company Name	Location
Union Quimico Farmaceutica Sa (Uquifa Sa)	Spain
Olon Spa	Italy
Industriale Chimica Srl	Italy
Amsa Anonima Materie Sintetiche And Affini Spa	Italy
Procos Spa	Italy
Apotex Pharmachem Inc	USA
Olainfarm Jsc	Latvia
Mylan Laboratories Ltd	India
Lupin Ltd	India
Dr Reddys Laboratories Ltd	India
Orchid Pharma Ltd	India
Teva Pharmaceutical Industries Ltd	India
Sun Pharmaceutical Industries Ltd	India
Msn Pharmachem Private Ltd	India
Unichem Laboratories Ltd	India
Alembic Pharmaceuticals Ltd	India
Hikal Ltd	India
Macleods Pharmaceuticals Ltd	India
Hetero Drugs Ltd	India
Sharon Bio Medicine Ltd	India
Emcure Pharmaceuticals Ltd	India
Megafine Pharma P Ltd	India
Zcl Chemicals Ltd	India
Macleods Pharmaceuticals Ltd	India
Hainan Poly Pharmaceutical Co Ltd	India
Teva Pharmaceutical Industries Ltd	India

Source: Frost & Sullivan Analysis

Increasing number of expired patents of drugs is a major factor hindering growth of the global memantine market. For instance, according Merz Pharmaceuticals, a Germany-based company, in October 2018, overall licensing income during patented period for memantine decreased due to expiration of patent protection in a majority of markets. Geographically, North America is expected to hold dominant position in the global memantine market, owing to increasing number of generic versions of memantine in the U.S. market. For instance, in February 2018, Lupin Limited announced the launch of its Memantine Hydrochloride Extended-Release Capsules in the U.S. market.

Aether Industries has intermediates in pipeline which are actively used in production of Memantine. These intermediates are said to have good market growth in future which will be beneficial for Aether's topline. Aether is known to have strong market positioning in complex intermediates where global competition is intense.

7.19 API – Ketorolac

Ketorolac is a non-steroidal anti-inflammatory drug (NSAID'S) recommended for treatment of moderate or severe pain. Ketorolac is administered by oral, parental and topical route of administration in human body. Ketorolac is used for short duration treatment, physicians recommend ketorolac for less than 6 days of treatment. Moreover, ketorolac functions as inhibitor of prostaglandin synthesis, having anti-inflammatory, antipyretic and analgesic properties and helps in lowering the contraction/relaxation of smooth muscles in the human body.

Ketorolac has diversified medicinal use such as, ketorolac with paracetamol controls pain without affecting respiration in infants, used in treatment of dysmenorrhea, used as eye drop during eye surgery to surge pain in patients. Thus, due to diversified used in different medical conditions, pharmaceutical companies are focusing on research and development to strengthen their market share in global ketorolac market.

The major manufacturers are:

Company Name	Location
Quimica Sintetica Sa	Italy
Union Quimico Farmaceutica Sa (Uquifa Sa)	Italy
Recordati Industria Chimica E Farmaceutica Spa	Italy
Farmak As	Czechia
Dr Reddys Laboratories Ltd	India
MSN Laboratories Private Ltd	India
Shandong New Time Pharmaceutical Co Ltd	India
Symed Labs Ltd	India
Vasudha Pharma Chem Ltd	India
Emcure Pharmaceuticals Ltd	India

Aether Industries has intermediates in pipeline which are actively used in production of Ketorolac. These intermediates are said to have good market growth in future which will be beneficial for Aether's topline. Aether is known to have strong market positioning in complex intermediates where global competition is intense.

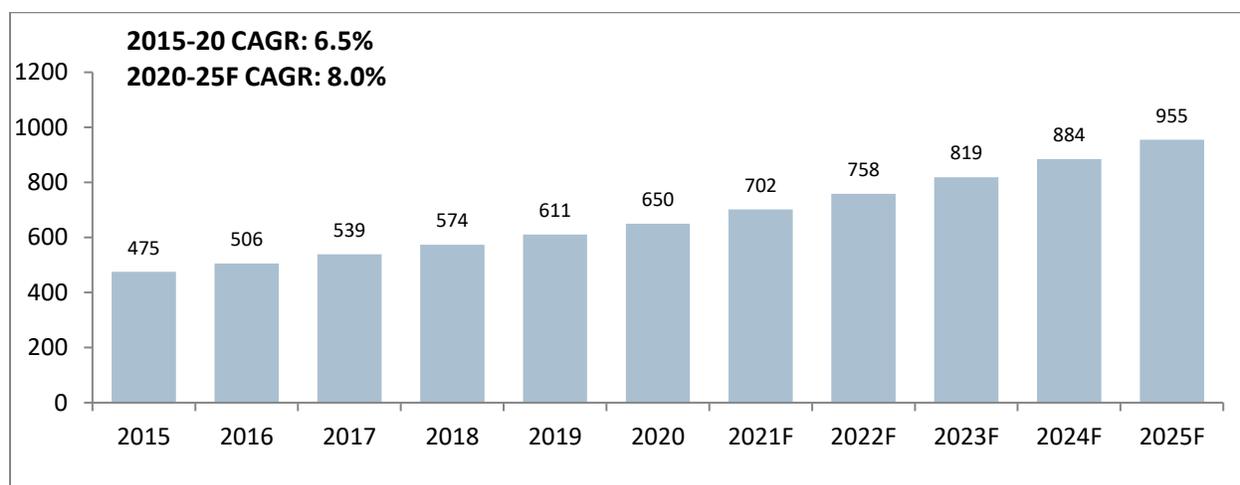
7.20 Delta-Valerolactone (δ -Valerolactone)

