Global Opportunities for the Chinese Chemical Industry

Full report
April, 2017
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Preface

Preface by the China Petroleum and Chemical Industry Federation (CPCIF)

In 2016, China’s petroleum and chemical industries realized a revenue of RMB13.3 trillion, accounting for 11.5 percent sales revenue among the country’s industrial enterprises above designated size. Stable growth and structure adjustment of China’s petroleum and chemical industries are important factors that guarantee a continuous and healthy development of the Chinese economy.

At present, China’s economic development has entered a “New Normal”, with macroeconomic transformation and upgrading showing three general features: changed of the development speed, optimization of the industrial structure and conversion of the development force. Change of the development speed means that the economy is shifting from high-speed growth to medium-to-high speed growth; optimization of the industrial structure optimization means that China’s industrial sectors are evolving from basic raw material processing and manufacturing to high-end and intelligent manufacturing; and conversion of the development force means that the economy is shifting from investment-driven, large scale development to consumption-focused and innovation driven. During the 13th Five Year Plan, China’s chemical enterprises will continue to focus on adjustment and change: internally, they will shut down outdated capacity and encourage entity transformation and technology innovation;
externally, they will develop advanced manufacturing capacities globally and encourage acquisition of overseas advanced technologies to meet domestic and international market demand. To achieve that, the chemical industry development needs to be aligned with China’s overall development path along industrialization, informatization, internationalization, urbanization and agricultural modernization.

China is the second largest economy in the world, and the economy expected to grow at 6.5 percent annually, contributing to around 25 percent of global economic growth. However, compared with global enterprises' total investment in China, Chinese enterprises' overseas investment is still low. Therefore, to better integrate into global economy, we need more domestic enterprises to invest overseas and become globalized. As for the chemical industry, Chinese chemical enterprises need to fully consider two key areas of globalization: firstly, they need to develop tailored strategic objectives, e.g., optimize raw material supply, expand sales channels, improve technologies, strengthen brands. Secondly, they need to make investments in overseas areas or enterprises that linked with the Chinese economy or market to capture higher synergies and improve China’s self-sufficiency of high-end products.

This report uses the latest industrial statistical data and analyzes the development situation, external environment and investment trends of China’s key chemical areas with the purpose to provide reference guide to Chinese chemical enterprises that seek to globalize and help them select the right segments and geographies. We hope that executives of Chinese chemical
enterprises as well as chemical industry research personnel will benefit from this report.

Li Shousheng
Chairman
China Petroleum and Chemical Industry Federation (CPCIF)
Preface by A.T. Kearney

China is not only the largest chemical market globally, with its global share almost doubling since 2005, the Chinese Chemical industry has also been one of the main drivers behind the rapid development of the Chinese economy over the past decades.

This development has been fostered by the ability of Chinese Chemical companies to transform from producers of basic chemicals to providers of high quality products and value-adding solutions that cater not only to the needs of their traditional domestic customers, but also meet the high-quality requirements of leading global customers in China and beyond.

Historically, many key customers in major chemicals end-use segments (e.g., automotive, construction chemicals) were in China, as China not only benefited from unprecedented domestic demand growth but many foreign players also established a global manufacturing base in China. In the next stage of development, as some of the historical cost advantage of China will disappear, it will be critical for China’s leading Chemical companies to look outward and globalize their operations to seek new growth markets and stay globally competitive. We expect this globalization of Chinese chemical companies to happen largely through M&A, and many companies are already well underway on that journey.

This report should serve as a guide for Chinese Chemical companies that aspire to globalize their operations, looking at regions that are particularly interesting for investment and giving an overview of and specific recommendations on selected chemical segments.
We trust that this report will help write the next chapter in the development of the Chinese Chemical industry, the chapter where companies are taking full advantage of the globalized world.

Thomas Luedi
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Introduction

Introduction to the China Petroleum and Chemical Industry Federation (CPCIF)

China Petroleum and Chemical Industry Federation is a nationwide comprehensive social intermediary organization that offers services and management to the petroleum and chemical industry. The Federation runs independently as per its charter to improve regulatory systems and standard operations. It shows great respect to the intentions of its members, actively serves enterprises and strengthens communication with government agencies. It helps coordinate interactions, collaboration, and partnerships with associations, academia, enterprises and public institutions to consolidate the power of the industry. CPCIF’s mission is to be service-oriented, reflecting the voices of its enterprises and protecting their rights and exploring new industry management mechanisms adapted to the socialist market economy; assist the government in promoting the development of the industry such as facilitating technology advances and industrial upgrading, improving the development of the industry, where the economics is the core and restructuring is the pipeline. As a social organization, CPCIF represents the entire petroleum and chemical industry of China to strengthen cooperation and exchanges with overseas counterparts.

The CPCIF has six duties: 1. industry development plan and access policy design; 2. HSE and standards management; 3. science and technology awards assessment to promote innovation and technology progress; 4. Data statistics and
analytics to build a data platform for the industry; 5. International exchange and cooperation; 6. Other duties authorized by the state government.
Introduction of A.T. Kearney

A.T. Kearney is a leading global management consulting firm with offices in more than 40 countries worldwide. Since 1926, A.T. Kearney has been the trusted advisor to the world's foremost organizations. A.T. Kearney is a partner-owned firm, committed to helping clients achieve immediate impact and growing advantage on their most mission-critical issues.

At A.T. Kearney, we live by the principles established by our founder Andrew Thomas (Tom) Kearney and his belief that “our success as consultants will depend on the essential rightness of the advice we give and our capacity for convincing those in authority that it is good.”

Our work is always intended to provide a clear benefit to the organizations we work with in both the short and long term. We focus our resources, leverage our global scale, and drive excellence in all we do while enhancing our partner-like culture to ensure we are collaborative, authentic, and forward-thinking.

We have a distinctive, collegial culture that transcends organizational and geographic boundaries. Our consultants are down to earth, approachable, and have a passion for doing high impact, innovative client work. We always seek to deliver both immediate impact and growing advantage to our clients and our people.

We help our chemical industry clients in China and globally deal with a broad range of challenges – from growth and globalization to restricting and profit maximization. We are proud to count the
large majority of chemicals companies globally, by geography and product segment as our clients and have helped many of them to transform their organizations and set them up for long-term sustainable success.
1. China’s Chemical Industry: To Accelerate Globalization
Context for outbound Chemicals Investments

With decades of rapid development, China’s chemical industry has achieved many milestones. It has established a comprehensive and sophisticated portfolio of more than 20 sub-sectors. It has built the largest production capacity in the world. It has compiled advanced technologies in commodity chemicals production. Finally, it has developed a capability to plan and develop world scale chemical installations and clusters.

Currently, China’s economy is in the middle of a transition from unprecedented investment-driven high growth to a “New Normal” of consumption-led medium growth. This transition is reshaping the economy by providing new market opportunities and impacting growth patterns. Regardless, with the ongoing urbanization, industrialization and increasing purchasing power of the large middle class, China will consolidate its position as a major and fast growing market and key global energy and resource consumer.

In this new era of economic development, globalization is a key strategic approach for Chinese companies to upgrade and stay competitive. The Chinese government has launched the “Belt & Road Initiative” and advocates international production capacity cooperation, aiming at integrating China’s quality equipment and advantageous production capacity with the leading technology of developed countries. It furthermore aspires to promote regional economic integration and co-prosperity with its neighbors and trade partners.
The chemical industry is one of China’s twelve key industry sectors and it has accelerated its globalization process. Recent years have seen rapid growth in both outbound greenfield investment and cross-border M&A by state-owned enterprises and private entities. These outbound investments have covered a broad range of destination countries and business sectors and included complex commercial arrangements. During the 13th Five-Year plan period, China’s chemical industry is entering a new stage characterized by structural adjustments, industrial upgrading and green development. Globalization is a critical approach to tackle major challenges such as structural overcapacity, lower demand growth, energy and resource scarcity, cost inflation, limited innovation, and fiercer international competition and trade protection.

**China’s Macroeconomic Environment**

The Chinese economy will maintain a positive momentum in the mid-long-term, targeting an average GDP growth of 6.5-7 percent annually to 2020. With the ongoing urbanization and industrialization and increasing purchasing power of the population, China is consolidating its position as a major and fast growing market and strategic energy/resource consumer in the world. A vast and strongly growing home-market, high foreign reserves, financing capability and internationalization of Renminbi is providing solid foundation for the overseas development of Chinese companies.
China’s economy is in the middle of a transition to a “New Normal” of medium-high and consumption-led growth. Six long-term trends are reshaping China’s economy by providing new market opportunities and impacting growth patterns. These six long-term trends are resource scarcity, shift from a “build” to “replace” economy, green sustainability drive, new technology emergence, new consumption patterns, and marketization. Combined, these six trends have led to four new macroeconomic thrusts that will drive China’s economic development for the foreseeable future: consumption-led growth, efficiency focus, stronger local players, and supply side reform (Exhibit 1.1).

Exhibit 1.1: China’s long-term macroeconomic trends and thrusts
(Source: A.T. Kearney)
The “Belt & Road Initiative” and International Industrial Capacity Cooperation

The “Belt & Road Initiative” is a development strategy promoted by the Chinese government to connect China with Europe over land routes through Central and Western Asia and by sea through Southeast Asia and Africa. The rollout of the Belt & Road area accounts for 63 percent of the global population and 29 percent of global GDP and will be a leading factor in the overseas investment of Chinese enterprises. The initiative will benefit industries like transportation, infrastructure, energy and finance and allow them to establish strong connections in trade and culture and promote regional economic integration and co-prosperity (Exhibit 1.2). In 2016, China made direct investments in 56 of the Belt & Road countries, and signed engineering contracts in value of RMB837 billion.

Promoting international cooperation of production capacity is a key initiative to maintain China’s medium-high growth and link China with the rest of the world. China advocates to combine China’s high-quality production capacity and advantageous equipment with the technologies and advanced equipment from developed countries and support the urbanization and industrialization needs in emerging economies and developing countries. China has defined the "one axis and two wings" strategy, identifying 45 cooperating countries, and proposed accelerate the “Going Out” of production capacity and equipment manufacturing for many key industries such as iron and steel, nonferrous metals, building materials, railway, power, chemical,
textile, automobile, communications, engineering machinery, aerospace, shipbuilding and marine engineering and adopted a series of initiatives to promote international production capacity cooperation.

**China’s Belt & Road initiative corridors**

The implementation of the “Belt & Road Initiative” is progressing well. The "13th Five-Year International Production Capacity Cooperation Plan" and the "International Production Capacity Cooperation Plan with Key Countries" have been developed. Frameworks for bilateral, multilateral and third-party co-operations have been defined. For example, bilateral production capacity cooperation mechanisms with more than 20 countries including Kazakhstan, Ethiopia and Brazil have been agreed. Increased financing support for financial institutions and joint investments funds between China and Saudi Arabia, China and
Kazakhstan, China and the EU, and China and Africa are being discussed and set up.

**The China Chemical Sector**

China’s chemical sector is growing rapidly and has become a strategic pillar with increasing global competitiveness and a strong foundation for promoting international development. It consists of a strong industrial system covering more than 20 sub-sectors including oil refining, petrochemical, basic chemical raw materials and chemicals, chemical fertilizers, agricultural chemicals, coatings and dyestuff, synthetic materials, specialty chemicals, rubber products and chemical equipment manufacturing. Output of several bulk commodity chemicals tops global output, including for inorganic materials, methanol, ethylene, fertilizers, agricultural chemicals, synthetic resins and synthetic rubbers. China’s chemical sector has developed advanced technologies (e.g., in coal gasification, coal-based chemical production, potassium processing, phosphate rock flotation, phosphogypsum processing, synthetic resin preparation, graphite, biochemical engineering) and set up global scale production facilities (e.g., in LNG processing, refining, cracking, ammonia production). In 2015, China’s chemical sector ranked first among Chinese industrial sectors in terms of operating income (RMB12 trillion) and trade (RMB2.4 trillion).

China is rapidly expanding its chemical industry base and chemical parks. There are four completed 20 million ton per annum refinery bases and nine above 1 million ton per annum
ethylene bases, and 381 chemical parks above designated size, forming a pattern of upstream and downstream integrated, green and sustainable chemical production sites. By investing in these modern integrated chemical production facilities and chemical parks, China has significantly improved its health, safety and environmental protection standards.

During the “13th Five Year Plan” period, China’s chemical sector enters a new development phase characterized by restructuring, industrial upgrading and green development. It faces many challenges, such as structural overcapacity, slower demand growth, energy and feedstock constraints, factor cost inflation, slow innovation, pressure to further improve safety and environmental protection, fiercer global competition, and trade protectionism. Globalization of Chinese chemical companies will help address several of these challenges. Specific opportunities exist as host countries’ ongoing industrialization and urbanization (mainly emerging economies), product segment consolidation (several chemical product segments regionally and globally) investment needs (developing economies) provide strong opportunities for Chinese chemical companies to collaborate and develop their business activities globally. International collaboration in trade and investment is an important initiative for China’s chemical sector to address its domestic overcapacity, reduce its cost structure and drive consolidation and will provide the foundation for an ongoing high-medium speed sector growth.

The Chinese chemical market has seen strong growth in recent years. The industry is predicted to continue growing at a similar, albeit slightly decelerated growth rate for the forecast period.
The Chinese chemical market generated total revenues of RMB11.2 trillion in 2016 growing at a 9.4 percent CAGR from 2012 to 2016 in value. The commodity chemical market grew at a 9.3 percent CAGR, specialty chemical market at a 7.1 percent CAGR and the agrochemical market at a 14.9 percent CAGR over the same period (Exhibit 1.3).

As is the case across the globe, commodity chemicals dominate the Chinese market. These chemicals tend to be produced in bulk at low cost, which suits the rapid expansion of the Chinese market and the less advanced technology and expertise. In the future, a shift towards specialty chemicals is expected, but it may take several years for this shift to happen as technological development and upgrading will be required.

Growth is expected to slow to an expected 5.4 percent CAGR for the total Chinese chemical market to 2020 in value terms. By 2020, the Chinese chemical market is expected to reach RMB13.8 trillion. The commodity chemicals segment is expected to remain the market’s largest segment. It is expected to grow at a 5.9 percent CAGR. Specialty chemicals are expected to grow at a 4.6 percent CAGR and agrochemicals at a 8.6 percent CAGR.
Due to the technical nature of the chemical manufacturing process, fixed costs are high, which makes it difficult to exit the market and contributes to a strong rivalry. There are few very large multinational corporations and numerous medium-to-large companies active in the chemical market. Differentiation in commodity chemicals is difficult, hence customer switching is common.

Buyer power benefits from the commoditized nature of chemicals; however, dependence on chemicals as a raw material in their manufacturing processes somewhat reduces buyer power. A large proportion of chemicals are commoditized and this lack of differentiation increases buyer power as chemical suppliers are forced to compete on price. Some differentiation can be achieved in commodity chemicals through chemical composition, purity. Branding is less effective in creating customer loyalty.
Suppliers to chemical manufacturers include oil, gas and mining companies. The large size of these suppliers and price fluctuations associated with natural resources, gives suppliers to chemical manufacturers some power. But supplier power is weakened undifferentiated raw materials and price becomes a major factor for chemical manufacturers in choosing their suppliers.

New entrants to the chemical market may be deterred by high entry costs and strict government regulations. However, low product differentiation helps to attract new entrants to this market. There are very few, if any, substitutes for chemicals as they are a fundamental raw material to a wide variety of downstream products and applications.

**Outbound Investments: Current Situation and Future Trends**

China’s chemical sector is implementing its globalization strategy and has increased its outbound investments. In 2016, China completed RMB88 billion in outbound chemical investments, with an additional RMB394 billion of outbound chemical deals announced but not yet completed (Exhibit 1.4). Since 2010, outbound chemical investment grew at an 80 percent annual growth. Over the same period, 48 chemical companies completed a total of RMB189 billion in outbound investments. 2016 was a record year for China’s chemical outbound investments. ChemChina’s announced acquisition of Swiss original agrochemicals producer Syngenta for USD43 billion
(RMB289 billion) was the largest ever outbound investment by a Chinese company (deal closure expected in Q2 2017). China’s outbound chemicals investments are mainly in the form of M&A and not greenfield plant investments.

China’s outbound chemical investments covered more than 30 countries and regions globally, with seven nations (USA, Australia, Canada, Brazil, Germany, Singapore and France) consisting of about half of China’s recent outbound chemical investments (Exhibit 1.5). With the Belt & Road initiative now being implemented, it is expected that countries along the new Silk Road will become increasingly important destinations for China outbound chemical investments.

**Chinese chemicals outbound M&A**  
(RMB bn, equity value)

Exhibit 1.4: China overseas chemical investments  
(Source: Dealogic, A.T.Kearney)
To date, China’s outbound chemical investments have been led by some of the largest state-owned enterprises. ChemChina has been the largest foreign investor in the Chemicals sector with a total cumulative outbound M&A investment of RMB228 billion having concluded 11 deals and two currently in process. Six Chinese outbound chemicals deals have been larger than USD1 billion (RMB6.3 billion) (Table 1.1).