δ -Valerolactone (DVL), a lactone, is a versatile intermediate with a variety of applications. It is used as a chemical intermediate in production of polyesters. DVL is used in the synthesis of an acid chloride which is subsequently utilised as a building block in active ingredients. δ -valerolactone is used as an intermediate in the production of coatings, dispersants and as a comonomer for polymerization with ϵ -caprolactone, which is responsible for the lowering of the melting point of the resulting copolymer or oligomer. Additionally, δ -valerolactone is used for the preparation of the homopolymer poly- δ -valerolactone.

DVL due to its good application, flexibility, lower biological toxicity, easy polymerization and ability to increase the viscosity of coatings and other characteristics, delta-valerolactone is widely used in polyesters, polyurethanes, special solvents, and coatings.

Geographically, USA and Europe is the largest market for DVL. Americas and Europe have large polymer and paint manufacturers owing to which both the geographies are major consumers of DVL. India and China are comparatively smaller markets

Exhibit 7.22: Global Delta-Valerolactone Industry size (MT), 2015-2025F



Source: Frost and Sullivan Primary Research & Analysis

Aether is the only manufacturer of Delta-Valerolactone in India. The company produced nearly 84 MT of the product in CY2020. The company accounted for 13% of the global market share in CY2020. Other players produced 560-570 MT holding 86% to 88%. In CY2021, Aether produced 148 MT of DVL. The company deploys heterogeneous catalysis as the chemistry core competency and continuous reaction technology, fixed bed reaction technology, gas phase reaction technology, and high vacuum fractional distillation as the technology core competencies for this product. Globally BASF is the largest manufacturer accounting for nearly 65% - 70% of the market (in 2019). Apart from BASF and Aether other manufacturers belong in China with Changzhou Jintan Hengxin Chemical Co., Ltd. (Changzhou Jintan Hengxin Institute of Chemistry) being one of the leading manufacturers which produces around 50-60 MT of DVL annually with 8% to 9% market share. The products are made to order and no

inventories are kept. It is produced and dispatched immediately. Globally, Aether is the second largest manufacturer of the product.

Company	Production Range	% Share
Other Global players (incl. Chinese players)*	560-570 MT	86% to 88%

* fragmented supplier base

7.21 Agrochemicals AI – Methoxyfenozide

Methoxyfenozide is a new specific benzoyl hydrazide insecticide for insect growth regulation. Methoxyfenozide, introduced by Rohm & Haas in 1999 as Intrepid, belongs to the moult accelerating compounds (MAC) class. The MAC products are relatively slow in action, however they possess good residual activity and, since they are active on specific pests such as beet armyworm, they offer potential in mixture use and in IPM programmes.

Methoxyfenozide is mainly used in vegetables and farmland to control lepidopteran pests on vegetables (melons and fruit), apples, corn, cotton, grapes, kiwi, walnuts, flowers, beets, tea and field crops (rice, sorghum and soybean), Especially for larvae and eggs.

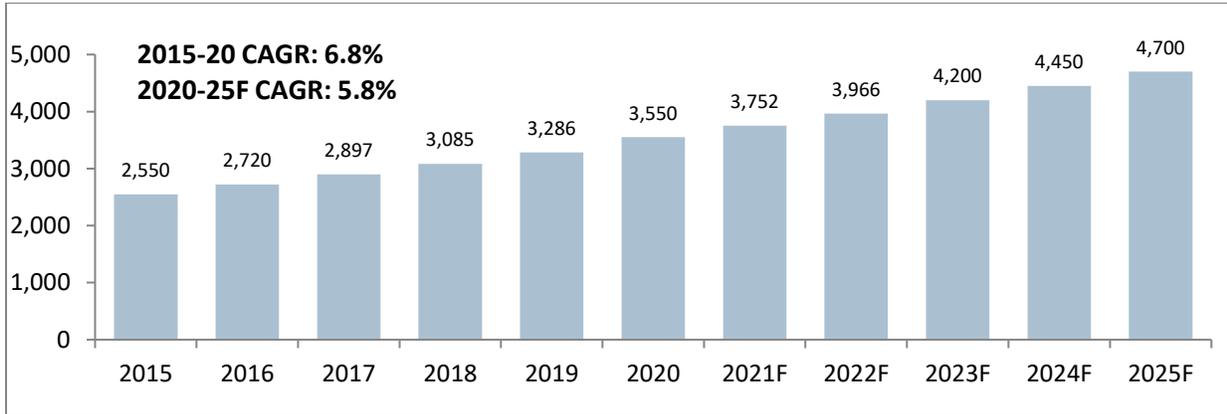
The product was introduced for use on a wide range of fruit & vegetable crops, and has also been licensed out to Bayer for introduction in European markets. The product was introduced in the UK (2003) and Spain (2005) under license by Bayer as Runner, and also in Poland, followed by further EU introductions for use on fruit and vines.

The key innovator of the API was Dow AgroSciences (Intrepid, Runner, Prodigy). It is mainly used for crops such as Soybean, F&V, Pome fruit, Vine, among others. The main pests it works upon are Lepidoptera. The application rate varies between 20 – 300 (g/ha).

European Annex 1 registration has been achieved, with the main crop uses in the region being vine, pome fruit, stone fruit and citrus. The most important crop use being on soybeans in Brazil, the USA and Argentina where it is used to control loopers, armyworms and other worm pests.

Methoxyfenozide is considered a better product as compared to quite few other products and hence it acts as a replacement to not so favorable agrochemical products. In past, Dow had been replacing Tebufenozide with methoxyfenozide in some markets, particularly for cotton. It is said that methoxyfenozide has lower application rate with broader spectrum of activity.

Exhibit 7.10: Global Methoxyfenozide Industry size (MT), 2015-2025F



Source: Frost and Sullivan Primary Research & Analysis

The major vendors of Methoxyfenozide includes:

- Dow AgroScience (Corteva)
- Shandong Weifang Rainbow

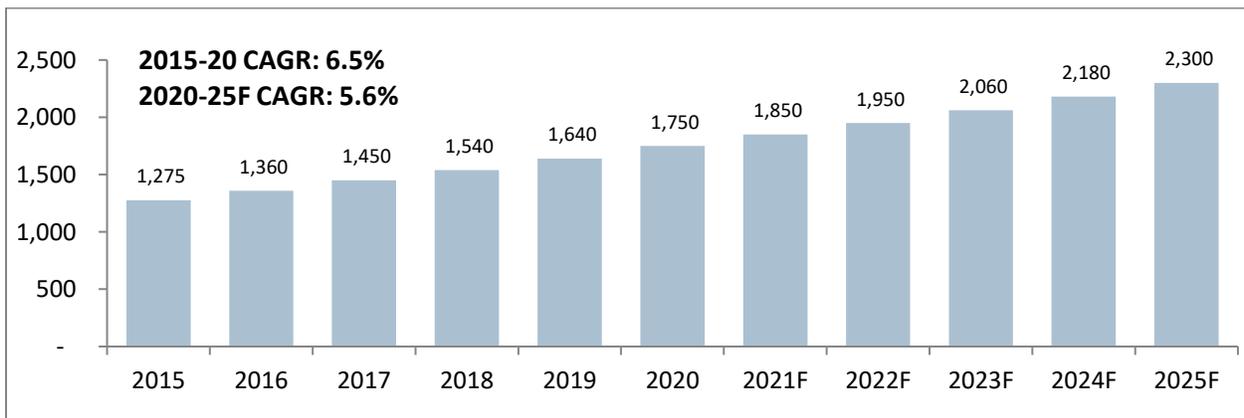
Intermediate Requirement:

3-methoxy-2-methoxybenzoyl chloride is a key intermediate to manufacture Methoxyfenozide. Nearly 500 Kg of 3-Methoxy 2-Methyl Benzoyl Chloride is required to produce 1000 kg of Methoxyfenozide.

Intermediate: 3-Methoxy 2-Methyl Benzoyl Chloride (MMBC)

MMBC is one of the key intermediate for manufacture of Methoxyfenozide. The global market of the intermediate was around 1,750 MT in 2020 and is expected to grow at nearly 5.6% in the near future of 2020-25

Exhibit 7.11: Global MMBC Industry size (MT), 2015-2025F



Source: Frost and Sullivan Primary Research & Analysis; MMBC market is arrived at using its consumption of ~0.5 kg/kg for Methoxyfenozide

Some of the key Global manufacturers include WeylChem US, Aether Industries, Jiangsu Kefeite Biochemistry Technology Ltd., By Share Ltd, etc.

WeylChem US produces chemicals such as general organic chemicals, flavour enhancers, pharmaceutical intermediates, pesticide active ingredients, and herbicides as well as a few inorganic chemicals. It produced close to 1,150 MT of MMBC in 2020 accounting for major share of 66% of the global market. The company specializes in Grignard chemistry, offering a broad range of Grignard reagents & end-to-end custom manufacturing of specialty chemical products.

In 2020, Aether is the only manufacturer of 3-Methoxy 2-Methyl Benzoyl Chloride (MMBC) in India and second largest manufacturer globally with 14% market share in terms of production volume. CY2020 was the first year of commercial production of MMBC for Aether, producing around 238 MT in CY2020. In CY2021, Aether produced 247 MT of MMBC. Aether deploys Grignard chemistry and carbon dioxide coupling chemistry as the chemistry core competencies and continuous reaction technology and high vacuum fractional distillation technology as the technology core competencies for this product.

Chinese manufacturers include Jiangxi Keyuan Biopharm Co. Ltd., China, Jiangsu Kefeite Biochemistry Technology Ltd., By Share Ltd, China, among others which together account for 350-380 MT accounting for 20% of the global market.