<table>
<thead>
<tr>
<th>China acquirer</th>
<th>Target company</th>
<th>Target country</th>
<th>Deal value (RMB billion)</th>
<th>Year</th>
<th>Product segment</th>
</tr>
</thead>
<tbody>
<tr>
<td>ChemChina (announced)</td>
<td>Syngenta</td>
<td>Switzerland</td>
<td>298.3</td>
<td>2017E</td>
<td>Agro-chemicals</td>
</tr>
</tbody>
</table>

Exhibit 1.5: China overseas chemical investments by geography (Source: Dealogic, A.T.Kearney)
Chinese outbound chemical investments initially focused on securing resource and feedstock supply but have now extended to include a wider variety target companies that allow Chinese chemical companies to access to new markets, obtain leading technologies and gather know-how and brands.

As China’s chemical companies’ capabilities in building and operating high quality assets is in traditional segments (e.g., refining, petrochemical, fertilizers, rubber and tire), their overseas investment focus is in new materials and modern chemical
segments such as renewable energy (ChemChina and Elkem acquisitions), new materials (ChemChina Rhodia and Elkem acquisitions), biotechnology (ChemChina and Syngenta acquisitions) and life science (ChemChina Adama and Syngenta acquisitions).

In addition to overseas M&A, the quantity and quality of overseas project contracts have also increased. In 2015, the contract value for completed petroleum and chemical engineering and construction projects totaled RMB92 billion (9.4 percent annual growth) and the value of newly signed contracts was RMB132 billion (also 9.4 percent annual growth). The project scope is also increasingly shifting from construction to higher value added activities such as project design and EPC.

With the Chinese economy in transition, changes in the industrial development path and the launch of the Belt & Road initiative, the environment for Chinese chemical companies has changed dramatically. Pioneers of the “go out” strategy have seen initial success in their overseas development efforts. An increasing number of chemical players across product segments have begun to actively plan for overseas expansion, mainly through M&A. Many large petrochemical players have announced or are preparing for large-scale overseas investment projects. Overseas investment will become an important means for China’s chemical companies as they develop into multinational corporations and global leaders.
2. Global Context and Implications for Chinese Globalizers
Global Macroeconomic Environment

The global economy will continue the trend of slow, gradual growth, with a forecasted average annual growth of 3 percent from out to 2020. Increased uncertainty and volatility in global economic development, growing political sentiments in developed economies against globalization, structural slowdowns in emerging market economies, China’s rebalancing and structurally lower commodity prices continue to show downside risks to global growth.

Structurally lower commodity prices are an important factor supporting stronger economic growth. Although economies that are dependent on commodity exports may suffer, lower input prices for industry and lower fuel prices for households provide a boost to aggregate demand and global growth.

We anticipate economic performance to continue to diverge within the emerging and developed market groupings based on policy choices, as governments grapple with structural reforms in the context of reduced fiscal and monetary stimulus. In this regard, strong leadership and bold government actions will determine whether domestically oriented economies can escape the trap of stable but low growth.

We expect the next wave of global growth to come from seven emerging markets: China, Malaysia, Chile, Poland, Peru, Mexico, and the Philippines. In addition, a variety of strong-performing and high-potential Sub-Saharan African economies will begin to contribute more to the global economy.
Despite this benign base-case global outlook, several significant risks – economic, political and environmental – could derail sustained global economic growth. Among them are deflation in developed markets, a hard landing in China, extreme weather and geopolitical flare-ups. There are also positive wildcards that can boost growth prospects: an economic recovery in Europe and increased agricultural production leading to lower global food prices.

Besides China, the Indian subcontinent and the ASEAN region are expected to be the fastest growth regions out to 2020 (Exhibit 2.1).

Exhibit 2.1: Global and regional economic growth forecast (EIU)
Foreign Direct Investment

Although globalization has appeared to be on hiatus since the Global Financial Crisis, with key indicators such as global trade and international investment flows remaining below pre-crisis peaks, FDI has bucked this trend. In 2015, global FDI inflows soared to RMB11.4 trillion, the highest level since 2007. Emerging and frontier markets in Asia (“developing Asia”) continued to attract the greatest volume of FDI inflows —on the back of a sharp increase in investment in developed markets. At the same time, investment from Asian frontier markets into developed markets increased. Mergers and acquisitions, rather than greenfield investments, was the major FDI mode.

A detailed analysis of FDI flows and attractiveness of destination countries is covered in chapter 5 of this report.

Exhibit 2.2: FDI investment flows in 2015 (Source: UNCTAD)

Note: Total FDI inflow & outflow do not match because of a lack of comparability of data across different countries. For a given transaction, host country and home country often do not register it in exactly the same way.
Oil Price Outlook

Between June 2014 and March 2016, oil prices plummeted 65 percent marking one of the three largest drops in oil prices since the 1970s. The main causes for this significant price decrease were structural slowdown in demand (substitution, energy efficiency, lower economic activity), increased supply from US shale producers as well as from Middle Eastern producers determined not to lose market share causing a lack of consensus from OPEC members to impose a production ceiling.

Based on the consensus estimate of reputable agencies that forecast oil prices, we expect the oil price to fluctuate between USD50/bbl and USD60/bbl throughout 2017 due to better supply management and inventory draws (Exhibit 2.3).

Exhibit 2.3: Historical and future oil price (Source: EIA)
Beyond these short-term forecasts, the future oil price remains uncertain due to concerns over the future of OPEC, return of low-cost producers, such as Iran, Iraq, and Libya, to market and technology breakthroughs in unconventional oil extraction in North America that lower the breakeven point for producers there. Contrary to this, the large reduction in capital expenditure in the industry has potential for a massive price correction as supply may become short-term constrained. On the demand side, continuing weakening global demand and competition from new emission friendly energy sources and increasing regulation on carbon emissions causes concerns. On the flip side, recent new U.S. energy policy regulations will likely stimulate oil demand there. What is certain, however, is the continuing desire from producers for strategic cost transformations to lower breakeven costs, which structurally lower prices.

China, as the world’s largest oil importer, will be impacted by future oil price movements and so will its chemical industry. As regional feedstock competition intensifies and China is diversifying its energy mix away from oil to other sources – such as gas from Central Asia and Russia and coal as feedstock for many chemicals products – Chinese chemical companies will need to develop a capability to effectively manage multiple feedstock sources based on short and long term economic attractiveness.
Global Chemical Trends

2016 was a challenging year for the chemicals industry globally. The industry faced significant headwinds including a strong U.S. Dollar, slow growth in emerging economies, a recession in Brazil, stagnation in Europe and Japan and the ongoing cyclical downturn in the agricultural sector. Against these challenging conditions, consolidation has started in several sub-segments and some very large deals have been announced, such as the Potash Corp. – Agrium merger, Bayer Crop Sciences’ takeover of Monsanto and of course ChemChina’s proposed acquisition of Syngenta. In addition to the unfavorable economic environment, recent years saw a large outpouring of activist investor pressure to public chemical companies for coherent business portfolios. This large insistence for coherent strategic positioning of portfolios led to a string of mergers and acquisitions, including the largest chemicals industry transaction to date, the proposed merger and 3-way split of Dow Chemical and DuPont. We expect the pressure from activist investors on portfolio coherence to continue.

Looking ahead, there are four key trends that will shape chemical industry dynamics, two on the feedstock side (regional and feedstock competition and margin capture at the asset) and two on the customer side (rise in solution-based service models and disruption of traditional demand patterns).

- **Regional and feedstock competition** will continue to increase as regions continue to take more distinct feedstock positions in gas, NGLs, naphtha, and coal. As prices for these feedstocks fluctuate, so will each regions’
competitiveness. While the price ranges of these feedstocks are becoming more understood at different oil prices, market balancing mechanisms show potential for future disruption.

- To secure a strong return on assets, integrated players will try to increase margin capture “at the asset”. This trend will expose many companies without a clear integration strategy and put increasing pressure on “stuck in the middle” players.

- Many traditional chemical companies focus on product innovation. Despite this, the highest margins and shareholder value is driven by adopting solution-based approaches. Broad-based players not adjusting to this new solution-based and end-use market tailored model will increasingly be forced into a less attractive component-provider role.

- In our market scenario analysis, we already see scenarios with peak demand for chemicals in some chains as consumption in the developing world may not follow the same path as demand in advanced markets. New value chain battle fronts, namely interchain competition, will intensify in the future, driven by flexibility of end customer industries.

These customer and feedstock trends in the chemicals industry will see five key dynamics occurring. (i) operational scale and integration optimization, (ii) market consolidation for commoditized products, (iii) end-to-end value chain management to counter risks of supply chain disruptions and geopolitical uncertainty, (iv) innovation to counter commoditization, and (v) portfolio restructuring to focus on specialty products. Successful
management of and positioning around these industry dynamics drive large value creation for chemicals players, while those companies that struggle to capitalize on these dynamics will see tough conditions ahead.

Currently many Chinese chemical companies lack scale as well as the capabilities for solution-based service models. Globalization provides not only the chance to gain scale, but also to learn from more advanced service models in more developed markets.

**Implications for Chinese Globalizers**

Taking into consideration the global and Chinese macroeconomic development, FDI flows and ongoing globalization, as well as the opportunities and challenges for the chemical industry based on key feedstock and customer discontinuities, we see four major implications for Chinese chemical companies aspiring to globalize:

**Asian economies provide the largest growth opportunity**

From a macroeconomic perspective, Asia – in particular ASEAN and the Indian subcontinent – offer the most attractive growth opportunities. Within ASEAN the Philippines, Vietnam and Indonesia are showing strongest potential. In addition, a variety of strong-performing and high-potential Sub-Saharan African markets will begin to contribute more to the global economy.
Finally, the Belt & Road Initiative provides attractive investment opportunities in emerging economies in Central Asia.

**Chinese chemical companies need to develop globally competitive offers**

Currently many Chinese chemical companies are focused on chemical commodities and semi-specialties, sold via a push-based sales model. Although this business model has proven successful in the past it will not allow full participation in the global chemicals market which is moving towards solution-based service models, a capability that few Chinese chemical companies have built yet. Developing globally competitive offers will not only require R&D investments, but also the development of customer insights and international customer service organizations.

**M&A opportunities will increase**

Strong activities in strategic portfolio streamlining among chemical companies and ongoing consolidation across product segments will offer many M&A opportunities. In addition, antitrust regulations are and will require divestments following some of the current large M&A activities. Chinese chemical companies should screen the market for these opportunities and proactively approach potential sellers, rather than waiting for opportunities to arise.

**Feedstock options need to be carefully evaluated**

The success of many chemicals investments is dependent on the competitiveness of feedstocks used. As regions continue to take more distinct feedstock positions (gas, NGLs, naphtha, and coal),
market balancing mechanisms show potential for disruption. Feedstock-dependent investments therefore need to be carefully evaluated against a set of price scenarios.
3. Chemical Opportunities by Sector
Picking the right sector

Before starting to look for international investment opportunities, companies need to carefully evaluate what sector to invest in. This analysis needs to include sector attractiveness and fit with the company.

External attractiveness of chemical markets

The external attractiveness analysis of a chemicals market must include factors that are aligned with the company’s strategy:

- **Market size** – especially if the company has a strong growth aspiration, the absolute size of the target segment should carry a strong weight in the evaluation.

- **Market growth rate** – growth is especially important for organic expansion as it creates opportunities for new market players.

- **Market profitability** – obviously profitable markets seem more attractive, however in cases of inorganic growth, the profitability will determine the valuation of target companies and only acquirers with strong ownership advantages will be able to create value through synergies.

- **Capital intensity** – this factor can play in two ways: while it will make sectors unattractive for cash constraint companies it can open opportunities for companies with access to attractive financing conditions.

- **Market cyclicality** – this factor is often overlooked, but especially for public listed companies the cyclicality of the
segment has an impact on the valuation. In addition, cyclical markets offer interesting opportunities if the timing is right.

**Internal fit of chemical markets**

Besides the attractiveness of a market it is equally important to evaluate the “fit” with the current business structure, operations, and culture:

- Overlaps in the customer base, allowing synergies in customer access, customer knowledge, sales organization and efficiency, upselling/cross-selling
- Overlaps in geography, allowing better market access, combined logistics and supply chain
- Technological similarity, allowing new applications of existing products
- Raw material synergies, allowing volume consolidation and optimized supply chains
- Value chain extensions (upstream and downstream)

This process should be iterated with an increasing amount of detail, i.e. starting with a relatively broad screening of larger target markets followed by conducting a detail analysis on sub-segments and single products or applications

**Selective Sector Analysis**

There are multiple drivers for Chinese Chemical companies to globalize their footprint, the most common ones being access to
raw material and low cost feedstock, access to new markets and access to advanced technology and know-how.

This report analyzed 10 sectors in which CPCIF members have taken actions or shown strong interest in globalization. These sectors include: refineries, petrochemicals and commodity plastics, fertilizers, chlor-alkali, agrochemicals, construction chemicals, textile dyes, strategic new materials, natural rubber, SBR and tires, chemical engineering and construction. These sectors, according to their drivers for globalization, broadly fall into three different categories:

1. Sectors competing mostly on access to raw material and low cost feedstock, i.e. refineries, petrochemicals and commodity plastics, fertilizer, chlor-alkali
2. Sectors with high margins and/or growth or synergy with the China’s development potential and strong and advanced international partners, i.e. agrochemicals, construction chemicals, textile dyes, strategic new materials
3. Sectors for which globalization and localization is key for access to major markets, i.e. natural rubber, SBR and tires, chemical engineering and construction

3.1 – Refineries

The Belt & Road Initiative region, which covers over 60 nations and beyond, including 29 nations in Asia, 15 nations in the Middle East and Africa and 20 nations in Central and Eastern Europe, is the world’s major production and consumption region of refining
and chemical products. At present, the refining capacity in countries along the Belt & Road Initiative appears to be in surplus, but with big differences across countries. Most countries have developed cooperation plans and aspire to develop their own refining industry, but lack funds, technology and equipment to do so. To that end, there are extensive opportunities for Chinese chemical companies to forge such cooperation.

Many countries are accelerating refinery construction and capacity upgrading and the capacity of oil refining in the Belt & Road region is expected to grow significantly. From 2014 to 2020, the total refining capacity is increasing by 180 million tons to 1.7 billion tons. In addition to China, 9 countries, including India, Iraq, Russia, The United Arab Emirates, Malaysia, Saudi Arabia, Vietnam, Turkey and Egypt plan to expand capacity by more than 160 million tons (Table 3.1).

<table>
<thead>
<tr>
<th>Country/Region</th>
<th>Main demands and requirements</th>
</tr>
</thead>
<tbody>
<tr>
<td>Russia</td>
<td>Expand the export portfolio from a single product of crude oil to a variety of refined oil products by upgrading existing refineries and increasing the production of high quality gasoline and diesel</td>
</tr>
<tr>
<td>Kazakhstan, Uzbekistan, Kyrgyzstan, Turkmenistan, Tajikistan</td>
<td>Expand existing facilities or build new facilities to increase domestic refining capacity and meet domestic oil demand</td>
</tr>
<tr>
<td>Country/Region</td>
<td>Main demands and requirements</td>
</tr>
<tr>
<td>---------------</td>
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</tr>
<tr>
<td>India</td>
<td>Develop domestic refining industry by expanding existing facilities, building new facilities and upgrading oil quality, to not only meet domestic demand, but also increase the export of refined oil products. Meanwhile, there is also demand for upgrading several old refineries.</td>
</tr>
<tr>
<td>Saudi Arabia</td>
<td>Develop domestic refining industry by expanding existing facilities, building new facilities and upgrading oil quality to expand the export portfolio from a single product of crude oil to a variety of refined oil products and become a global leading refined oil exporter.</td>
</tr>
<tr>
<td>Iran</td>
<td>Implement the long-planned refining capacity expansion program, switching from a net importer of refined oil (esp. gasoline) to a major refined oil exporter, meanwhile meeting domestic demand.</td>
</tr>
<tr>
<td>Iraq</td>
<td>After the local situation is stabilized, revitalize the domestic refining industry to meet domestic demand and reduce imports.</td>
</tr>
<tr>
<td>Pakistan, Bangladesh, Myanmar, Indonesia, Vietnam, Mongolia, Afghanistan</td>
<td>Develop domestic oil refining industry to meet domestic oil demand and revitalize domestic economy.</td>
</tr>
</tbody>
</table>

Table 3.1: Demands and requirements in developing the refining industry  
(Source: CNPC Economics & Technology Research Institute)

Technological transformation has two aspects: upgrading obsolete and outdated plants and rebuilding and expanding small refineries. More than half of the countries along the Belt & Road corridor have obsolete plants and outdated technologies.
Refineries in Russia, Kazakhstan, Uzbekistan, Kyrgyzstan, Azerbaijan and Ukraine were mainly built during the era of the former Soviet Union. Many refineries in the Middle East, like in Iraq, Oman, Kuwait and Egypt, were built in the 1950s and 1960s. Most refineries in Southeast Asian countries, like in Myanmar, Thailand and the Philippines, were built in the 1970s and 1980s. These refineries have old and simple equipment, lack deep processing capabilities, have low processing efficiency and produce a simple product mix. These refineries need urgent upgrades. In addition, most of these refineries are small and to achieve structurally better cost structures, most countries plan to expand individual refining capacities.