Company	Production Range	% Share
Global players*	1,500 -1,540 MT	~ 84-88%

* fragmented supplier base

7.22 Agrochemical AI – Bifenthrin

Bifenthrin belongs to the broad-spectrum pyrethroid that benefits from activity against certain mite species. Originally launched in 1986 under the brand name Talstar, bifenthrin is now FMC's most commercially significant insecticide. This novel pyrethroid is used to control a broad range of insect pests including whitefly, insect larvae and mites. The initial focus was on cotton, however fruit & vegetable usage has now overtaken cotton. The product is also applied in a broad range of other crops, including soybean, maize, rice and oilseed rape. In addition to crop outlets, bifenthrin also finds significant usage in a range of non-crop markets, including lawn and home & garden to control a variety of insect pests, as well as usage in the termite control sector

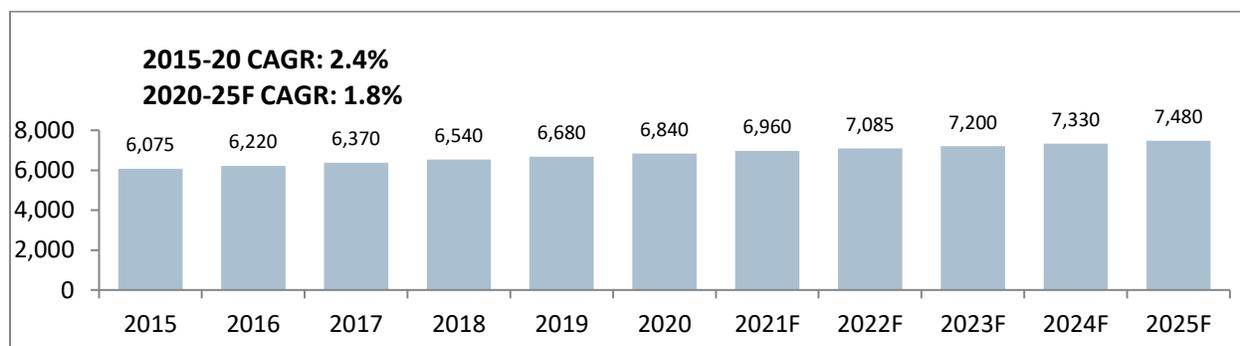
In addition to solo formulations, FMC has also introduced bifenthrin in a number of combination products, including with zeta-cypermethrin as Hero and Capture and with imidacloprid as Brigadier for use on potatoes during planting. In 2012 the company received a patent for a formulation specially developed for mixing with fertilisers. In 2015 Hero and Capture were included in Monsanto's Roundup Ready Plus Crop Management Solutions platform

Bifenthrin has received EU Annex 1, with the company reinstating registrations for the product in all of the key EU member states, although non-crop uses are no longer permitted in the EU.

Moreover, Bifenthrin is marketed by Amvac as Discipline or SmartChoice (as part of a mixture with chlorethoxyfos), is a broad-spectrum pyrethroid used for the control of a broad range of insect pests on maize. Amvac initially gained a US registration in 2004, since which time the product has found significant use as part of Amvac's SmartBox system. In 2010 Amvac acquired the Aztec product line from Bayer CropScience, including the maize insecticide Smartchoice, a combination of chlorethoxyfos and bifenthrin.

The global market for Bifenthrin was around 6,840 MT in 2020. Bifenthrin from FMC experienced strong growth in the early 2000s, mainly due to new registrations, mixture formulations and growth in non-crop sectors, including termite control. This led to a growth of nearly 2.4% historically till 2020. However increasing generic competition slowed value growth and the growth in the product is expected to be around 1.8% in near future.

Exhibit 7.12: Global Bifenthrin Industry size (MT), 2015-2025F



Source: Frost and Sullivan Primary Research & Analysis

Key global manufacturers of this Agrochemical ingredient includes FMC (Capture, Talstar, Discipline, Hero), Amvac, Bharat Rasayan, Adama, among others.

Apart from the above-mentioned global players, some of the Indian local players include

Meghmani Organics Ltd
Hemani Industries Limited
Agrow Allied Ventures Private Limited
United Phosphorus Ltd.
Crystal Crop Protection Pvt. Ltd.
Bharat Rasayan Limited
Best Agrochem Pvt. Ltd.,
Heranba Industries Ltd.
Shogun Organics Limited
Insecticides India Ltd.
Krishi Rasayan Exports Pvt. Ltd.,
Safex Chemicals India Ltd.
Hindustan Pulverising Mills
Aimco Pesticides Limited
Jai Shree Rasayan Udyog Ltd

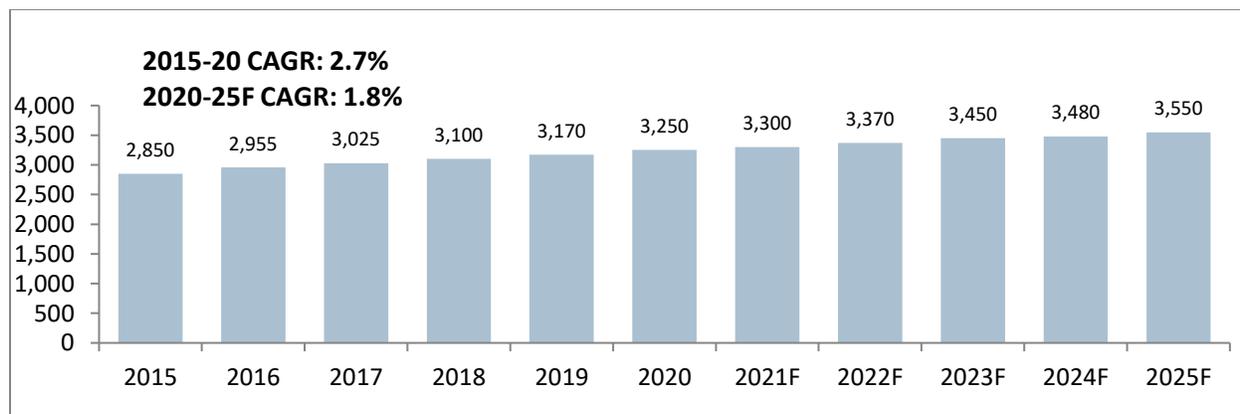
Intermediate Requirement:

Nearly 475 Kg of Bifenthrin Alcohol is required to produce 1000 kg of Bifenthrin

Intermediate: Bifenthrin Alcohol (BFA)

Bifenthrin Alcohol is one of the key intermediate for manufacture of Bifenthrin. The global market of the intermediate was around 3,250 MT in 2020 and is expected to grow at nearly 1.8% in the near future of 2020-25

Exhibit 7.13: Global Bifenthrin Alcohol Industry size (MT), 2015-2025F



Source: Frost and Sullivan Primary Research & Analysis; Bifenthrin market is arrived at using its consumption of ~0.48 kg/kg for Bifenthrin

Aether is the only manufacturer of Bifenthrin Alcohol in India. Aether started commercial production of BFA in August 2021 and currently holds a production capacity of 480 MT per annum. In CY2021, Aether produced 144 MT of BFA. The company deploys Grignard chemistry and coupling chemistry as the key chemistry competencies and continuous reaction technology and high vacuum fractional distillation technology as the key technology competencies for this product.

The market is crowded with Chinese players providing the intermediate. Some of the key manufacturers include:

Changzhou Booming Crop Science Co.,
Hefeng Agro Co.,Ltd.
Jiangsu Chunjiangruntian Agrochemical Co., Ltd
Jiangsu Huifeng Agrochemical Co., Ltd.
Jiangsu Yangnong Chemical Co. Ltd.
LIAONING FLUORINE NEW ENERGY Material
Nanjing Bangnong Chemicals Co
Xinxiang City Sanxin Science And Technology C
Capot Chemical Co.,Ltd

Chinese players are major suppliers for India Agrochemical companies. In CY2020, Chinese players produced 2,750-2,790 MT holding 85-86% global market share for BFA. Bulk of the exports from China is routed through traders, distributors and logistic companies. India imported nearly 1,100 MT of Bifenthrin Alcohol in 2020-21. There is great scope for import substitution for local intermediate manufacturers in India.

Company	Production Range	% Share
Chinese players*	2,750-2,790 MT	85% to 86%
Other Global players	460-500 MT	14% to 15%

*fragmented supplier base

Exhibit 7.26: Revenue from Operations (FY19-FY21)