In terms of updates of product quality standards, the quality of oil products produced in this region is lower than that produced in developed countries. At present, no country can fully meet the Euro V standards and only one quarter of the countries in this region meet Euro IV standards for gasoline and diesel. With increasingly stringent environmental standards, there is a need for substantial product upgrades.

China's annual refining capacity reached 720 million tons by the end of 2016. China has 24 large-scale refineries (with capacity >10 million tons per year) in operation, owns critical IP and world-class technologies and has significant experience planning and constructing large-scale refineries. Chinese refiners are strongly positioned collaborate with partners along the Belt & Road corridor, with a primary focus on ASEAN, the Middle East, Central Asia, Russia, and participating in greenfield, upgrading and expansion projects.
3.2 – Primary Petrochemicals & Commodity Plastics

The primary petrochemicals and commodity plastics market was valued at USD570 billion in 2016 and is predicted to grow at a 4.5 percent compound average growth rate “CAGR” to USD678 billion in 2020. Demand for petrochemicals and commodity plastics comes from growth in usage by consumer applications, historically averaging 1-1.5x GDP growth.

The largest demand for petrochemical products comes from Asia-Pacific, in particular from China. The region is expected to comprise 55 percent of global demand by 2020, and grow at a 5.4 percent CAGR. The next largest markets by 2020 will be North America and Europe, valued at USD101 billion and USD100 billion, respectively. These two markets are expected to grow at modest 2.7 percent and 2.3 percent CAGR, respectively. The African and Middle Eastern market is expected to grow at 5.1 percent CAGR and reach USD72 billion by 2020, mainly driven by growth in the Middle East. The South American market is expected to grow at 5.2 percent CAGR to reach USD28 billion by 2020.

Profitability in petrochemicals is determined by feedstock prices. Petroleum-derived products and other fossil fuel feedstock, such as natural gas and coal, are the main feedstocks, making access and proximity to large volume, low cost feedstock an important consideration in choosing the location of petrochemical and commodity plastics investments. Recent prices of naphtha, gas, and – to some extent - coal have plummeted, keeping production
costs low in all geographies. The Middle East remains the cheapest region for feedstock due to plentiful supply of low cost gas. The shale revolution has also lowered gas costs in North America, making this location second cheapest. Europe, Asia, and Latin America have traditionally been more expensive due to their dependence on naphtha. However, with the drop in oil prices, the gap narrowed. As we expect oil prices – and, thus, naphtha prices – to rise in the medium term (see chapter 2 – Oil Price Outlook) these regions will be again less competitive.

The petrochemical and commodity plastics sector is cyclical and exposed to rapid changes in supply and demand. Recently, global supply has continued to increase mainly due to large capacity additions in the Middle East, the United States, and Asia. Thus, oversupply emerged and profitability plummeted in 2014. The drop in oil prices in 2015 helped the industry to return to profitability. Based on future capacity addition plans, we expect profitability will reach a low peak in 2018, before tumbling again. Longer term, the market is expected to balance, reaching a peak in 2025. Despite the trough in profitability, margins are currently sufficiently high to support investment in additional capacity, provided the plants are integrated complexes with a steam cracker.

The petrochemical and commodity plastics market can be better examined by segmenting it into C1 (methanol), C2 (ethylene), and C3 (propylene) chains.
C1 Chain (Methanol)

Global methanol demand grew at a 10.2 percent CAGR from 2010 to 2016 and reached 86 million tons. The methanol market is divided into three segments: traditional chemicals (e.g. formaldehyde, acetic acid), methanol-to-olefins (MTO), and fuel blending. Recent global methanol demand growth has been primarily driven by MTO and fuel blending, with most growth coming from China. This trend is expected to continue out to 2020, with MTO plants in China expected to account for 60 percent of incremental methanol demand.

Methanol supply has grown even stronger in recent years and reached 115 million tons. Key supply growth is concentrated in regions with access to abundant energy sources, such as coal in China and natural gas in the United States. Due to large capacity additions in China, nameplate capacity of methanol producers currently exceeds demand, with average operating rates of 53 percent reported in Chinese plants, well below current North American operating rates (Exhibit 3.1).
Middle East & North American natural gas-based producers are currently best positioned to enjoy strong margins, with natural gas prices in these regions remaining very low. South American and Central and Eastern European producers remain competitive, while naphtha based Southeast Asian and Western European producers’ feedstock prices are least competitive. Given low capacity utilization of Chinese inland coal-based producers, the cost curve is artificially steep at the tail-end (Chinese natural gas based producers), leading to a high price environment and currently attractive margins for most regions.

Looking ahead to 2020, margins for methanol producers will be determined by the four key factors: (i) supply additions, (ii) Chinese capacity utilization, (iii) methanol demand growth, (iv) and oil price. In a scenario of continued low operating rates,
limited supply additions, and strong demand growth coupled with high oil prices (>USD60/bbl), global methanol prices will be high, providing attractive margins for North American and Middle East producers, while allowing South American, European, Southeast Asian and Chinese coal producers to remain profitable. Under a bearish scenario of increased Chinese operating rates, large supply increases, weak global growth, and lower oil prices (2015 level), we can expect margins to decrease, with the price setting producer dropping to Chinese coastal coal producers, pushing out Chinese natural gas, European, and Southeast Asian producers. This bearish scenario drastically impacts margins for North American and Middle Eastern producers, reducing the attractiveness of projects in these regions and globally (Exhibit 3.2).

Exhibit 3.2: 2020 methanol price and cash margin scenarios
(Source: EIU, Nexant, A.T. Kearney)

Note: 1. Oil price at $60/bbl, base case GDP growth at 3.2% global basis.
Middle Eastern and North American producers remain best positioned for strong profitability in methanol. Cheap natural gas in these regions places producers at the bottom of the cost curve. Regardless of global growth and oil price fluctuations, feedstock in these regions will remain cheap, ensuring profitability for the future.

C2 Chain (Ethylene)

Global ethylene demand grew at a 3 percent CAGR from 2010 to 2016. Demand growth has been uneven, with strong demand growth in the Middle East and Asia, while Europe and North America had declining or flat demand.

The ethylene production landscape has been dominated by expansions in the Middle East, China and the rest of Asia, while North American and Western European capacity share has decreased. This is beginning to change however, as cheap natural gas liquids have been a key game changer in the North American C2 landscape, where significant capacity expansion are being completed (Exhibit 3.3). The low oil price environment in recent years neutralized some of that advantage, with Middle Eastern feedstock prices remaining the most competitive in the near future. Regardless of global growth scenarios, we expect the United States become a large net exporter of ethylene with capacity increases expected to surpass demand in North America in both a low and high growth scenario. Due to the low oil price, some expansion projects in North America, Iran, Europe, China and Latin America were re-evaluated and subsequently delayed. Despite disadvantaged feedstock prices in other regions of the world, integrated steam crackers in Western Europe and
Southeast Asia have maintained positive ROI as margins begun to shift upstream. Integrated crackers are now essential for producers to capture margins.

**Ethylene surplus/deficit capacity by region** (mt)

Exhibit 3.3: Global Ethylene balance by major markets
(Source: Nexant, press search, A.T. Kearney)

Note: 1. Demand supply imbalance calculated at 90% of nameplate capacity.

For the C2 chain, Middle Eastern producers remain most competitive due to cheap and accessible feedstock, with North American ethane producers next best placed. Looking ahead to 2020, at a base case scenario of USD60/barrel oil, Middle Eastern ethane and naphtha producers remain best positioned, with North American ethane producers next best placed. However, in this scenario, Middle Eastern and North American producers come under pressure from China inland coal producers that are expected to be very competitive thanks to access to low cost, stranded coal and local demand markets (Exhibit 3.4).
C3 Chain (Propylene)

Global propylene demand grew at a 3.9 percent CAGR from 2010-2016. Like ethylene, demand growth for propylene differs by region, with Europe and North America having declining or flat demand, while Northeast Asia, Southeast Asia, and the Middle East have growing strongly.

The global propylene supply has grown at a 4.0 percent CAGR, keeping up with demand growth. Propylene capacity has grown strongly in the Middle East and in Asia, with producers taking advantage of cheap feedstock in these regions. In particular on-purpose propylene, has seen significant capacity increases. On-purpose propylene supply has grown from 8 percent capacity share to 19 percent from 2010 to 2016. This is particularly
evident in North America, where total capacity remained constant, but on-purpose propylene capacity increased and conventional capacity decreased. Propylene capacity additions have been impacted by the current oil price and on-purpose propylene capacity expansions slowed in the last 2 years as it becomes less attractive in a low oil price environment (Exhibit 3.5).

Propylene surplus/deficit capacity\(^1\) by region
(mt)

Exhibit 3.5: Global Propylene balance by major markets
(Source: Nexant, A.T. Kearney)

Note: 1. Demand supply imbalance calculated at 90% of nameplate capacity.

High cost crackers and metathesis units will be increasingly under pressure with capacity increases, as these plants produce at high cost. Beyond pressure on high-cost propylene producers, there are other C3 growth opportunities. The incentive for additional alkylation capacity remains in North America due to excess propylene supply there. Looking ahead to 2020, the Middle East and North America will both remain net exporters of propylene with supply in these markets far surpassing local demand. In
North America, propylene from refineries will need to go into alkylation to balance markets. There could be potential for additional alkylate blending in gasoline, and attractive returns on investment for North American RG propylene alkylation. (Exhibit 3.6).

Aromatics

Aromatics growth has been steady over the past six years as global demand for benzene and para-xylene, the two largest aromatics, grew at a 2.9 percent CAGR from 72.5 million tons in 2010 to 86 million tons in 2016. Aromatics demand growth is forecasted to accelerate and benzene expected to grow at 2.9 percent CAGR and para-xylene at 5.4 percent CAGR out to 2020. The Middle East and Asia-Pacific will drive growth for benzene
with demand in both regions forecasted to grow at a 4.4 percent CAGR to 2020. Benzene demand growth in the mature markets of North America and Western Europe are expected to be stagnant, growing at a 0.9 percent CAGR and 0.1 percent CAGR, respectively. Para-xylene demand growth is forecasted grow in North America expected at a 7.9 percent CAGR and in Western Europe at a 6.1 percent CAGR out to 2020. Despite lower growth, the largest share of para-xylene demand growth will come from Asia-Pacific (namely China) that already comprises 84 percent of global demand. The regions’ para-xylene demand is forecasted to grow at a 5.0 CAGR from 33.6 million tons in 2016 to 41 million tons in 2020. The Middle East, North America and Asia-Pacific will remain the most attractive locations for foreign investment due to favorable feedstock positions for para-xylene production and continuing demand growth for benzene derivatives.

Benzene demand is being mainly driven by the growth for its derivatives – styrene, cumene/phenol, cyclohexane, nitrobenzene/aniline, and linear alkyl benzene (LAB). Of these derivatives, styrene is the most important, accounting for half of global benzene demand. Around 60 percent of styrene is consumed to produce polystyrene that used in a variety of packaging ranging from disposable packaging to electrical appliance housing.

Para-xylene demand is driven by the production of purified terephthalic acid (PTA) and its predecessor dimethyl terephthalate (DMT), that are the raw materials for polyester fibers and resins (PET). Demand for para-xylene has outstripped that of benzene and other aromatics for many years, contributing
to a continued trend towards the development of technologies that are more selective towards para-xylene.

Aromatics supply is expected to grow at a marginally slower rate than demand as total capacity is expected to increase at a 3.3 percent CAGR compared to a 4.0 percent CAGR for demand. Capacity additions for benzene and paraxylene are expected to differ significantly, with benzene capacity additions only expected to grow at a 2.0 percent CAGR, compared to a 5.2 percent CAGR for para-xylene. Most the benzene and paraxylene capacity growth has been in China and this trend will continue in the medium term. Capacity additions are also planned in the Middle East, Eastern Europe and South America. Significant capacity increases are unlikely in North America and Western Europe. Benzene supply has mainly been constructed in-line with demand for its derivatives, the most important being styrene, that is used to produce polystyrene.

Profitability in the aromatics sector has been mixed over the last few years. Average global operating rates for benzene were low due to stagnant demand and ongoing capacity additions. Despite these low operating rates, the benzene market has been tight and margins remained relatively high since 2013. This is because the low availability of pygas, reformate and COLO (“Coke oven light oil”) feedstocks have limited production for many benzene producers. Weak production economics from naphtha crackers due to competition from low-cost gas crackers is restricting pygas production. Uneconomic operation of toluene conversion units limits competition from toluene. Limited COLO feedstock due to weakness in the steel and coking sector caused a reduction in benzene output from COLO-based producers in China. These
three trends are expected to continue in the medium term and will continue to tighten the market and favor higher operating rates of naphtha-based benzene producers. These trends will also support new investment in coal-based production facilities in China.

Para-xylene profitability has been negatively affected by large capacity additions in China, the Middle East, South-East Asia, and India. These capacity additions caused para-xylene plant operating rates to plunge and led to the shutdown of uncompetitive plants in North America, Western Europe, Japan, and South Korea. Further capacity additions will continue to put pressure on margins, but with para-xylene demand expected to grow at a 5.4 percent CAGR, demand is expected to catch up with supply in the medium term. Producers at the low-end of the cost curve, such as those with access to low-cost gas in the Middle East and North America will remain attractive.

The aromatics market remains attractive due to the feedstock supply constraints of pygas in benzene production and strong growth for para-xylene. But there are downside risks. An increase in pygas feedstock supply from naphtha crackers would boost operating rates of pygas-based benzene producers. An increase in oil prices would put pressure on the margins of all benzene producers. Lower than expected economic activity in China would slow para-xylene demand growth and sustain overcapacity. While the impact of the above risks is significant, their probability of occurring is low.

Attractive aromatics investment plays are naphtha-based benzene producers in the Middle East and in Asia-Pacific due to
their stable feedstock supply and growing regional demand and para-xylene producers in the Middle East and North America due to their low feedstock costs. Attractive investment regions are located along the Belt & Road corridor in countries where the petrochemicals sectors need significant upgrading and expansion (Central Asia, Russia, some Southeast Asian countries) and in the Middle East and Iran.

3.3 – Fertilizers

The global fertilizers market was valued at USD58 billion in 2016 and is predicted to grow at a 1.9 percent CAGR to USD62 billion in 2020. The fertilizer sector is led by three main nutrients – nitrogen (N), phosphate (P₂O₅) and potash (K₂O). Nitrogen fertilizer is the largest, constituting 59 percent of the market by volume, followed by potash at 24 percent and phosphate at 17 percent. Fertilizer growth is expected to be low. The nitrogen from urea market will grow at a 1.1 percent CAGR and the nitrogen from other sources market will grow at 1.0 percent CAGR out to 2020. Potash and phosphate demand growth is expected to be higher at a 2.8 percent CAGR and 1.5 percent CAGR, respectively (Exhibit 3.7). Nitrogen fertilizers must be applied every year to maintain yield and biomass. Phosphate fertilizers are used frequently to help with root growth and seed production. Potash fertilizers help improve crop resistance to lodging, disease, and drought. Potash fertilizers do not need to be used every year, making potash a more price elastic product and vulnerable to economic cycles and price increases.
The largest market for fertilizer is China. The country is expected to comprise 30 percent of global demand by 2020, and but only grow at a 1.6 percent CAGR. The next largest market is North America, growing at a 0.6 percent CAGR to 35 million tons in 2020. Asia-Pacific (excluding China and India) and India are the third and fourth largest markets, growing at a 1.8 percent CAGR and a 0.7 percent CAGR, respectively, from 2016 to 2020. South America is expected to be fastest growing at a 3.5 percent CAGR to 31 million tons in 2020 (Exhibit 3.8).
Profitability drivers differ across the three main nutrient sources. Feedstock cost is the main profitability driver for nitrogen fertilizers, as the bulk of the sector is produced from ammonia. For this reason, the Middle East and North America are attractive due to their cheap and plentiful gas access. Phosphate and potash profitability is cyclical. Both phosphate rock and potash need to be mined from resource deposits that are only available in certain regions of the world. Phosphate rock is the more common of the two nutrients and small deposits can be found across the world. The largest producers of phosphate rock are China, Morocco and the Western Sahara, and the United States. Canada, Russia and Belarus account for most potash resource deposits and production. Large capacity additions of phosphate rock and potash extraction and processing are currently being constructed across the world, leading to oversupply and downward pressure on prices.
The fertilizer market can be further analyzed by considering each segment: nitrogen (N), phosphate (P₂O₅) and potash (K₂O).

**Nitrogen (N)**

The global demand for nitrogen fertilizer was 146 million tons in 2016 and is expected to grow at a 1.0 percent CAGR to 152 million tons by 2020. 43 percent of the overall incremental demand is expected to come from Asia-Pacific, followed by 29 percent from South America, 21 percent from Europe and 7 percent from North America. Among the Asian countries, most incremental demand growth is expected to come from China (21 percent), India (7 percent), with the remaining 14 percent coming from countries across Asia-Pacific. For South America, most the incremental demand growth is estimated to come from Brazil, Argentina, Colombia and Mexico. Of the 146 million tons of nitrogen fertilizer used in 2016, approximately 53% came in the form of urea, while the remaining 47% came from other nitrogen sources such as ammonium nitrate, ammonium phosphate, direct ammonia application, urea-ammonium nitrate solutions (UAN) and others.

On the supply side, the world ammonia (the main source of anthropogenic nitrogen for the production of urea and other N-based fertilizers) capacity is estimated at 216 million tons in 2016, equivalent to 178 million tons of nitrogen. With successive capacity expansion plans, the total ammonia capacity is expected to grow to 232 million tons by 2020. Of the 16 million tons of incremental capacity, 25 percent is expected be in North America, followed by 18 percent in the Middle East and Africa, 18 percent in Eastern Europe and Central Asia, 14 percent in Asia-Pacific
(excluding China & India), 11 percent in China, 7 percent in India, and 4 percent each in South America and Western Europe.

As global urea capacity grows faster than global demand, overcapacity is building up and the supply-demand gap is increasing. Competition among global urea suppliers will be more intense and the capability to produce at low cost becomes a critical success factor. As nitrogen fertilizer is as much a local/regional market as a global market, regional cost competitiveness is important. The Middle East and North Africa has the lowest cost given low cost feedstock supply. China is a critical region not only due to its large size but also as global price setter given its location on the global cost curve (Exhibit 3.9).

![Global urea cost curve](source)

Exhibit 3.9: Global urea fertilizer cost curve by major region
(Source: CRU, RBC Capital Markets, Bloomberg, A.T. Kearney)

Note: 1. Average of China domestic, Middle East Granular, & Gulf NOLA prices.

Phosphate (P$_2$O$_5$)

The world demand for phosphate fertilizer is expected to grow at a 1.5 percent CAGR to 46 million tons in 2020 from 43 million
tons in 2016. Of the incremental demand increase, 44 percent is expected to come from Asia, followed by 22 percent from South America, 17 percent from North America, 13 percent from the Middle East and Africa and 4 percent from Europe. Among the Asian countries, most of the increased demand is expected to come from China (17 percent) and India (9 percent), with the remaining 17 percent comes from other countries across the region. In South America, most the incremental demand is estimated to come from Brazil and Argentina.

On the supply side, the world phosphoric acid (as $\text{P}_2\text{O}_5$) capacity is estimated at 54 million tons in 2016. By 2020, the total phosphoric acid capacity is expected to grow to 57 million tons. Of the incremental capacity, 86 percent is expected to be added in the Middle East and Africa. The remaining incremental capacity is expected to be added in Asia (7 percent) and the Americas (7 percent).

Like for urea fertilizer, phosphate fertilizer overcapacity is already large and increasing and the supply demand gap widening. However, overcapacity is increasing at lower rate than for urea fertilizer and the capacity utilization rate is expected to stabilize assuming some of the planned expansion projects will be delayed. In terms of production cost, the Middle East and North Africa is again lowest cost, given access to low cost (high grade) phosphate rock supply (Exhibit 3.10).
Potash (K₂O)

The world potash fertilizer demand is expected to grow at a 2.8 percent CAGR to 66 million tons in 2020 from 59 million tons in 2016. Of the incremental demand, 59 percent is expected to come from Asia, followed by 25 percent from the Americas, 9 percent from Europe, and 7 percent from the Middle East and Africa. Among the Asian countries, most of the incremental demand is expected to come from China (43 percent). For the Americas, most of the incremental demand is estimated to come from Brazil.

On the supply side, the world potash capacity is estimated at 67 million tons as of 2016. By 2020, the total capacity is expected to grow to 75 million tons. Of the incremental capacity, 67 percent is expected to be in North America. The remaining incremental capacity is built in Eastern Europe and Central Asia (26 percent),
and smaller additions are also planned in Western Europe and the Middle East & Africa

Overcapacity is expected to build up, with greenfield capacity ramping up. Potash supply is more consolidated than other fertilizers and large players in Canada and in Russia/Belarus have a cost advantage due to access to low cost ore (Exhibit 3.11).

![Global Potash Cost Curve](image)

Exhibit 3.11: Global potash cost curve by major region
(Source: CRU, RBC Capital Markets, Bloomberg, A.T. Kearney)

Attractive investment opportunities in the fertilizer sector are limited due to low growth and increasing overcapacity. However, the current low price environment poses challenges to many players and valuations are low. Regions with low cost feedstock and/or mineral deposits close to the growth regions are most attractive.
What follows is a brief overview of the most attractive investment countries for fertilizer.

**Iran**

Iran is a large country with rich oil and gas resources and adequate natural gas supply and therefore can produce low cost ammonia and urea. Iran's Pars Special Economic and Energy Zone (PSEEZ) near Assaluyeh is in the world's largest natural gas field, with well-performing oil and gas extraction and downstream chemical facilities. The nearby Port of Pars is close to major fertilizer export markets like India, Turkey, Africa, the Middle East and Europe. Since sanctions have been lifted, Iran has been accelerating the development of its petrochemical industry including fertilizer production and is opening foreign investment opportunities beyond oil and gas in other industrial sectors.

China can combine its advantages in fertilizer production technology, equipment manufacturing and production management with Iran's low cost feedstock access and existing port infrastructure to jointly invest in large-scale synthetic ammonia and urea projects.

**Southeast Asia**

Southeast Asian countries like Indonesia, Thailand, Malaysia and Vietnam as well as South Asian countries like India, Pakistan and Bangladesh, that are densely populated with high fertilizer demand, are main importers of China's nitrogen fertilizer. They need to build their own fertilizer production capacity to meet local development requirements, therefore offering cooperation.
opportunities in technology export, project construction, and equipment sales.

India

Fertilizer consumption in India has been increasing rapidly. It is the largest fertilizer market after China, North America and the rest of Asia-Pacific combined. The share of consumption of nitrogen, phosphate and potash is 13.8 percent, 13.9 percent, and 6.1 percent of world demand. The investment outlook for India is heavily dependent on the development of subsidies. Large subsidies in the past has resulted in increasing deficits and the government is under the financial pressure. In terms of foreign investment, the India government allows foreign investors to set up company fully owned companies and pursue acquisitions. The “Public Private Partnership” (PPP/BOT) model is an attractive investment option given the lack of infrastructure in India. In 2014, India and China signed a 5-year trade and economic co-operation pact, aiming to instill RMB138 billion Chinese investment into India. However, Chinese investors need to carefully assess the attractiveness of fertilizer investments in India, given the lack of infrastructure, a low government efficiency and the complicated legal system.

South America

The share of South America and Caribbean consumption of nitrogen, phosphate and potash is 6.5 percent, 13.7 percent, and 20.2 percent of world demand in 2016. Brazil, Argentina, Mexico and Columbia are the major markets for fertilizer in this region. South America is dependent on fertilizer imports and this trend is
expected to continue to the future. There are no specific limitations on foreign ownership in basic chemicals manufacturing and fertilizers.

In Brazil, the government has launched the “Investment Attraction Program” (IPA) to attract more foreign investment. In addition to the tax benefits from the national government, regional governments are also providing benefits to attract foreign investments, such as access to land, facilities, utilities, financing. For Chinese investors, despite the optimistic market outlook, the investment decision should be taken cautiously with key considerations to consider being high local tax rates, low industrial and market efficiency, high cost of capital and complicated/dynamic legal requirements.

**Africa**

As a continent with a fast-growing population and increasing food shortage, Africa’s agriculture sector is critically important and fertilizers have a significant growth potential. The share of the Middle East and African consumption of nitrogen, phosphate and potash is 6.2 percent, 7.5 percent, and 3.5 percent of world total demand in 2016. Fertilizer demand is expected to grow annually at 2.6 percent for phosphates and 5.3 percent for potash, while nitrogen consumption is expected to stay flat until 2020. The largest fertilizer consumption is in South Africa, Nigeria, Kenya, Ethiopia and Malawi. One of the key challenges in the agricultural sector is low agricultural productivity. To meet the strategic plans under the CAADP Compact, most Sub-Saharan African countries will need to more than double their fertilizer consumption. About two-thirds of the countries in Sub-Saharan
Africa have fertilizer subsidy programs and approximately 40 percent of the fertilizer demand is subsidized through government and private sector distribution.

For foreign investors, despite the moderately attractive market outlook, there are four areas of challenges and policies constraining the market in Sub-Saharan Africa that investors need to take into consideration when analyzing investments. First, Sub-Saharan African countries (maybe with the exception of South Africa) have weak legal systems, outdated sector regulations and inadequate enforcement of quality control. Second, there are barriers to market entry including restrictions on fertilizer imports, restrictions on domestic marketing, and high financing cost, limited storage capacities and collateral requirements. Third, some countries discourage investment in local enterprises. In addition, there are different standards for fertilizers within the region and price controls. Lastly, limited manufacturing capacity and insufficient port and transport infrastructure results in high logistics costs.

Since the 2006 Abuja Declaration on Fertilizer for an African Green Revolution, some progress has been made in policy to support market development, but current fertilizer policies and regulations are still not adequate to establish a competitive market.
3.4 – Chlor-alkali

The chlor-alkali market\(^1\) was valued at USD58 billion in 2016 and is predicted to grow at a 2.9 percent CAGR to USD65 billion in 2020. The largest market is by far Asia Pacific, namely China. The region is expected to comprise 58 percent of global demand by 2020 and grow at a 3.6 percent CAGR. The next biggest markets in 2020 will be North America and Europe with market value of USD10 billion and USD7.5 billion, respectively. The average demand growth in North America is estimated at 3.0 percent per year, and in Europe at 0.3 percent per year.

The chlor-alkali process is energy intensive making the cost of energy a key profitability driver in production. Additionally, chlorine is expensive to transport and store, making it important to produce near consumers to maximize profitability. Large expansion in chlor-alkali production occurred from 2010-14, with most capacity being added in China. This large capacity increase lowered operating rates below economic sustainability. However, with demand expected to be healthy and capacity increases reduced, operating rates are expected to rise to economically attractive levels.

The chlor-alkali industry remains modestly attractive due to its 2.9 percent CAGR, large USD65 billion market size, and expected return to economically attractive margins. Regions with cheap electricity and proximity to consumers remain most attractive. Asian countries with cheap electricity and established industries that consume chlorine are most attractive due to the region’s large market size and high demand growth rate. Attractive opportunities can be found elsewhere but North America and
Europe remain hampered by low growth, while the South America and the Middle East & Africa remain small. Attractive Asian markets for foreign investment include Japan, India, Singapore, and South Korea. Access to cheap electricity and proximity to consumers remains the most important considerations for assessing investment opportunities.

The chlor-alkali industry in Europe is advancing the elimination of mercury and diaphragm cell process to produce caustic soda. The EU plans to close 3.3 million tons of mercury cell plants by the end of 2017 and 1.6 million tons of diaphragm cell plants, jointly accounting for 39 percent of capacity in the region. This capacity phase out provides market entry opportunities for Chinese chlor-alkali equipment manufacturers.

As a fast-growing emerging economy, India’s chlor-alkali consumption is growing rapidly. India currently imports >500,000 tons of caustic soda and >1 million tons of PVC annually and also imports many chlorine consuming chemicals. There is large potential for China to cooperate with India’s chlor-alkali industry. But at present, China faces anti-dumping penalties for PVC in India, resulting in reduced exports to India. Removing these trade barriers will be beneficial for both countries in building up their chlor-alkali industries and trade. India is interested in the development of chemicals consuming chlorine while China has mature PVC and other chlor-alkali chemical technologies and is interested in broadening the co-operation with India beyond trade for capacity investment and technical services.

Subsequently, as Russia plans to expand >1 million tons of chlor-alkali capacity, Chinese equipment manufacturers can provide
turnkey solutions for chlor-alkali plants and downstream products consuming chlorine to Russian producers.

Central Asian countries are located near Xinjiang, and Xinjiang is a key chlor-alkali production base in China. Companies like Xinjiang Tianye and Xinjiang Zhongtai have modern manufacturing sites and are well positioned to partner with local chlor-alkali producers in Central Asia.

There also strong demand potential for chlor-alkali products in Southeast Asia and China is currently a large exporter of PVC, caustic soda and chlorine consuming chemicals to there. China can further strengthen the current trading relationship with focused investments in chlor-alkali businesses and assets in Southeast Asian countries.

3.5 – Agrochemicals

The global agrochemicals market (herbicides, fungicides, insecticides and other crop chemicals) was estimated at USD54 billion in 2016 and is predicted to grow at a 4.5 percent CAGR to USD64 billion in 2020. Herbicides formed the largest share of the agrochemicals market in 2016 with 43 percent of market value, while insecticides and fungicides constituted 28 percent and 26 percent of the market value, respectively. Other crop chemicals made up the remaining 3 percent of the market. The insecticide and fungicide markets are expected to grow at a 3.8 percent CAGR and 5.3 percent CAGR, respectively, to 2020. The herbicide market is expected to grow at a 4.4 percent CAGR.
Long term growth drivers for agrochemicals are population growth, consumer spending growth, and limited availability of arable land. These factors require an increase in farm productivity and support the growth of agrochemicals, at least until alternatives are available at scale (new GMO seeds, robots to pick the weeds, etc.). In the short and medium-term, weather and farm income are also affecting the demand for agrochemicals and drive the cyclicality we observe in the sector.

Unlike other sectors in the chemicals industry, the agrochemicals sector is not led by Asian demand. The largest market for these products is and will be Latin America. The Latin American market is expected to be worth USD18.1 billion in 2020, followed by Asia at USD17.8 billion, Europe at USD15.6 billion, NAFTA area at USD10.4 billion, and finally the Middle East and Africa at USD2.6 billion. Growth rates in all regions remain attractive with Latin America again leading, at a 6.5 percent CAGR from 2016-20. The next fastest growing regions are the Asia with 5.0 percent, the Middle East and Africa with 4.3 percent, Europe with 3.4 percent, and NAFTA area with 2.0 percent annual growth (Exhibit 3.12).
Profitability in the agrochemicals sector is generally high but cyclical. The strong profitability (for originator producers) is largely due to entry barriers. The main entry barriers are innovation and development and related costs (to develop new, less toxic and higher efficacy products), patent protection, and regulatory scrutiny. The market is led by the large agribusiness companies Syngenta, Bayer, BASF, DuPont, Monsanto, and Dow (all originator producers) and is currently going through a global consolidation with announced deals of ChemChina-Syngenta, Bayer-Monsanto, and the DowDuPont merger and subsequent agrochemicals carve out. Strong product development, registration and marketing skills are key to maintaining profitability, both for originator and generics producers. While feedstock cost is not a huge profitability factor for originator producers, it is a key value driver for generics producer.
The agrochemicals sector remains attractive due to a high growth rate (4.5 percent CAGR), consolidated supply, and (recovering) high margins. Most regions remain attractive, particularly Latin America, Asia, and North America due to high growth rates and large market size. Due to the high entry barriers, M&A has been and is the preferred investment method for globalization recently. Traditionally attractive investment countries for global investors have included USA, Canada, Brazil, Mexico, India and Poland. However, with the ongoing sector consolidation and recent global deals, very few acquisition targets remain available and most of them are generics players.

3.6 – Construction Chemicals

The global construction chemicals market was valued at USD48 billion in 2016, and predicted to grow at a 8.3 percent CAGR to USD66 billion by 2020 (Exhibit 3.13). Construction chemicals are specialty chemicals used in construction and are applied directly on-site to construction materials to improve the performance and functionality of these materials. This market is expected to grow strongly driven by construction activity in emerging regions such as Eastern Europe, India and China.

The largest geographic market for the construction chemicals is China. The China market was worth USD15 billion in 2016, accounting for 31 percent of global demand. This market is expected to grow at a 9 percent CAGR until 2020. Investments in infrastructure and civil engineering have been the two major drivers for growth in China’s construction chemicals market. The
growth momentum is expected to sustain with ongoing urbanization and large-scale infrastructure projects in the pipeline.

Europe is the next largest market, worth USD12 billion in 2016. The North American market is the third largest with a value of USD10 billion in 2016, followed by Japan (USD4 billion), and Latin America (USD2 billion). The growth rate in the North American market is expected to be high at a 10.5 percent CAGR from 2016 to 2020 – driven by a strong recovery in the construction sector and expected increase infrastructure spending – compared to a much lower 2.5 percent CAGR for Europe.

Construction chemicals consumption in India has recently increased rapidly due to the fast development of the construction sector. Huge investment by both the public and private sectors led to strong demand growth. The investment outlook for construction chemicals is positive.

M&A activity and sector consolidation is expected due to the fragmented supply structure and limitations by smaller players in technology and equipment to manufacture products that meet the requirements for large projects. Key players in construction chemicals have adopted M&A not only to improve their scale and manufacturing efficiency but also to deepen and broaden local market penetration.
The global construction chemicals market is divided into the following product segments: protective coatings, adhesives and sealants, concrete admixtures, asphalt additives and flame retardants. Concrete admixtures is the largest segment, valued at USD16.7 billion in 2016, followed by the adhesive and sealants and protective coatings segments, valued at USD10.3 billion and USD9.7 billion, respectively, in 2016. The remaining segments of flame retardants, waterproofing chemicals, and asphalt additives are smaller, valued at USD3.5 billion, USD3.1 billion and USD2.8 billion, respectively, while other construction chemicals make up the rest of the market (Exhibit 3.14).
Profitability in the construction chemicals segment is low to medium. Construction chemicals margins are negatively impacted by fierce competition, commoditized products, and price sensitivity of customers, but strong demand growth has kept margins moderately attractive.