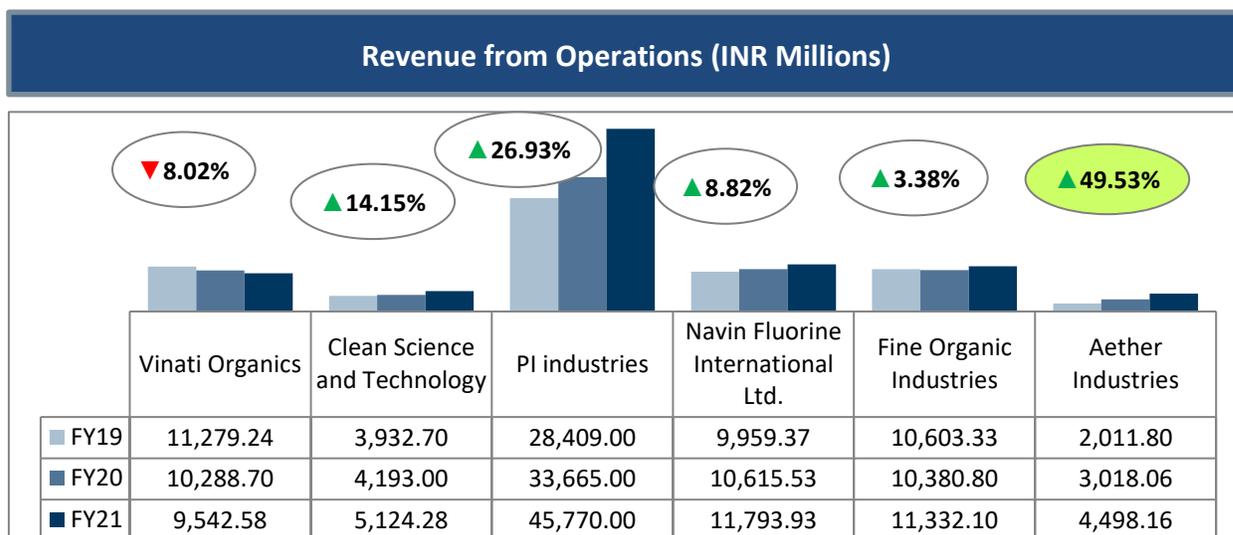


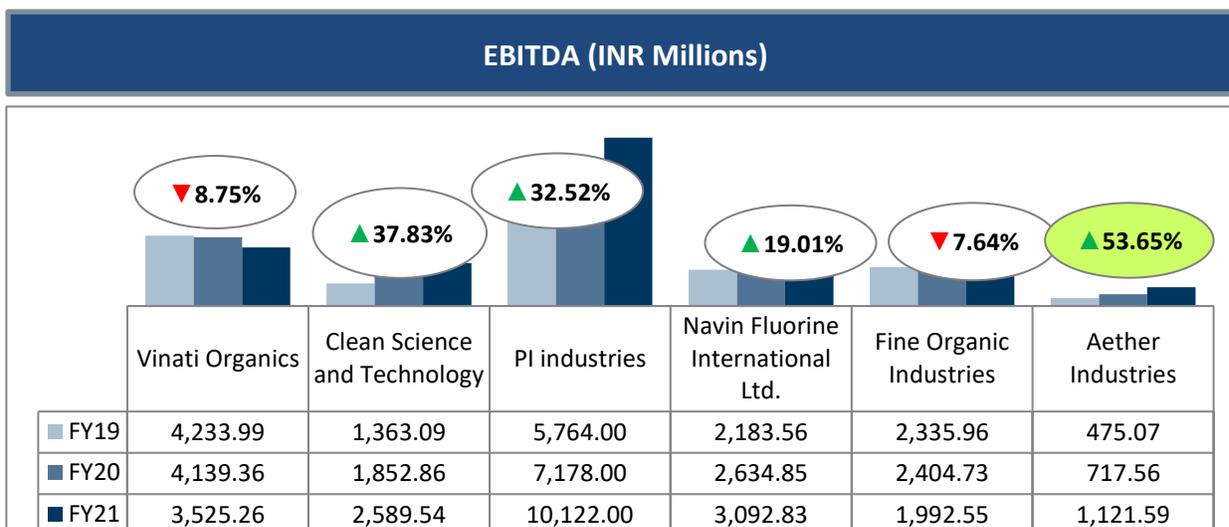
Exhibit 7.27: Growth of Revenue from Operations – CAGR% (FY19-FY21)

	Vinati Organics	Clean Science and Technology	PI Industries	Navin Fluorine	Fine Organics	Aether Industries
FY19-FY21	-8.02%	14.15%	26.93%	8.82%	3.38%	49.53%

Source: Company Websites, Frost & Sullivan

In the short period of 8 years of incorporation and 5 years into commercial manufacturing, Aether has reached revenue of INR 450+ Cr in 2020-21 which is a great achievement.

Exhibit 7.28: EBITDA (FY19-FY21)



Source: Company Websites

Exhibit 7.29: Growth of EBITDA – CAGR% (FY19-FY21)

	Vinati Organics	Clean Science and Technology	PI Industries	Navin Fluorine	Fine Organics	Aether Industries
FY19-FY21	-8.75%	37.83%	32.52%	19.01%	-7.64%	53.65%

Source: Company Websites, Frost & Sullivan

Exhibit 7.30: EBITDA Margin (FY19-FY21)

EBITDA Margin (%)

	Vinati Organics	Clean Science and Technology	PI Industries	Navin Fluorine	Fine Organics	Aether Industries
FY19	37.54%	34.66%	20.29%	21.92%	22.03%	23.61%
FY20	40.23%	44.19%	21.32%	24.82%	23.17%	23.78%
FY21	36.94%	50.53%	22.11%	26.22%	17.58%	24.93%

Source: Company Websites

EBITDA margin defined as EBITDA/ Revenue from operations

Exhibit 7.31: PAT Margin (FY19-FY21)

PAT Margin (%)						
	Vinati Organics	Clean Science and Technology	PI Industries	Navin Fluorine	Fine Organics	Aether Industries
FY19	24.39%	24.14%	14.14%	14.47%	12.61%	11.48%
FY20	31.09%	32.46%	13.37%	37.32%	15.57%	13.15%
FY21	27.48%	36.87%	15.70%	20.46%	10.46%	15.67%

Source: Company Websites

PAT margin defined as PAT/ Total Income

Exhibit 7.32: ROCE (FY19-FY21)

ROCE (%)						
	Vinati Organics	Clean Science and Technology	PI Industries	Navin Fluorine	Fine Organics	Aether Industries
FY19	41.48%	65.95%	23.08%	22.42%	42.88%	25.16%
FY21	22.80%	82.73%	25.59%	26.30%	29.07%	28.50%
Delta	-1,867 BPS	1,677 BPS	250 BPS	387 BPS	-1,380 BPS	334 BPS