What follows is a brief overview of the key product segments in the construction chemicals market:

**Protective Coatings**

The protective coatings segment is composed of high-performance waterproof coatings and epoxy resins applied in various applications such as paint and coatings, insulation materials, laminates, fixtures, castings and composites. Major
end-use sectors are construction, oil & gas, automotive, aerospace, product finishes (furniture). High-performance waterproof coatings exhibit advantages in toughness, thermal stability, resistance to degradation and strain bearing capabilities. They are widely used across many end-use segments. Epoxy resins are applied to applications with high safety and durability requirements. Protective coatings are also used to control steel corrosion and concrete deterioration.

Key growth drivers for protective coatings are residential and commercial construction and infrastructure development. Asia is the fastest growing market globally. The protective coatings market is expected to reach USD13.3 billion by 2020 at and grow a 8.1 percent CAGR between 2016 and 2020.

**Adhesives & Sealants**

Adhesives & sealants are bonding agents widely used in the construction industry. Adhesives are used to bind two surfaces together and sealants are applied to protect the two surfaces to be attached while joining them together. The material is advantageous in retaining the substrates properties in the bonding process, comparing to welding and soldering/ brazing. Adhesives & sealants require little heat input in the bonding process and result in little to no damages and that makes them attractive substitutes for traditional bonding agents. Major end-use sectors are construction, automotive, packaging, consumer goods, repair and remodeling, textile and footwear. The Adhesives & sealants market is expected to grow at a 8.1 percent CAGR to USD14.0 billion by 2020.
Concrete Admixtures

Concrete admixtures are composed of both organic and inorganic chemicals, including water-reducing admixtures, hardening accelerators, retarders, air entraining agents, plasticizers, etc. The use of concrete admixtures is to strengthen the properties of the concrete and prevent potential damages. Major advantages of concrete admixtures are the following: lower overall concrete cost in construction, modified concrete properties, easier concrete handling during construction leading to shorter application time and higher concrete quality.

Most developed countries now use concrete admixtures for the large majority of concrete used. Developing and emerging countries still have a lower penetration of concrete admixtures construction, which – together with higher construction and infrastructure development growth – leads to an attractive growth opportunity.

Global demand for concrete admixtures is forecasted to be valued at USD23.8 billion in 2020, with an implied 9.3 percent CAGR. Emerging economies will fuel the growth by a general trend toward increasing additive intensity in concrete to meet rising performance expectations.

Asphalt Additives

Asphalt additives are used to improve the performance of asphalt/aggregate mixtures. The benefits of using asphalt additives includes reducing energy consumption and emissions in asphalt preparation and application, lowering the construction cost and meeting better road specifications. The key driver for
the asphalt additives market is the need for asphalt manufacturers and road pavers to reduce cost.

The asphalt additives market was valued at USD2.8 billion in 2016 and is projected to reach USD3.7 Billion by 2020, at an implied 7.1 percent CAGR. This growth can be attributed to the development of infrastructure investments, asphalt recyclability, and increasing use of asphalt in roofing applications.

**Flame Retardants**

Flame retardants are applied to construction materials and products that are required to meet specific fire safety requirements and standards. They are compounds with halogen, nitrogen, phosphorus, and other materials. Flame retardants can stop or slow down the spread of fire and, thus, provide more time to escape in a fire event. Key end-use sectors for flame retardants are construction, electronic devices, insulation materials, plastic products and textiles. The flame retardants market is small compared to other construction chemicals segments but is growing strongly due to the raising safety awareness and regulations. Halogen-based flame retardants are experiencing lower growth than other flame retardants due to their hazardous effect (carcinogenic). The flame retardants market is expected to grow to a value of USD4.7 billion by 2020 at an implied 7.7 percent CAGR.

The Asia-Pacific and North American markets are the most attractive due to their large size and expected growth rates of over 7 percent a year until 2020. Attractive countries for foreign
investment in these regions are USA, India, Australia, Canada, Singapore, Japan and South Korea.

3.7 – Textile Dyes

The textile dyes market was valued at USD1.4 billion in 2016 and predicted to grow at a 8.7 percent CAGR to USD1.9 billion in 2020. The global market size by volume was 2.4 million tons in 2016 and is forecasted to reach 2.8 million tons by 2020 at an implied 4.2 percent CAGR (Exhibit 3.15). Volume growth is expected to be slower than value growth, which suggests increasing prices, largely driven by more stringent environmental requirements and strong end-use demand.

**Global textile dyes demand growth**
(USD bn)

Exhibit 3.15: Global textile dyes market by volume and value (Source: Dealogic)
The largest demand for textile dyes comes from apparel manufacturers and home textile manufacturers which constitute together almost 80 percent of total demand (Exhibit 3.16).

**Global textile dyes by end-use market**
(USD mn, percent)

2016 *Total value = USD 1,387 million*

- Apparel: 59%
- Home Textile: 19%
- Others: 23%

2020 *Total value = USD 1,935 million*

- Apparel: 57%
- Home Textile: 22%
- Others: 21%

Exhibit 3.16: Textile dyes demand by end-use sector
(Source: SRI Consulting, A.T. Kearney)

The largest geographic market for textile dyes is by far Asia-Pacific. The Asia-Pacific market was worth USD852 million in 2016, accounting for 61 percent of the global market. Asia-Pacific is expected to grow at a 9.5 percent CAGR until 2020. Europe is the next largest market, worth USD181 million in 2016. North America and South America are the third and fourth largest markets, valued at USD96 million and USD85 million, respectively. South America will have the highest growth rate with an expected 9.5 percent CAGR from 2016 to 2020, followed by North America with an expected 8.4 percent CAGR over the same period. Europe is expected to grow at a 5.6 percent CAGR out to 2020 (Exhibit 3.17).
China and India have become the largest two producers globally as old textile dyes capacity in the US and Europe was closed due to more stringent pollution regulations and high labor cost and replaced with new investment in China and India.

The textile dye market remains attractive due to its large market size and 8.7 percent CAGR although margins are expected to remain low. Asia is the most attractive market due to its large demand and high growth rate. Specifically, India, the second largest global dye producer, is struggling to meet demand growth due to many Indian players struggling to get sufficient dye intermediate supply. Southeast Asia is the next most attractive region in Asia as the apparel manufacturing base is shifting into selected Southeast Asian economies.

In China, disperse textile dyes is a mature product with many large producers, including Longsheng and Runtu. For producers
and aspiring new entrants, growth opportunities in disperse textile
dyes are better overseas than in the highly competitive domestic
market. Reactive textile dyes is another international growth
opportunity for Chinese dyes producers.

India and ASEAN are good target markets for overseas
expansion of Chinese textile dyes producers as they have several
competitive advantages to be competitive in these two markets,
namely sufficient low cost supply of dyes and dye intermediates.
China’s largest textile dyes producers benefit from large scale
integrated manufacturing sites and low manufacturing cost.
China has also strong capabilities in producing dye intermediates.
With more stringent regulations in the US, Europe and India,
China’s dye intermediates capacity has become increasingly
important. Industry know-how and technologies on dye
intermediates will help Chinese producers to build plants
overseas. Investing in traditional industry leaders in Europe and
North America to control key patents and obtain R&D
competency may be another option for Chinese dye producers to
globalize.

3.8 – Strategic New Materials

Water treatment chemicals and filtration membranes as well as
carbon fiber materials are analyzed in this report as they
represent attractive product segments in strategic new materials.
These segments are growing strongly in China and globally, have
high margins due to advanced technologies and provide
attractive outbound investment opportunities for Chinese companies.

**Water treatment – Chemicals**

The global water treatment chemicals market was valued at USD14.2 billion in 2016, and is expected to grow at a 2.5 percent CAGR to USD15.7 billion in 2020. Rising water quality standards in manufacturing and other industrial applications, a shift to higher-value water treatment chemicals with improved performance and expanding access to safe drinking water in underserved regions will contribute to growth. To that end, growth in particularly strong in emerging economies, while mature markets that already have widespread use of water treatment chemicals grow slower.

The four major types of water treatment chemicals are: (1) corrosion and scale inhibitors, (2) coagulants and flocculants, (3) biocides, and (4) pH adjustors. In 2015, these four types constituted 45 percent, 32 percent, 11 percent and 7 percent, respectively, of the total water treatment chemicals market. Growth of corrosion and scale inhibitors is predicted to be the fastest, due to a shift to higher-value water treatment chemicals with improved performance. For example: phosphates were historically the most commonly used type of scale inhibitor due to their low cost. However, polymer and phosphonate-based scale inhibitors have expanded their market share as they can be formulated into multi-functional products that provide corrosion inhibition, chelation, and coagulation in addition to scale control.
Water treatment chemicals are added prior to use in industrial processes as pH adjusters, coagulants, and flocculants and used to decontaminate the water after intensive use in industrial processes. Similarly, water treatment chemicals are added to municipal water (e.g., coagulants, flocculants) and used in incineration plants. Many of the traditional water treatment chemicals are used in high volumes but have low value. The power generation sector is the largest end-user for water treatment chemicals, constituting 19 percent of the market by value, followed by petroleum refining (12 percent), pulp & paper manufacturing (11 percent), oil exploration (8 percent), food and beverage production (8 percent), municipal water (8 percent), and mining (2 percent) (Exhibit 3.18).

The more mature markets of North America and Europe are major consumers for water treatment chemicals, constituting 31
percent and 23 percent, respectively, of the global market in 2016 (Exhibit 3.19). These markets are projected to grow slowly as users limit the consumption of water treatment chemicals and increasingly rely on higher efficacy specialty chemicals that can be used in lower dosages, or apply nonchemical water treatment practices. Emerging economies post the best opportunities for water treatment chemicals growth, particularly rapidly industrializing countries such as India and China, and regions with significant infrastructure development such as Africa, the Middle East, and Southeast Asia. Governments in emerging economies continue to increase access to sanitized drinking water, as well as rising water treatment standards for manufacturing and other industrial applications, boosting demand for water treatment chemicals. In China, water treatment chemicals market is projected to grow at a 4.6 percent CAGR, from RMB14.5 billion in 2016 to RMB17.4 billion in 2020.

**Global water treatment chemicals demand by region**

(USD bn)

![Chart showing global water treatment chemicals demand by region from 2016 to 2020](chart.png)

*Exhibit 3.19: Global water treatment chemicals market by region (Source: GWI; A.T. Kearney)*
Water treatment – Membranes

The global membrane equipment market for water treatment was valued at USD1.3 billion in 2016, and is predicted to grow at a 8.3 percent CAGR to USD1.8 billion in 2020 (Exhibit 3.20). Demand for membrane systems is rising rapidly due to their ability to eliminate waterborne contaminants as viruses, pyrogens, and other microbial threats in municipal water and chemical contaminants such as paint and ink pigments in water used in industrial processes.

Depending on the pore size, water treatment membranes are divided into two main segments: high pressure membranes, of which pore size is smaller than 0.01 micrometer; and low pressure membrane, of which pore size is larger than 0.01 micrometer. High pressure membranes (Reverse Osmosis and Nano Filtration) is the larger segment, constituting 69 percent of the total market by value. The high-pressure segment is predicted to grow strongly at a 9 percent CAGR from 2016 to 2020, driven largely by: (1) urbanization, (2) water scarcity and need for more recycling and desalination, (3) more stringent quality regulations for waste water requiring filtration system upgrades and (4) lower technical threshold and more widespread availability.

Low pressure membranes (Ultra Filtration and Micro Filtration) constitute 31 percent of the total market in 2016, and are predicted to grow at a 6.7 percent CAGR to 2020. With manufacturing costs decreasing, low pressure membranes are successfully substituting non-membrane filtration equipment. Other growth drivers for low pressure membranes are (1)
increased demand of municipal waste water treatment and (2) advances in technology that expand low pressure membrane usage, e.g., in high temperature surface water treatment.

**Global water treatment membranes demand**  
(USD bn)

Geographically, Asia Pacific is the largest market, representing 35 percent of total global market, followed by North America (25 percent) and EU (24 percent). In Asia Pacific, the growth is supported by the expanding manufacturing market and more stringent quality regulations for water and wastewater streams (e.g., China’s “Action Plan for Prevention and Control of Water Pollution”). In developed countries, such as North America and Europe, interest in membranes and other processing systems is supported by a concern about pesticide residues and residues from other chemical treatment methods that are not eliminated by traditional filtration techniques.
Carbon Fiber

Global carbon fiber composites demand was 101,600 metric tons in 2016 and is expected to grow at a 12.4 percent CAGR to 181,900 metric tons in 2020. Carbon fiber composites feature a good general array of material properties and the ability to meet a wide range of performance requirements: carbon fiber composites are stronger than metals and more dimensionally stable with a higher stiffness. Although carbon fiber composites are generally several times more expensive than a typical metals alternative (e.g. a high-grade aluminum), their light weight and ability to withstand elevated temperatures have allowed these materials to substitute metals in many applications. For instance, carbon fiber enables “light weighting” automobiles and airplanes that leads to large fuel savings. In automotive, for example, it is estimated that every 10 percent of vehicle mass savings results in a 6-8 percent improvement in fuel economy. Carbon fiber also enables blade length extension in wind turbines, leading to more wind energy being captured and higher efficiency wind turbines.

The key carbon fiber end-use sectors are aerospace, wind turbines, automotive, pressure vessels, sport and leisure. Aerospace and wind turbine are by far the largest and most attractive markets, in particular aerospace, where high end carbon fiber composites with high margins are needed. The aerospace market accounted for 18 percent of carbon fiber composite demand in 2016. Commercial airliners, with the increasing production of the 787 Dreamliner, is estimated to drive growth strongly. The wind turbine sector is expected to grow at 13 percent annually, as the world continues with its shift to renewable energy generation. Pressure vessels is a smaller but
faster growing end-use sector, expected to grow at an impressive 25.6 percent CAGR from 2016 to 2021. Carbon fiber pressure vessels have higher containment pressures, lighter weights, and longer lifespans than conventional metals-based pressure vessels. With these benefits, carbon pressure vessels enable alternative fuel vehicles such as natural gas vehicles to increase fuel economy.

Geographically, Europe leads the world in carbon fiber demand, and it is expected to retain that lead. Europe is expected to constitute 43 percent of global demand by 2020, followed by North America (23 percent), and Asia (31 percent). In the United states, demand for carbon fiber composites was valued at USD6.7 billion in 2015 and is forecast to grow at a 5.5 percent CAGR to USD8.5 billion by 2020.

The carbon fiber segment has very high entry barriers, in particular for the higher value products and end-use segments. Technology and know-how are critical to be able to serve some of the top carbon fiber users. China has made good initial investments in the sector domestically, but local producers will likely need to pursue global M&A deals to access these customers and segments and globalize their business.
3.9 – Natural rubber, SBR and tires

Natural Rubber

Global natural rubber demand was 12.7 million tons in 2016, and is expected to grow at a 2.6 percent CAGR to reach 14.0 million tons by 2020. The growth is spurred by the global rise in motor vehicle sales. The ongoing improvement of synthetic rubber quality in various applications, including tires, increases the natural rubber substitution threat.

Natural rubber is a commodity elastomer due to its pricing structure and the fact that most of its use is linked to tires. Key end-use sectors for natural rubber are motor vehicle tires, other tires (i.e. for bicycles, motorcycles, aircrafts, agricultural vehicles and construction vehicles), and some non-tire applications (i.e. mechanical goods, dipped latex products, carpet packing, and latex adhesives).

Geographically, 73 percent of natural rubber is consumed in Asia Pacific driven by large tire manufacturing capacities there. Asia Pacific also benefits from an abundance of natural rubber in region, which has supported the development of indigenous industries for the production of a wide variety of rubber products. Demand for rubber in mature economies remains large: Europe accounts for 17.4 percent and North America for 6.3 percent, respectively of global demand. These two markets are expected to grow at a 3.4 percent CAGR and 2.5 percent CAGR, respectively, out to 2020 (Exhibit 3.21).
Global SBR demand was estimated at 5.1 million tons in 2016, and is expected to grow to 5.7 million tons by 2020, at an implied 2.7 percent CAGR. SBR, along with natural rubber, is a key raw material for tire production. The tire industry accounts for 75 percent of SBR demand, followed by mechanical rubber goods/automotive parts (20 percent) and footwear (5 percent).

**Global natural rubber demand by geography**
(mt)

![Exhibit 3.21: Global Natural Rubber consumption by region](Source: J.P. Morgan, A.T. Kearney)

Geographically, Asia Pacific is the largest SBR market, constituting 57 percent of total global demand in 2016. Within Asia, China’s position as the leading global SBR consumer has become more pronounced in recent years, producing vast quantities of tires for both domestic consumption and export markets. Americas and Europe are the next two largest regions, representing 21 percent and 18 percent, respectively, of global
SBR consumption (Exhibit 3.22). Demand has been and is expected to remain flat in developed regions, as local tire plants are increasingly uneconomic and customers move towards imports from emerging markets.

SBR profitability is low, due to the low-cost, commoditized nature of the product and recent large capacity additions. SBR profitability fluctuates in line with the price of natural rubber - SBR manufacturers suffer reduced profitability during periods of low natural rubber prices due to increased competition from natural rubber producers.

**Global SBR demand by geography**

<table>
<thead>
<tr>
<th>Year</th>
<th>Africa</th>
<th>Middle East Europe</th>
<th>Americas</th>
<th>Asia Pacific</th>
<th>CAGR</th>
</tr>
</thead>
<tbody>
<tr>
<td>2016</td>
<td>0.1</td>
<td>0.1</td>
<td>0.9</td>
<td>2.9</td>
<td>3.5%</td>
</tr>
<tr>
<td>2017</td>
<td>0.1</td>
<td>0.1</td>
<td>0.9</td>
<td>3.0</td>
<td>3.5%</td>
</tr>
<tr>
<td>2018</td>
<td>0.1</td>
<td>0.1</td>
<td>0.9</td>
<td>3.1</td>
<td>1.5%</td>
</tr>
<tr>
<td>2019</td>
<td>0.1</td>
<td>0.1</td>
<td>1.0</td>
<td>3.2</td>
<td>1.4%</td>
</tr>
<tr>
<td>2020</td>
<td>0.1</td>
<td>1.0</td>
<td>1.1</td>
<td>3.4</td>
<td>3.5%</td>
</tr>
</tbody>
</table>

Exhibit 3.22: Global SBR consumption by region (Source: Nexant, A.T. Kearney)

Limited natural rubber supply and consumer preference in favor of advanced synthetic rubber grades are expected be positive for SBR demand. The most attractive regions are Asia-Pacific and North America due to their large market size and/or stronger growth rates. Attractive countries in these regions for foreign
investors include USA, Canada, India, South Korea, and Singapore. Indonesia, Malaysia and Thailand could also be attractive due to their proximity to natural rubber supply. The preferred method of market entry depends strongly on the target segment and existing technologies. While transferring existing technologies through greenfield investments is relatively easy, expansion into specialty sectors (e.g. fuel efficient tires and low-rolling-resistance tires) might require acquisitions for Chinese producers.

**Tires**

The global tire market was valued at USD374 billion in 2016, and is expected to grow at a 3.9 percent CAGR out to 2020.

Profitability in the tire industry is low, mainly due to the large buying power of OEMs and competitive market dynamics. The buyers of tires are large OEMs that can exert pressure over tire manufacturers. Barriers to enter the tire market are relatively high due to the concentrated nature of the market. It would be challenging for new entrants to be profitable without scale in this market. The aftermarket channels is generally more profitable than the OEM channel.

Profitability for the tire manufacturers fluctuates in opposing direction with the natural rubber price. Tire manufacturers’ profitability increases during periods of low natural rubber price due to reduced raw materials costs.

China is the world’s largest tire production nation, with a total production of 572 million units in 2016, accounting for 30 percent of the global production. China’s tire industry faces various
challenges including structural overcapacity, increasing domestic production costs, dependence of natural rubber imports and reliance on tire exports. China mainly imports natural rubber from ASEAN (Thailand, Indonesia, Malaysia, Vietnam).

Overall, the tire industry remains moderately attractive due to its large market size and reasonable growth of 3.9 percent CAGR.

3.10 – Chemical Engineering and Construction

In 2016, global capital investment in the chemical industry was valued at USD102 billion, providing significant opportunities for EPC (Engineering, Procurement, Construction) contracts. Capital investment in the chemical industry is expected to shrink at a 8.5 percent CAGR to around USD73 billion in 2020 due to lower investments in China, uncertain global economic prospects, and new energy market dynamics (Exhibit 3.23). Despite this expected contraction, USD388 billion total investment in the global chemical industry is still expected between now and 2020. This provides attractive opportunities for Chinese EPC companies to expand in China and globally.
Almost half of global chemical capital investment in 2016 was in Asia-Pacific, particularly in China. USD49 billion was invested in Asia-Pacific in 2016, with an additional USD128 billion in capital investment expected until 2020. The next two largest regions are Americas and the Middle East with 2016 total investment value of USD21 billion and USD15 billion, respectively. Both regions are expected to continue to invest strongly out to 2020, with incremental investment value of USD58 billion in the Americas and USD41 billion in the Middle East between now and 2020. Europeans only invested USD5 billion in chemical installations in 2016 but investment in European chemicals expected to increase and an incremental USD34 billion of investment is expected between now and 2020 (Exhibit 3.24).

The EPC market for the chemical industry is mainly driven by the design, procurement, and construction of large petrochemical plants. Over the last fifteen years, the chemicals EPC market has
been characterized by large capacity increases in Asia-Pacific, particularly in China, driven by increasing chemicals demand due to strong economic growth and rising living standards. The region holds the largest ethylene capacity in the world ahead of North America and the Middle East and is estimated to contribute up to 55 percent of the global petrochemical demand in the next decade. There is a sustained shift towards investments in North America and the Middle East due to advantaged feedstock supply.

**Base chemical capacity growth**

(kt)

Exhibit 3.24: Global base chemical capacity growth (Source: IHS, A.T. Kearney)

We expect the trend of megaprojects in North America, the Middle East, and the high demand growth regions of Southeast Asia and India to be the primary driver of growth for the chemical EPC market outside of China. The continued increase in project size to high-capacity mega projects and needed capabilities to build highly complex, high-tech systems in increasingly
inhospitable locations around the world is presenting challenges for EPC firms. Chinese EPC firms can expect to face tough competition from leading MNCs in the bidding for these large projects. Chinese EPC firms have made strong inroads by offering high quality, comprehensive and turnkey solutions including financing at attractive contract rates.

The Middle East and Asia-Pacific markets will be particularly attractive to Chinese EPC firms due to their location within the Belt & Road region. Large chemical EPC projects in Belt & Road countries fit into the strategic objectives of the Belt & Road initiative to boost economic development and coordination with China’s neighboring countries. Attractive investment countries in the Belt & Road region include the UAE, Saudi Arabia, Iran, Qatar, and Oman in the Middle East and India, Vietnam, Thailand, Malaysia, and Indonesia in Asia-Pacific.
4. M&A as a Method of Globalization
M&A trends in the Chemical Industry

Driven by several megadeals, chemical industry M&A is surging. Led by the merger of Dow Chemical and DuPont, which will create a combined company (before split up into three independent entities) worth USD130 billion. 2016 was a record year for chemical M&A, well beyond the 2011 historic industry record of USD151 billion and about twice as high as 2015 levels (Exhibit 4.1).

Exhibit 4.1: Global chemical M&A activity (Source: Dealogic, A.T. Kearney)

The Dow-DuPont merger highlights the broader evolution of the chemical conglomerate model. With many traditional diversified chemical companies like ICI, Rhône-Poulenc, and Hoechst long gone, the Dow-DuPont merger and Covestro’s spin-off from Bayer have marked the transformation of some of the largest remaining diversified players. As chemical conglomerates
continue to pursue scale and portfolio coherence, we expect not only further M&A, but also more divestitures in cases where businesses struggle to reach scale or do not fit within the portfolio strategy. We believe that commodity-oriented players will focus on M&A for feedstock and asset scale, while specialized players will focus on solution businesses and digital business models. One example of the latter is Bayer’s acquisition of proPlant and Intelmax, both of which offer digital solutions for sustainable, resource-efficient agricultural production.

Five factors stand out as key drivers for future M&A activity according to a survey conducted by A.T. Kearney among senior executives in the chemical industry: limited returns from organic growth, lower oil prices, portfolio optimization, activist investors, and favorable feedstock prices.

- **Limited returns from organic growth.** Chemical companies currently have high valuations relative to historical earnings. To sustain these valuations, they must increase earnings – which is difficult to achieve purely organically, leading many to turn to M&A.

- **Lower oil prices.** The plunge (and recent recovery) in oil prices has impacted chemicals companies both positively (for example, for naphtha-based petrochemicals players) and negatively (for example, for oil field chemicals players). With oil price outlooks improving, but expected to remain structurally lower than before the plunge, negatively impacted players may need to divest non-core assets to bolster their balance sheets.
• **Portfolio activities.** Chemical companies are re-evaluating their business and product portfolios and are divesting non-core assets, driven by the growing importance of achieving scale, focus, and coherence in their portfolios. This has created a fruitful environment for M&A opportunities by strategic and financial investors.

• **Activist investors.** Investor activism has emerged as recent industry trend, with several prominent moves by players such as Third Point, Trian, and Jana Partners. Chemical executives expect this trend to continue, with more respondents highlighting this as a significant driver.

• **Favorable feedstock prices.** Since the North American shale revolution brought large quantities of low-cost gas and liquid feedstock to the market, U.S. chemicals producers have enjoyed advantages over Western European players. Cash-on-cash returns for key chemical building blocks (methanol, ethylene, and propylene) were two to three times higher for U.S. producers than their Western European counterparts in recent history. The favorable position of U.S. producers should continue through 2020 both in low- and high-priced oil scenarios, creating sustainable conditions for feedstock-motivated M&A.

In addition to the factors highlighted above, we also see tax efficiency as a key trend impacting the attractiveness and structure of chemical M&A deals. Dow Chemical’s divestiture of chlorine assets to Olin is one example where tax efficiency significantly impacted the value generated for seller and buyer as well as the choice of a Reverse Morris Trust for the transaction.
We expect tax efficiency to continue to be an important consideration for chemical M&A.

The distribution between petrochemicals and basic chemicals, specialty chemicals, and trade and distribution as target sectors for M&A has been roughly stable over the past 10 years. Petrochemicals and basic chemicals continue to dominate the M&A landscape despite closely followed by fine chemicals.

The Role of M&A in China’s Overseas Expansion

ChemChina’s USD43 billion bid for Syngenta, the second biggest announced megadeal in 2016 and the biggest foreign acquisition in Chinese history shows how emerging market players are using M&A deals to capture critical know-how and growth opportunities outside of their home market, accelerate growth at home and build a global asset platform.

China has risen from a minor position in global chemical M&A 10 years ago to the world’s largest, now accounting for 24 percent of all deals and China’s influence on the global M&A market is expected to increase as more companies look to acquire world-class know-how and take advantage of growth opportunities outside their home market (Exhibit 4.2).

Chinese acquirers increasingly beat global competitors for ownership of attractive assets in the US and Europe, for example in acquiring divestitures from global chemicals companies: Rohm
& Haas’ dry film photoresist business, Bayer’s Azodicarbonamide production plant, PPG’s Mt. Zion glass manufacturing facility were all bought by Chinese chemical companies.

For the coming years, developed markets are likely to remain the most popular destination for Chinese chemical outbound investment. In a survey of senior managers of Chinese chemical companies, North America, Asia and the Middle East were named as the three most attractive destinations for overseas investments.

**Cross-border chemicals M&A by country of origin ( % of # of deals)**

Exhibit 4.2: Chemical M&A transaction volume by country of acquirer (Source: Dealogic, A.T. Kearney)

Despite the surge in cross-border M&A deals in China’s chemical sector, the large majority of chemical M&A is still domestic. Of the 241 M&A deals with Chinese acquirers in 2016 only 32 (13 percent) where cross-border deals (Exhibit 4.3).
In the A.T. Kearney survey of senior managers of Chinese chemical companies conducted during CPCIF’s CEO roundtable discussion, lack of M&A capabilities and industry/market know-how were named as the main impediments for outbound investments. The vast majority of participants stated little or no overseas M&A-experience.

**M&A success factors**

Very few Chinese companies have – so far – established a sound and strategy driven M&A process:

- Target selection is usually opportunistic rather than the outcome of a strategic target screening and prioritization.
process. The “hunting ground” is very broad and not linked to the corporate strategy or business unit strategy.

- Buyers have a limited understanding of ownership advantages and the value to the seller and of synergies often not considered or captured.
- Little commercial due diligence conducted to assess the true value do the target
- Post-acquisition integration is limited and the governance model detached

To pursue successful outbound M&A deals, Chinese chemical companies need to consider the following key success factors:

**M&A has to be strategy-driven**

Pursuing the right deals is critical to ensure M&A success. The M&A decision must be aligned with the corporate or business unit strategy, for example in deciding in what markets to invest in or what products or technologies to buy. This allows for an active scouting for M&A targets that support the strategy rather than just waiting for opportunistic deals.

So far only very few chemical companies in China have implemented a systematic and strategic M&A process that includes the following steps:

- Definition of the strategic objectives including profitability, growth, management model (e.g. financial holding, strategic holding, operator) for identifying target candidates
• Definition of chemical sectors for organic and inorganic investments
• Definition of target geographies
• Systemic screening and prioritization for suitable M&A targets
• Assessment of synergies and development of compelling deal rationale

**Discipline is key**

Once an opportunity is identified, it is important to develop a deep understanding of the target’s stand-alone attractiveness and value to identify and quantify synergies of a potential acquisition. If the deal is competitive and valuation and synergies exceed the expected acquisition price, it is vital to maintain discipline and retreat if the required bidding prices is too high.

The acquirer therefore needs to develop a sound understanding of its parenting advantages when buying the target company, these can include:

• Customer base: customer access, customer knowledge, sales organization and efficiency, upselling/cross-selling
• Geographic reach: market access, logistics and supply chain, relationships with local authorities
• Technology: new applications of existing products
• Raw material: volume consolidation, optimized supply chain
• Value chain: vertical integration (upstream and downstream)
• Scale effect on SG&A

• Cost structure optimization: lean manufacturing, shared back-office, indirect costs optimization

• Brand name and image

A well-trained muscle can capture more deals

Practice makes perfect. Serial acquirers not only display better discipline, they also are able to manage the cycle and acquire during the down cycle when valuations are low and are excellent in pursuing multiple M&A deals in parallel and effectively integrate the acquired companies. These serial acquirers to pursue smaller targets that are easier to assess and exploit in terms of synergies and integrate.

Post-merger integration creates value

Beyond a clear strategy to do successful M&A, post-merger integration is equally critical as it lays the foundation for value capture post deal. A.T. Kearney research reveals that synergy capture is difficult and much leakage occurs. The longer synergy capture is delayed, the more difficult it is to capture these. In general, synergies that are not captured within the first 12-18 months post closure are lost.

A successful integration process needs speed and focus. A clear vision is essential. Even before closing, the management team needs to develop a clear vision for the acquired entity. And as in every relationship, it’s the people that matter – so the acquirer needs to ensure to welcome and provide a "home" for the new colleagues. As acquisitions are a time of uncertainty, it is
important to minimize ambiguity. Plans, responsibilities, timing and decisions should be clear and communicated as fast as possible.

Speed is also more important than perfection – the 80 percent solution is sufficient, if it helps achieve integration and benefits more quickly. Therefore, it will be necessary to take moderate risks, but to stay resistant to compromises.

In addition, problems are unavoidable but they must be identified and solved. Hidden problems cannot be solved. This requires a structured and well-resourced integration process and organization.

Finally, all results need to be aligned with the business case – defined goals should be aligned with the assumptions and the projected results from the business case for the acquisition.
5. Attractive Investment Destinations
Context

Identifying the right target countries for foreign investments based on the specific value drivers of a chemicals value chain or product segment is key. For example, for petrochemical investments, countries with low feedstock costs are most attractive. Global chemical executives tell us that a key factor in determining whether to invest in a foreign country is the size of its domestic market. Other important factors include access to low cost labor and a transparent regulatory environment, but none of these factors are examined in isolation. Rather, investors analyze a combination of strategic and access criteria to assess the attractiveness of a market as an FDI destination.

Among the member companies of the CPCIF there are specific regions with a high degree of activities or potential interests:

- USA and Canada for access to a large market, low cost petrochemical feedstocks and transparent business climate
- Europe, for example, Germany with strength in technology, know-how and chemicals solutions and Eastern Europe, with strong growth markets across chemicals categories and attractive local champions
- Iran as an attractive early stage investment opportunity with strong expected future development and growth
- India and Pakistan as large markets also with strong growth expectations
• ASEAN countries as attractive growth economies close to home, in particular Thailand, Indonesia, Vietnam and Myanmar

• Kazakhstan as the key country in the Belt & Road region

• Africa as the next driver of global growth

The Foreign Direct Investment Confidence Index®

The A.T. Kearney Foreign Direct Investment Confidence Index®, established in 1998, examines the overarching trends in FDI. The top 25 ranking is a forward-looking analysis of how political, economic, and regulatory changes will affect countries' FDI inflows. Over its 18-year history, there has been a strong correlation between the rankings and global FDI flows. Since its inception, countries ranked in the Index have consistently received at least half of global FDI inflows roughly one year after the survey.

In 2016 the United States and China once again claim the top two spots in the A.T. Kearney Foreign Direct Investment (FDI) Confidence Index, holding these respective positions for the fourth year in a row. These two countries have held steady at the top of the Index in spite of a challenging global operating environment, including the economic slowdown in China, low oil and commodity prices and appreciation of the US dollar. The sustained interest of global business executives in investing in
the United States and in China demonstrates the enduring attractiveness of the world’s two largest economies.