Source: Company Websites

ROCE = EBIT/(total equity + current borrowings + non-current borrowings - current investments - cash & cash equivalents- bank balances other than cash & cash equivalents)

Exhibit 7.33: ROE (FY19-FY21)

ROE (%)						
	Vinati Organics	Clean Science and Technology	PI Industries	Navin Fluorine	Fine Organics	Aether Industries
FY19	26.90%	35.90%	18.00%	13.90%	27.20%	60.54%
FY21	17.40%	36.80%	13.80%	15.80%	16.40%	40.79%
Delta	-950 BPS	90 BPS	-420 BPS	190 BPS	-1,080 BPS	-1,975 BPS

Source: Company Websites

ROE defined as PAT/ Total Equity

Exhibit 7.34: CAGR% (FY19-FY21)

Particulars	Vinati Organics	Clean Science and Technology	PI Industries	Navin Flourine	Fine Organic	Aether Industries
Operating EBIDTA	-8.75%	37.83%	32.52%	19.01%	-7.64%	53.65%
RoE	-19.41%	1.20%	-12.25%	6.47%	-22.28%	-17.91%
RoCE	-25.85%	12.00%	5.29%	8.31%	-17.66%	6.44%
RoA	-18.60%	2.44%	-3.73%	12.04%	-22.22%	21.49%
Operating Expenses	-7.58%	-0.68%	25.47%	5.78%	6.29%	48.23%
PAT	-2.36%	42.53%	34.16%	31.42%	-6.02%	74.58%

Operating EBITDA excludes other income;

ROE defined as PAT/ Total Equity;

RoCE defined as EBIT/(total equity + current borrowings + non-current borrowings - current investments - cash & cash equivalents- bank balances other than cash & cash equivalents);

RoA defined as PAT/Average Total Assets; Operating Expenses excludes other income, finance cost and depreciation;

Exhibit 7.35: Various Financial Ratios (FY21)

Company Particulars	Aether Industries			Clean Science and Tech.		
	FY19	FY20	FY21	FY19	FY20	FY21
Current ratio i. e., liquidity ratio	1.08	1.25	1.44	4.68	3.34	3.87
Quick Ratio	0.63	0.63	0.91	3.77	2.88	3.35
Average collection period	67.60	67.22	69.46	46.14	56.41	51.31
Average payment period	60.59	71.48	68.14	51.96	81.94	142.77
Days cash on Hand, All Sources	2.92	5.51	28.92	120.29	221.78	356.69
Cash Ratio	0.01	0.03	0.17	2.06	1.85	2.43
Net Working Capital	73.42	299.33	716.22	1,514.67	1,800.54	2,931.61
Debt equity ratio	3.27	2.18	1.19	0.01	0.01	0.00
Capital Gearing Ratio	0.31	0.46	0.84	104.80	127.17	1,630.41

Debt Service Coverage Ratio	2.12	3.50	4.50	237.91	825.09	86.55
Interest Service Coverage Ratio	3.88	6.82	8.94	3,796.24	1,417.95	2,656.58
Total Assets Turnover Ratio	1.10	1.19	1.19	1.40	1.11	0.94
Fixed Assets Turnover Ratio	1.92	2.38	2.48	3.35	2.80	2.50
Net Capital Turnover Ratio	27.40	10.08	6.28	2.60	2.33	1.75
Current Assets Turnover Ratio	2.68	2.47	2.36	2.48	1.87	1.57
Inventory Turnover Ratio (days)	132.70	168.15	134.06	78.93	97.69	156.24
Receivables Turnover Ratio (days)	87.44	76.16	87.83	55.47	60.79	52.87
Payables Turnover Ratio (days)	75.97	89.66	75.59	47.63	100.79	180.13
EPS	2.48	4.24	7.36	9.19	13.15	18.68
NAV	4.09	8.31	15.69	14.26	16.95	27.60

Company	Navin Flourine International Ltd.			Vinati Organics Ltd.		
Particulars	FY19	FY20	FY21	FY19	FY20	FY21
Current ratio i. e., liquidity ratio	3.17	4.39	5.91	5.98	7.22	6.17
Quick Ratio	2.54	3.48	5.01	4.82	6.05	4.91
Average collection period	60.16	67.26	77.77	68.13	79.07	91.60
Average payment period	63.90	63.92	69.80	40.51	46.31	57.45
Days cash on Hand, All Sources	105.66	157.58	263.05	51.88	166.55	113.85
Cash Ratio	1.27	1.95	3.11	1.13	3.16	1.77
Net Working Capital	3,838.93	6,004.98	9,927.41	4,422.76	5,535.53	5,487.61
Debt equity ratio	0.00	0.00	0.00	0.00	0.00	0.00
Capital Gearing Ratio	259.17	1,006.54	648.63	285.44	3,687.05	762.18