The A.T. Kearney Foreign Direct Investment Confidence Index® is based on a survey of industry participants. For this report, a focused analysis, incorporating only the answers for companies in process industries, was conducted (Table 5.1).

<table>
<thead>
<tr>
<th>Rank for chemicals/process industries</th>
<th>Country</th>
<th>Score</th>
<th>Overall rank</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>United States</td>
<td>2.10</td>
<td>1</td>
</tr>
<tr>
<td>2</td>
<td>China (including HK)</td>
<td>2.06</td>
<td>2</td>
</tr>
<tr>
<td>3</td>
<td>United Kingdom</td>
<td>1.94</td>
<td>3</td>
</tr>
<tr>
<td>4</td>
<td>Brazil</td>
<td>1.90</td>
<td>6</td>
</tr>
<tr>
<td>5</td>
<td>Canada</td>
<td>1.86</td>
<td>4</td>
</tr>
<tr>
<td>6</td>
<td>Germany</td>
<td>1.84</td>
<td>5</td>
</tr>
<tr>
<td>7</td>
<td>India</td>
<td>1.79</td>
<td>11</td>
</tr>
<tr>
<td>8</td>
<td>Mexico</td>
<td>1.76</td>
<td>9</td>
</tr>
<tr>
<td>9</td>
<td>Japan</td>
<td>1.72</td>
<td>7</td>
</tr>
<tr>
<td>10</td>
<td>France</td>
<td>1.72</td>
<td>8</td>
</tr>
<tr>
<td>11</td>
<td>Australia</td>
<td>1.72</td>
<td>10</td>
</tr>
<tr>
<td>12</td>
<td>Turkey</td>
<td>1.71</td>
<td>22</td>
</tr>
<tr>
<td>13</td>
<td>Netherlands</td>
<td>1.70</td>
<td>13</td>
</tr>
<tr>
<td>14</td>
<td>Poland</td>
<td>1.70</td>
<td>23</td>
</tr>
</tbody>
</table>
### Table 5.1: A.T. Kearney Foreign Direct Investment Confidence Index for process industries (Source: A.T. Kearney)

<table>
<thead>
<tr>
<th>Rank for chemicals/process industries</th>
<th>Country</th>
<th>Score</th>
<th>Overall rank</th>
</tr>
</thead>
<tbody>
<tr>
<td>15</td>
<td>Spain</td>
<td>1.68</td>
<td>17</td>
</tr>
</tbody>
</table>

At least for established economies the findings of the FDI survey are largely consistent with CPCIF’s observations with the USA and Canada on Number 1 and 5, Germany on 6, India on Number 7. More entrepreneurial options like Iran, Myanmar or Sub-Saharan Africa are not yet seen as highly attractive by a broader sample of business executives, but nevertheless offer opportunities for first movers.

As shown in chapter 4 also the historic M&A investments of Chinese chemical companies show a similar pattern with the USA, Australia, Canada, India, Japan and the UK being the most frequent target countries.

Process industry companies have a similar outlook as the all industry sample – the most notable differences are Turkey and Poland, which are ranked significantly higher. Global executives tell us that one of the most important factors in determining whether to invest is the size of a country’s domestic market, which explains the similarity between the overall and process industry specific ratings. Other important factors include access to low cost labor and a transparent regulatory environment, but none of these factors are examined in isolation. Rather, investors
analyze a combination of strategic and access criteria to assess the attractiveness of a market as an FDI destination.

Among companies with outbound investment aspirations, their top priority is to identify attractive targets. The recent improved macroeconomic environment is also encouraging companies to spend their retained profits on new investments abroad. And while the appreciation of the US dollar has made investing in the United States more expensive, the corresponding depreciation in the Euro and many emerging market currencies makes targets in those markets more attractive. The weakness of the Euro in particular is helping to attract Chinese investors to European markets, as are European investment promotion initiatives. Another factor that may be contributing to company’s plans to increase foreign investment in the coming years is the belief that foreign investment and globalization will become even more important for corporate profitability and competitiveness. 80 percent of investors believe this to be the case, while only 15 percent believe that foreign investment will become less important to achieve improved business outcomes. Once again, executives based in Asia lead the charge, with 85 expressing the view that foreign investment will significantly or moderately increase in importance to corporate profitability and competitiveness. All of this suggests that despite the apparent hiatus in globalization and the increase in populist and nationalist policies beginning to turn economies more inward looking, local leaders are committed to a globalized business strategy.

These findings are also in line with a survey conducted among senior managers of Chinese chemical companies according to which the US and Asia are the most attractive markets most for
expansion. Access to (new) markets and industry know-how/networks were cited as the most strategic objectives for globalization.

**Foreign Investment Attractiveness by Region**

A detailed analysis of foreign investment countries follow for North America (United States and Canada), Europe (Germany and Poland), Southeast Asia (Indonesia, Malaysia, Singapore, Vietnam, Myanmar), Pakistan, the Middle East and Latin America (Brazil).

To assess the foreign investment attractiveness of a country, key assessment criteria from the World Bank Group report on Doing Business were selected (11 in total) and the global ranking for that country assessed, based on the survey results.

**North America (United States and Canada)**

The United States chemical industry output increased by 1.6 percent in 2016, despite facing headwinds including a strong dollar and recessions in Brazil, Russia, and Japan. The growth was mainly a result of a strong pickup in consumer spending and demand growth in the automotive, construction, and equipment sectors.

This contrasts with Canadian chemical sales, that fell 2.3 percent to their lowest levels since 2012. Drops in oil and gas related
feedstock prices were the root cause for this drop as chemical sales by volume increased by 3 percent in 2016. Sector profits only dropped by 9 percent as feedstock prices also decreased, thus still making 2016 one of the strongest years for the Canadian chemical industry.

Chemical sales will still come under price pressure in both the United States and Canada for the next few years. However, the United States especially will remain in a strong position for the future due to its low natural gas prices.

Foreign investment has traditionally been very welcome in the United States. However, concerns about national security (with a focus on China) have resulted in tighter guidelines and more stringent reviews for approving certain foreign acquisitions. If the acquirer is a state-owned enterprise, the acquisition will require a national security review, in particular for deals involving infrastructure, energy assets and/or critical technology. Regardless, the United States continues to be an attractive foreign investment destination due to its wealth of opportunities, large market size, investor-friendly environment, entrepreneurial culture and good infrastructure.

<table>
<thead>
<tr>
<th>United States</th>
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<tbody>
<tr>
<td>Ease of Doing Business Ranking</td>
<td>8</td>
</tr>
<tr>
<td>Getting Credit</td>
<td>2</td>
</tr>
<tr>
<td>Starting a Business</td>
<td>51</td>
</tr>
<tr>
<td>Dealing with Construction Permits</td>
<td>39</td>
</tr>
<tr>
<td>Getting Electricity</td>
<td>36</td>
</tr>
</tbody>
</table>
Canada’s federal government is open to foreign direct investment. The Investment Canada Act (“ICA”) sets rules and conditions for foreign investments. The law gives the government leeway in considering investments by foreign state-owned enterprises and those affecting national security. The law also defines state-owned enterprises to include companies subject to “influence” by a foreign government. State-owned enterprises face stricter scrutiny and monitoring of their proposed investments than private foreign investors. The ICA requires major foreign investors to meet commitments on issues such as capital spending, domestic jobs, and research and development; however, these commitments are not always enforced. Canada remains an attractive place for foreign investment.
Table 5.3: Canada global ranking on key foreign investment criteria
(Source: World Bank)

Europe (Germany and Poland)

The European chemical industry has benefitted from the recent low oil price environment that has been a relief to a region where 40 of its 44 crackers rely on oil-based naphtha as feedstock. At oil prices of USD50-60/barrel, competitiveness of European crackers stays within distance of their competitors in Middle East and North America. European chemicals output increased by about 1 percent in 2016. However, slow growth in the region, an unstable macroeconomic environment, slowdown in key emerging market customers and a reliance on naphtha as a feedstock will present ongoing challenges for the chemical industry.

The German federal government welcomes foreign investment, particularly when it creates jobs. Regulations make few distinctions between local and foreign investors, and there are no
currency controls. Germany Trade & Invest is a service that assists foreign companies looking to invest in Germany, providing information about domestic practices and facilitating contacts with German authorities. The service has an office in Beijing. Additional information about Germany as a foreign investment location is available from the commercial departments of German embassies and from the Association of German Chambers of Commerce, which has offices in major cities throughout China. In 2016, given large inflows of foreign investment, in particular from China, some public concern has risen and some politicians have proposed legislation to put higher security on Chinese investors.

<table>
<thead>
<tr>
<th>Germany</th>
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<tbody>
<tr>
<td>Ease of Doing Business Ranking</td>
<td>17</td>
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<tr>
<td>Getting Credit</td>
<td>32</td>
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<tr>
<td>Starting a Business</td>
<td>114</td>
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<tr>
<td>Dealing with Construction Permits</td>
<td>12</td>
</tr>
<tr>
<td>Getting Electricity</td>
<td>5</td>
</tr>
<tr>
<td>Registering Property</td>
<td>79</td>
</tr>
<tr>
<td>Protecting Minority Investors</td>
<td>53</td>
</tr>
<tr>
<td>Paying taxes</td>
<td>48</td>
</tr>
<tr>
<td>Trading Across Borders</td>
<td>38</td>
</tr>
<tr>
<td>Enforcing Contracts</td>
<td>17</td>
</tr>
<tr>
<td>Resolving Insolvency</td>
<td>3</td>
</tr>
</tbody>
</table>

Table 5.4: German global ranking on key foreign investment criteria
(Source: World Bank)
Poland has increased in attractiveness as a foreign investment destination in recent years due to its solid economic growth, well-educated workforce, numerous investment incentives, location in the heart of Europe and membership of the OECD, NATO, and EU. Despite this, the populist Law and Justice (PiS) party was voted into power in 2015, which has somewhat reducing foreign investor confidence. The PiS stated that Poland will remain investment friendly, however, several nationalist aspects of the party’s policy agenda are complicating the business environment for foreign investors.

Foreign investors in Poland are defined as corporations with Headquarters registered abroad, business associations established by foreign individuals, companies operating under the laws of a foreign country and individuals domiciled abroad. Business activity in Poland may be undertaken by investors of any nationality and foreign companies may invest in equities of Polish companies or establish new companies freely. Poland offers several incentives for investment, including access to European Commission Structural Funds and other instruments of the EC’s Cohesion Policy, as well as access to special economic zones. The special economic zones were set up to bring growth to regions hit by high unemployment and offer a variety of benefits, including low rent and tax breaks.

<table>
<thead>
<tr>
<th>Poland</th>
<th></th>
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<tbody>
<tr>
<td>Ease of Doing Business Ranking</td>
<td>24</td>
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<tr>
<td>Getting Credit</td>
<td>20</td>
</tr>
<tr>
<td>Starting a Business</td>
<td>107</td>
</tr>
<tr>
<td>Dealing with Construction Permits</td>
<td>46</td>
</tr>
</tbody>
</table>
Southeast and South Asia (Indonesia, Malaysia, Singapore, Vietnam, Myanmar, Pakistan)

The Southeast and South Asian chemical markets have had steady growth over the past few years due to their large domestic demand and increased government support for the chemical industry. With a large population, increasing urbanization, and steady economic growth, Southeast and South Asia have similar underlying fundamentals that led to China’s strong rise in the chemical market. Southeast and South Asian governments have recognized this and have been supporting industry growth. Investment has mostly focused on the commodity end of the chemical sector and aimed to establish the basic building blocks of the industry. Singapore focused on building capabilities in more specialized products. Despite this, challenges remain for the region to streamline business regulations, reduce red-tape and ensure cheap feedstock availability for its petrochemical plants.

Table 5.5: Poland global ranking on key foreign investment criteria
(Source: World Bank)
The Investment Co-ordinating Board ("Badan Koordinasi Penanaman Modal—BKPM") is responsible for promoting foreign investment and approving investment licenses in Indonesia. The government has recently shown commitment to improving the business environment and attracting investment by introducing new regulations to streamline licensing procedures and provide tax concessions. However, nationalistic politicians and those with vested interests in restricting competition continue to oppose more investor-friendly reforms.

Indonesia’s new Investment Law ensures the principle of equal treatment for foreign and domestic investors. It also ensures relaxed restrictions on the residence and employment of expatriates, removes most requirements for capital divestiture and revokes the monopoly rights of state-owned companies in certain sectors. Despite this, investors continue to face systemic problems that have long undermined investor confidence in the domestic economy. These include excessive bureaucracy, endemic corruption, a weak judiciary system and economic protectionism. Rising wages, recent labor protests and difficult land acquisition are also worrisome for many investors.

### Indonesia

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<tbody>
<tr>
<td><strong>Ease of Doing Business Ranking</strong></td>
<td>91</td>
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<tr>
<td><strong>Getting Credit</strong></td>
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<tr>
<td><strong>Starting a Business</strong></td>
<td>151</td>
</tr>
<tr>
<td><strong>Dealing with Construction Permits</strong></td>
<td>116</td>
</tr>
<tr>
<td><strong>Getting Electricity</strong></td>
<td>49</td>
</tr>
<tr>
<td><strong>Registering Property</strong></td>
<td>118</td>
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</tbody>
</table>
Malaysia generally welcomes foreign-investment projects involving transfers of technology, creation of skilled jobs, contribution of capital, and inflows from large emerging economies such as China, India and the Middle East. However, the government holds substantial discretionary authority over the approval of individual investment projects, which it often used to restrict foreign equity and to extract favorable agreements. Generally, the government prefers granting approvals to capital-intensive ventures. However, the country’s less developed areas continue to welcome investments in labor-intensive, small and medium-sized manufacturing projects.
Singapore’s free-enterprise economy is open to foreign investment in all industries. Manufacturing accounted for 57 percent of total investment commitments, services for the remaining 43 percent in 2016. The chemical sector attracted investments of USD2.6 billion in 2014, up from USD2.5 billion in 2013, and remains the industry with the highest fixed-asset investment commitments. Singapore remains a very attractive country for foreign investment due to its openness and top ranking in the World Bank’s Ease of Doing Business Ranking.

### Malaysia

<table>
<thead>
<tr>
<th>Category</th>
<th>Rank</th>
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<tbody>
<tr>
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</tr>
<tr>
<td>Enforcing Contracts</td>
<td>2</td>
</tr>
<tr>
<td>Resolving Insolvency</td>
<td>29</td>
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</table>

Table 5.7: Malaysia global ranking on key foreign investment criteria  
(Source: World Bank)

### Singapore

<table>
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<th>Category</th>
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</thead>
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<td>Dealing with Construction Permits</td>
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<td>Getting Electricity</td>
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<td>Registering Property</td>
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<td>Paying taxes</td>
<td>8</td>
</tr>
<tr>
<td>Trading Across Borders</td>
<td>41</td>
</tr>
<tr>
<td>Enforcing Contracts</td>
<td>2</td>
</tr>
</tbody>
</table>

Global Opportunities for the Chinese Chemical Industry 133
Vietnam continues to attract large levels of foreign direct investment despite competition from neighboring countries. FDI to Vietnam has been steadily increasing each year, reaching USD11 billion in 2016. Foreign capital flows are expected to continue to increase during the next five years averaging USD12 billion per year.

Vietnam’s appeal to foreign investors has been mainly due to its growing stature as global manufacturing base, low labor cost, relatively stable macroeconomic and political environment and government’s increasing openness to foreign investment and economic reforms. Despite this, investors must weigh these advantages against several challenges, including the country’s underdeveloped – but improving – infrastructure, complicated administrative procedures and a shortage of skilled labor. Additionally, significant interventionist policy levers remain at the country’s disposal despite its membership in the World Trade Organization. These include of subsidies to local players, tendering preferences and areas of restricted foreign access.
Vietnam

<table>
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<td>Paying taxes</td>
<td>167</td>
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<tr>
<td>Trading Across Borders</td>
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</tr>
<tr>
<td>Enforcing Contracts</td>
<td>69</td>
</tr>
<tr>
<td>Resolving Insolvency</td>
<td>125</td>
</tr>
</tbody>
</table>

Table 5.9: Vietnam global ranking on key foreign investment criteria
(Source: World Bank)

Following years of isolation from the global economy, Myanmar has embarked on a new course since 2011 and has begun implementing reforms to spur economic development and create a business climate meant to attract foreign investment. The government has made progress on steps that address some of the challenges, including eliminating multiple exchange rates, passing a new foreign investment law, reducing trade restrictions and reforming the tax policy and administration. As a result, business interest in Myanmar has increased, with investors attracted by a rich natural resources base, a large market potential, a young workforce and a strategic location between India, China, and Southeast Asia. Sanctions on Myanmar have been lifted by the European Union and Australia, while the United States has also eased almost all of its economic sanctions.

Despite the reforms undertaken and improving economic indicators, the government still has more work to do to create a stable and attractive investment environment. Property rights are
not yet well-established and land confiscation remains a major concern. Investor protection is weak and the criteria for foreign investment evaluation are not well-defined, which is exacerbated by weak rule of law and lack of proper mechanisms to enforce contracts and settle disputes. Investment approval procedures are opaque, overly bureaucratic and complex, and exclude foreign participation in certain sectors.

While plenty of risk remains from the complex and immature business environment, Myanmar has become an exciting destination for foreign investment for investors interested in tapping this new market before a large presence of foreign companies arrive.

<table>
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<td><strong>Getting Electricity</strong></td>
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<td><strong>Resolving Insolvency</strong></td>
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Table 5.10: Myanmar global ranking on key foreign investment criteria
(Source: World Bank)
Pakistan has been an important destination for foreign investment by Chinese companies over the last few years due to its low cost of labor, close geographic proximity and close geopolitical relations between the two countries’ governments. Foreign direct investment into Pakistan in 2016 was USD1.2 billion. Foreign capital inflows are expected to increase in the next five years, averaging USD2-3 billion a year. The power sector was the largest recipient of FDI in 2016, followed by oil and gas, communications, chemicals and transport. By country, China was the top source of FDI in 2016, followed by Norway, the UAE and the UK.

The Pakistani government released a five-year FDI strategy in 2013, stating its goals and plans to increase FDI to USD4 billion by 2017. Some of the main goals of the strategy include boosting exports and improving the competitiveness of production in Pakistan by transferring technology and upgrading labor skills, especially in the sectors of agriculture, chemicals, engineering, horticulture, housing, manufacturing and mining. The strategy emphasizes attracting capital inflows from global regions that already contribute heavily to FDI in the country, while also attempting to attract interest in several other sectors including agriculture, automotive, construction and real estate, dairies, energy, fisheries, infrastructure communication, livestock, manufacturing, and mining and exploration. The government has also established special economic zones.

Foreign investors are allowed to hold 100 percent equity in domestic entities across most industrial sectors, including the chemical industry. In the government’s 2014/15 budget, a reduced tax rate of 20 percent was allowed (compared with the
regular corporate rate of 31 percent) for investments in new industrial undertakings set up between 1 July, 2014 and 30 June, 2017. This beneficial tax incentive requires that 50 percent of the project cost, including working capital, be financed on an equity basis through FDI. The reduced rate is available for five years beginning from the month in which the industrial undertaking is set up or commercial production commences, whichever is later.

While the government is supportive of foreign investment, there remain risks to investing in Pakistan including political instability and violence and a challenging regulatory and business environment.

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<td>Paying taxes</td>
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<tr>
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Table 5.11: Pakistan global ranking on key foreign investment criteria
(Source: World Bank)
Middle East (Saudi Arabia, Iran)

The Middle East’s petrochemical industry continues to grow, with large capacity expansions expected in the coming years in Saudi Arabia, Oman, and Iran. 70 percent of the region’s petrochemical capacity is gas-based, but with gas prices slowly rising and with oil prices recovering, the region’s feedstock advantage will be dampened. With plentiful and cheap feedstock and growing domestic markets the region will remain a very attractive destination for chemicals investments.

Saudi Arabia has made strong improvements over the past ten years to transition from a closed economy dominated by hydrocarbons and bureaucracy to a more open economy that welcomes foreign capital. Several trends have helped its attractiveness as investment location: better security, removal of investment barriers, and expanding domestic-consumer market and the encouragement of major investment projects through government incentives.

Saudi Arabia enacted the Foreign Investment Act (FIA) in April 2000, providing a broad framework within which non-Saudis may invest in the kingdom through minority, majority or 100 percent-foreign-owned ventures. The FIA aims to provide equal treatment to foreign companies, stating that a foreign venture “shall enjoy all the benefits, incentives and guarantees enjoyed by a national project”. The FIA includes guarantees on the free repatriation of profits and capital, but it does provide a clause stating that foreign-owned assets can be expropriated (only in exceptional circumstances) in return for full compensation. It also allows
foreign companies to buy property and allows ventures to sponsor their own employees.

| **Saudi Arabia** |
|-----------------|-----|
| **Ease of Doing Business Ranking** | 94 |
| **Getting Credit** | 82 |
| **Starting a Business** | 147 |
| **Dealing with Construction Permits** | 15 |
| **Getting Electricity** | 28 |
| **Registering Property** | 32 |
| **Protecting Minority Investors** | 63 |
| **Paying taxes** | 69 |
| **Trading Across Borders** | 158 |
| **Enforcing Contracts** | 105 |
| **Resolving Insolvency** | 69 |

Table 5.12: Saudi Arabia global ranking on key foreign investment criteria  
(Source: World Bank)

International sanctions imposed on Iran meant that foreign investment into Iran had been miniscule over the past decade. However, with the easing of sanctions following Iran’s rapprochement with the United States, FDI is expected to rise considerably. However, many experts expect the country to underperform due to its complicated business environment and challenges of the remaining sanctions.

The Foreign Investment Promotion and Protection Act (FIPPA) sets the regulatory framework for foreign investments in Iran with
the aim to encourage foreign investment by streamlining investment approval procedures. It allows for international arbitration in legal disputes and guarantees compensation in the event of nationalization. The act also provides a legal framework for foreign investment under contracts, such as build-operate-transfer (BOT), buyback, and public-private partnerships (PPP). However, the bureaucracy surrounding investment approvals remains extensive and ministries are required to endorse proposals.

Iran’s leaders remain fraught over the long-term impact of foreign money on their control of the country’s economy, culture and people. Investors interested in Iran need to consider the possibility that geopolitical developments may cause investment plans to be postponed indefinitely or even cancelled.

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<td>Registering Property</td>
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Iran

### Resolving Insolvency

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<th>156</th>
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Table 5.13: Iran global ranking on key foreign investment criteria
(Source: World Bank)

**Latin America (Brazil)**

2016 was a challenging year for the Latin American chemical industry as the Brazilian economy contracted and demand for key plastics such as polyethylene (PE), polypropylene (PP), and polyvinylchloride (PVC) dropped significantly. An unstable political environment, declining investment and fiscal tightening will continue to hamper the chemical industry. However, the decline of the Brazilian Real against the US Dollar and low oil prices have a positive effect on the chemical industry. Imports have become expensive and export cheap and cheap feedstock for the region’s mainly naphtha-based crackers have made Brazilian petrochemicals producers more competitive internationally. Looking ahead, the unstable political environment and a weak fiscal management will continue to hinder Latin America’s attractiveness as a foreign investment destination.

Brazil remains a moderately attractive foreign investment destination due to its several market opportunities, large domestic market and rich natural resources. However, the country has been hit with political instability and is currently in recession. Additionally, bureaucracy, corruption, creeping government interventionism, and occasionally erratic policymaking make foreign investors wary.
There are no legal distinctions between majority-foreign-owned and majority-domestic-owned companies in Brazil. Legally foreign and domestic companies enjoy the same rights and privileges, and compete on an equal footing when bidding on contracts or seeking government financing. Although no regulation expressly prohibits foreign takeovers, special authorization is required for deals made via share purchase of listed companies. Foreigners and foreign-controlled companies may not own land within 150 km of Brazil’s national borders, directly on its coasts, or in any other geographical areas designated and defined as sensitive for national security.

<table>
<thead>
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<th>Brazil</th>
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<tbody>
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<td>Enforcing Contracts</td>
<td>37</td>
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<td>Resolving Insolvency</td>
<td>67</td>
</tr>
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Table 5.14: Brazil global ranking on key foreign investment criteria
(Source: World Bank)
Challenges

In a survey among senior executives of Chinese chemical companies almost half the participants reported unsatisfying results with their overseas investments to date. A key driver of this low success rate is the limited experience in pursuing overseas investments.

The largest internal impediments reported by respondents are a lack of M&A capabilities and lack of industry and market know-how. The largest external impediments are identification of the right target candidates and overcoming regulatory hurdles. Internal and external funding wasn’t seen as a major obstacle. Despite the challenges, Chinese executives have a clear understanding of major capabilities that need to be developed to successfully pursue investments overseas – with market oriented skills like marketing, R&D, service offerings and branding top on the list.

The lack of experience in doing overseas investments by Chinese chemical companies is particularly manifested in the following areas:

- Limited international experience of the senior executive team and therefore lack of language skills and intercultural sensitivity
- Limited understanding of advanced business models – e.g. value propositions based on total cost of ownership
- No strategic M&A process spanning the entire chain from target identification to post-merger-integration
• Push-oriented export model, based on price rather than value, that does not require detail market intelligence of target markets

These capabilities will take time to develop. To become fit for globalization, Chinese chemical companies need to:

• Keep developing products – in China and elsewhere – that fulfill the needs of an international customer base and by doing so gain more experience with solution-based service models

• Globalize the employee base via onboarding of foreign educated employees, employees with experience in MNCs, language and cultural trainings and international exchange programs

• Train their “M&A muscle” via an end-to-end M&A process that allows for better discipline, better pricing and generates learning curve effects

Learnings from overseas Investment of foreign Chemical and Oil companies

There are several examples of foreign chemical and oil companies investing overseas to expand globally. In this section we examine successful examples of non-Chinese companies’ overseas investment to globalize their business. These examples will provide insight for Chinese chemical companies looking to
invest overseas by demonstrating successful overseas investment strategies.

**Supply Chain Strategy**

One pertinent example for Chinese chemical companies looking to invest overseas is a successful strategy by a Middle Eastern national oil company (NOC) investing in two new tech chemical plants in North America. From this case study we can examine successful examples in supply chain strategy for companies looking to invest abroad.

The most important consideration for the supply chain strategy in a greenfield investment is to find a suitable site for the plant that supports the requirements for the necessary transportation infrastructure, supply landscape, storage and distribution, and site layout. Proximity to well-developed transportation infrastructure is essential to ensure cost-competitive accessibility for both supplies entering the plant and products exiting the plant for transport to customers. The NOC in this example ensured that the site was located near a large port and located near waterways to warrant low-cost delivery of its products. The NOC also assessed the quality of nearby road infrastructure and its utilization, and identified relevant existing pipelines to assess feedstock delivery costs for the plant. The supply market was then analyzed for each key inbound material category. This involved an assessment of domestic inbound material capacity and their key suppliers to identify supply requirements, and an analysis of transportation and logistics requirements to identify a preferred mode of transportation. Warehousing requirements were assessed to identify design and volume requirements, and
sourcing requirements were examined to design an optimal sourcing strategy. The NOC also assessed finished products storage capacity requirements to identify its storage equipment needs for each product. Loading requirements and material flow were also assessed to identify key aspects of site layout. The NOC then produced site layout principles to reduce congestion, and optimize material flow. By following this detailed supply chain strategy, the NOC was able to identify a suitable site that supported the requirements necessary for an effective supply chain strategy.

These were all successful strategies that are pertinent and essential considerations that Chinese chemical companies will need to consider when planning plant construction or identifying potential targets abroad. Successful identification of requirements for these aspects will ensure successful supply chain management and a competitive foreign investment. Such opportunities will largely arise upstream in the Belt & Road region.

Yantai Wanhua’s acquisition of Borsod Chem is a good example of such global supply chain expansion by a Chinese chemical company. Sichuan Fuhua’s supply agreement with NuFarm of Australia is another good example of a Chinese company expanding its supply chain globally, although in opposite direction. In this case, Fuhua set up a comprehensive Glyphosphate supply agreement with NuFarm.
Market Assessment

An example of a successful market assessment strategy is from a commodity business unit of a leading fine chemical company, that applied rigorous analytics to make a strategic decision regarding their future involvement in South America. The company had one production site, decreasing margins, and a decreasing market share and wanted to implement a strategy on their future involvement in South America. They were considering four options - increasing the capacity at their existing plant, building a new plant, acquiring a competitor, or exiting the market.

To make their decision, the company conducted in-depth market analysis and field research (growth rates per applications, expected margins, competitor movements), cost assessment (industry cost curves and delivered cost models), financial scenario and investment modeling for their own and potential competitor's investments. The results of their analysis suggested neither investing in new capacity nor acquiring a competitor, but streamlining and optimizing its own cost structure to become more cost competitive.

This is an important example to demonstrate how important an in-depth and comprehensive market and target analysis is to make the right investment decision. Leading global chemical companies have institutionalize this capability by setting up dedicated business development and M&A departments that have the bandwidth to evaluate and executive multiple deals in parallel. They all confirm that only a small minority of all acquisition targets assesses were ever acquired while many were
abandoned due to limited attractiveness of fit after in-depth analysis.

**Strategic Acquisition Assessment**

This example demonstrates a successful strategic acquisition assessment. A chemicals company was evaluating the opportunity to acquire a major oilfield chemicals company. The target company had launched an auction process and asked for a non-binding offers from potential buyers. The potential acquirer conducted commercial due diligence to assess the attractiveness of the global oilfield chemicals market, to evaluate the strength of the target company, and to analyze the investment case including synergies to determine the acquisition price offer.

The due diligence results suggested that the target company can form the nucleus of a buy and build strategy that gives the acquirer market access, facilitates international growth and establishes the acquirer as the clear number two player in the market. Preservation of the targets' business model and retention of key senior executive and technical staff were key for a successful acquisition and subsequent value growth. Executing this strategy required significant management commitment and leadership, willingness to embrace a more customer and service oriented business model, and a commitment to fund business expansion.

This case demonstrates a successful strategy to unlock the full value of a foreign acquisition. This is particularly useful for Chinese chemical companies looking to expand overseas through M&A. Strategically assessing a target by looking at its
market, the company’s operations, and the resulting synergies will allow a thorough evaluation of value creation potential of that acquisition. In this case, the target had innovative technologies the acquirer was lacking and had an international presence that allowed the acquirer to become a strong global player. These are important benefits that Chinese chemical companies should focus on when assessing foreign acquisition targets.

ChemChina is a good example of a leading Chinese company expanding overseas and become a global chemical leader through multiple strategic acquisitions over many years.
6. From Vision to Action: the Going Global Confederation of China’s Petroleum & Chemical Industry to be established to Facilitate & Coordinate the Globalization of China’s Chemical Industry
Traditionally, the growth focus of many Chinese chemical companies was the domestic market, as the strong evolution and growth of most chemical end-use markets, such as automotive, construction and consumer goods led to a strong growth in chemical products across segments. However, as domestic growth is slowing and competitive intensity increasing, many Chinese chemical companies are looking outside China for additional growth opportunities. In doing so, they are confronted with new challenges, including: limited experience and capability in international development, limited access to business information, underdeveloped networks in destination countries, absence of solid risk control mechanisms, high financing cost, lack of international talent. These challenges have become common concerns of Chinese chemical company executives.

To tackle these common challenges, CPCIF, with the leading member companies in the industry, is establishing the Going Global Confederation (“GGC”) of China’s Petroleum & Chemical Industry. The GGC, steered by the industry’s pioneers in globalization, will serve as a platform to facilitate and coordinate the overseas development of the Chinese petroleum & chemical companies. It will focus on the key partner countries and key industry sectors and integrate the resources inside and outside of the industry to facilitate multi-level and multi-channel industry coordination and business cooperation, and to facilitate policy communication, information exchange, financing and industry collaboration. The main tasks of the GGC will include: strategy & policy research, sharing of information and network, integration of industry and finance, coordination of the cooperation with upstream/downstream partners and with 3rd country partners, and support in risk control etc.
Upon member companies' requests, the confederation has signed collaboration agreements with several institutions to promote Chinese enterprises’ internationalization. Selected examples of collaboration agreements signed since the inception of the Going Global Confederation at the CPCIC in Shanghai in September include:

- Strategic cooperation agreement with the International Centre For Chemical Safety and Security (ICCSS) to start cooperation on personnel training, technical exchange, and review of petrochemical safety and security procedures
- Strategic cooperation agreement with PZU, the largest Eastern European financial group to provide financial and insurance services for Chinese enterprises

In addition, the GGC has assisted globalizing Chinese chemical companies through a series of projects in launching and improving their international operations, in boosting their global co-operations and partnerships and in coordinating implementation of international projects. Some recent projects include:

- Worked closely with National Development and Reform Commission, National Energy Administration, Ministry of Industry and Information Technology of the People’s Republic of China, Ministry of Commerce of the People’s Republic of China, Ministry of Foreign Affairs of the People’s Republic of China, Ministry of Finance of the People’s Republic of China, State Administration of Foreign Exchange to acquire the latest policies of the “Belt & Road” and “Go Global” initiatives;
• Shared latest policies and project information with member enterprises on the “Go Global” App and website, where also relevant articles are published weekly;

• Communicated proactively with Chinese Consulates to gather trade and investment information of key regions;

• Established close contact with financial institutions such as the China Development Bank (CDB), The Export-Import Bank of China (EXIMB), the Asian Infrastructure Investment Bank (AIIB), the SilkRoad Fund and SINOSURE to acquire financing expertise and set up the “Go Global” fund to solve Chinese enterprises’ funding needs when investing internationally;

• Published Petrochemical Investment Reports of key countries including Iran, Poland, Kazakhstan, Russia, Indonesia, Vietnam, and Pakistan, and we are striving to be the most authoritative domestic industrial investment report;

• Conducted out relevant trainings (language, legal, customs) to interested employee of member enterprises
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For more information, permission to reprint or translate this work, and all other correspondence, please email: insight@atkearney.com.

The signature of our namesake and founder, Andrew Thomas Kearney, on the cover of this document represents our pledge to live the values he instilled in our firm and uphold his commitment to ensuring "essential rightness" in all that we do.

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