Debt Service Coverage Ratio	35.17	72.87	165.05	25.17	85.49	3,514.78
Interest Service Coverage Ratio	230.77	113.02	152.60	419.51	348.70	1,460.43
Total Assets Turnover Ratio	0.78	0.72	0.67	1.02	0.77	0.60
Fixed Assets Turnover Ratio	2.17	2.05	1.96	1.95	1.42	1.20
Net Capital Turnover Ratio	2.59	1.77	1.19	2.55	1.86	1.74
Current Assets Turnover Ratio	1.77	1.59	1.20	2.27	1.75	1.47
Inventory Turnover Ratio (days)	85.71	119.11	122.50	64.22	79.33	114.81
Receivables Turnover Ratio (days)	63.30	75.12	87.93	78.95	71.58	106.03
Payables Turnover Ratio (days)	54.64	74.01	72.96	36.92	47.39	62.49
EPS	30.15	82.53	51.96	54.97	32.48	26.20
NAV	77.64	121.29	200.31	86.06	53.86	53.39

Company	PI Industries			Fine Organic Industries Ltd.		
Particulars	FY19	FY20	FY21	FY19	FY20	FY21
Current ratio i. e., liquidity ratio	2.08	1.83	3.57	4.12	3.91	4.01
Quick Ratio	1.42	1.09	2.73	3.25	2.91	3.18
Average collection period	76.36	70.92	53.83	52.00	50.62	47.24
Average payment period	103.80	109.05	98.44	34.35	41.67	48.50
Days cash on Hand, All Sources	32.34	36.55	236.43	48.11	95.71	102.40
Cash Ratio	0.25	0.24	1.85	1.04	1.57	1.71
Net Working Capital	8,794.00	9,082.00	32,361.00	3,287.96	3,901.66	4,654.08
Debt equity ratio	0.02	0.20	0.06	0.26	0.20	0.12
Capital Gearing Ratio	19.12	4.46	13.44	3.90	4.96	8.20

Debt Service Coverage Ratio	11.32	13.38	3.16	47.45	26.56	4.34
Interest Service Coverage Ratio	96.68	34.18	29.70	117.53	42.69	24.88
Total Assets Turnover Ratio	0.98	0.91	0.82	1.72	1.34	1.26
Fixed Assets Turnover Ratio	2.31	1.93	2.01	6.97	5.10	5.10
Net Capital Turnover Ratio	3.23	3.71	1.41	3.22	2.66	2.43
Current Assets Turnover Ratio	1.80	1.82	1.41	2.76	2.17	1.98
Inventory Turnover Ratio (days)	126.13	157.84	149.45	49.73	78.88	63.44
Receivables Turnover Ratio (days)	85.03	70.09	56.10	53.57	46.53	51.85
Payables Turnover Ratio (days)	120.79	116.75	113.00	29.74	51.37	53.89
EPS	29.73	33.08	49.89	44.44	53.75	39.25
NAV	63.73	65.79	218.67	107.24	127.26	151.80

- I. *Current ratio i. e., liquidity ratio defined as Current Assets/Current Liabilities*
- II. *Quick Ratio defined as (Current Assets-Inventory - Prepaid Expenses)/Current Liabilities*
- III. *Average collection period defined as (Avg. Trade Receivables/Revenue from Operations)*365*
- IV. *Average payment period defined as (Avg. Trade Payables/Cost of materials consumed incl. changes in Inventory and Stock in Trade)*365*
- V. *Days cash on Hand, All Sources defined as (Cash & cash equivalents +Current investments +bank balances other than cash & cash equivalents)/(Operating Expenses plus Finance Costs/365))*
- VI. *Cash Ratio defined as (Cash & cash equivalents+ Current investments+ bank balances other than cash & cash equivalents) /Current Liabilities*
- VII. *Net Working Capital defined as Total Current Assets- Total Current Liabilities*
- VIII. *Debt equity ratio defined as Total Debt/Total Equity*
- IX. *Capital Gearing Ratio defined as Total Equity/Total Debt*
- X. *Debt Service Coverage Ratio defined as (PAT+ Depreciation & ammortisation+ Finance Costs)/(Interest Cost+ Principal Repayments)*
- XI. *Interest Service Coverage Ratio defined as EBIT/Finance Costs*
- XII. *Total Assets Turnover Ratio defined as Revenue from Operations/Average Total Assets*
- XIII. *Fixed Assets Turnover Ratio defined as Revenue from Operations/Average Net Fixed Assets (incl. CWIP)*
- XIV. *Net Capital Turnover Ratio defined as Revenue from Operations/Net Working capital*

- XV. *Current Assets Turnover Ratio defined as Revenue from Operations/Average Current Assets*
- XVI. *Inventory Turnover Ratio(days) defined as (Closing Inventory/Cost of materials consumed incl changes in Inventory and Stock in Trade) *365*
- XVII. *Receivables Turnover Ratio(days) defined as (Closing Receivables/Revenue from Operations) *365*
- XVIII. *Payables Turnover Ratio(days) defined as (Closing Payables/Cost of materials consumed incl changes in Inventory and Stock in Trade) *365*
- XIX. *EPS defined as PAT/Weighted average number of equity shares outstanding during the year (incl. ESOP shares)*
- XX. *NAV defined as Total Equity/Weighted average number of equity shares outstanding during the year (incl. ESOP shares)*