



REACTION

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Introduction

Welcome to the final edition of Reaction Magazine for 2016. As we look back on the year, it's certainly been momentous, with the UK vote for Brexit and the US presidential election — the impact from both of which remains to be seen.

Meanwhile, in the chemical industry, we've had the continuation of mega-mergers, with multi-billion dollar deals announced by Bayer, Lanxess, Sherwin-Williams and Air Liquide to name just a few. As we look ahead to the external factors which may impact the industry in 2017, we will have national elections in Germany and France — two key chemical markets — as well as continued concern as to whether the China bubble may finally burst.

In this edition, we bring you an initial view on the impact of Brexit, although there is much more to be written on that once negotiations between the UK and EU finally start. We have the latest in our ongoing supply chain series, with a focus on driving sustainability within the supply chain. Lastly, we look beyond the BRIC paradigm with Richard Rekhy, the CEO of KPMG in India and follow that by looking at the growth opportunity for agrochemicals in the Indian market.

As ever, our global chemicals and performance technologies team remains active in the industry. We recently hosted our twelfth annual chemical industry wine tasting dinner in Shanghai. We'll also be at the Chemical Industries Association Annual Dinner in London this month and look forward to seeing many of you there.

We'll be back with our next edition in February, with an outlook on the chemical industry in China, a feature on mergers and acquisitions and a highlight on how global rules of competitiveness embrace GCC petrochemicals. If there are any other topics you would like us to cover in future editions of Reaction, please don't hesitate to contact us.

For those of you celebrating over the holiday season in December, very best wishes from all of us at KPMG.



Mike Shannon
Global Chair
Chemicals and Performance Technologies
KPMG International

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Beyond the BRIC paradigm

a changing landscape for emerging markets

By **Richard Rekhy**

From the 1980s to the fiscal downturn, emerging markets, led by the BRIC countries (Brazil, Russia, India and China), produced record growth and became a change engine for the global economy. Even after 2009, emerging markets proved to be surprisingly resilient and were able to often maintain growth rates not even seen in more developed economies. However, economic problems in Brazil and Russia, along with other factors, now require a rethinking of the old BRIC paradigm. Evolving beyond their traditional role as commodity producers and sources of low-cost labor, today's emerging markets play an increasingly greater role as hubs for high-end talent, backed by younger demographics and a rapidly growing middle class.





GDP growth

For most of us, the term ‘emerging markets’ has always been synonymous with high growth and new business opportunities. In the 1990s, the world heard the roar of ‘tiger economies’ as Asian countries posted GDP growth rates that were multiples of those from developed economies. During the 1990s, a decline in shipping times and cost and trade liberalization encouraged rapid fragmentation of production across borders. As production processes expanded, trade grew substantially among the members of the production chain. Exports of commodities and low-cost goods became a strong and steady engine for emerging markets. Led by China, the BRIC countries appeared to be

preparing for economic standing ‘at par’ with the West and Japan.

Emerging markets weathered the global downturn fairly well, with a rapid recovery after 2010 based on growing domestic markets, continued commodity exports and monetary policies, such as China’s US\$586 billion stimulus program.¹ By 2014, emerging markets accounted for 34 percent of global GDP, more than one-and-a-half times as much as they did in 1980.² During the 2000s, emerging economies were a main source of global growth, accounting for about 52 percent of world growth during the pre-crisis period and 60 percent during 2010-2014.³

However, global trade growth has slowed significantly since 2010 as world markets struggle to return to pre-crisis levels. This decline affects emerging markets in particular, since most are still heavily dependent on world trade. By 2014, global trade had fallen 20 percent short of its pre-crisis trend.⁴ The first half of 2015 saw the slowest growth in global trade since 2009, reflecting a significant contraction in import demand from emerging markets, including those in Asia, Central America and Eastern Europe.

Among the BRIC countries, Brazil and Russia have been struggling the most since 2010. Burdened with inflation and government controversies, Brazil is struggling through the longest recession

GDP growth rates



Emerging markets

Average since 1990:

5.0%

World

Average since 1990:

3.6%

Advanced economies

Average since 1990:

2.2%

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Source for graphic: IMF Signals Another Downgrade to Global Growth, The Wall Street Journal, 1 September 2016, <http://www.wsj.com/articles/imf-signals-another-downgrade-to-global-growth-1472738405>

¹ China’s Stimulus Plan, INFRA, http://siteresources.worldbank.org/INTSDNET/Resources/5944695-124775731647/INFRA_China_Newsletter.pdf

² Slowdown in Emerging Markets: Rough Patch or Prolonged Weakness?, World Bank Group Policy Research Group, December 2015

³ Ibid.

⁴ Ibid.

in 100 years. Its economy is shrinking at an alarming pace. Analysts predict that the country will lose up to 5 years of real GDP growth by the end of this year.⁵ Annual growth is not expected to exceed 1 percent until 2020.⁶

As for Russia, a 2-year plunge in crude prices has dealt a severe blow to the world's biggest oil producer and second-biggest exporter. The country has seen the Ruble reach historic lows and the economy is expected to be limited to a 1 percent growth rate until at least the end of the decade.⁷

In many ways, the old commodity-export model is becoming less essential to growth for emerging markets. The World Bank has warned that conditions

remain in place for a protracted period of low commodity prices in coming years.⁸ Based on the World Bank's yearly projections, growth among commodity-exporting emerging markets fell to less than 2 percent in 2014, contracting by a further 0.4 percent in 2015.⁹ Overall, regions with a large number of importers (East Asia, Pacific and South Asia) are expected to show resilience, while the outlook for regions with a sizable number of exporters (Latin America and the Caribbean, the Middle East and Africa) has continued to decline in 2016.¹⁰

Looking ahead in 2016, the International Monetary Fund (IMF) expects only modest GDP growth for emerging markets, with projections of

4.1 percent this year and 4.6 percent next year.¹¹ Challenges include slow growth in oil exporters, the continued cooling of China's economy, where growth continues to shift away from manufacturing and investment to services and consumption, ongoing recessions in Russia and Brazil and diminished growth prospects in many African and low-income nations.¹²

So does this mark the end of emerging markets as a rising force in the world's economy? Not likely, since these economies are still expected to account for the majority of world growth in 2016 despite uneven performance. However, a new paradigm is needed to better understand emerging markets and their current place in the global economy.



⁵ The Emerging Economies That Will Shine in 2016, Forbes, 9 March 2016, <http://www.forbes.com/sites/forbesinternational/2016/03/09/the-emerging-economies-that-will-shine-in-2016/#227b17b9604c>

⁶ Ibid.

⁷ Ibid.

⁸ Op. cit., The Emerging Economies That Will Shine in 2016

⁹ Global Economic Prospects: Spillovers amid Weak Growth, World Bank Group, January 2016

¹⁰ Global Economic Prospects: Regional Outlook, Update, World Bank Group, June 2016, <http://www.worldbank.org/en/publication/global-economic-prospects>

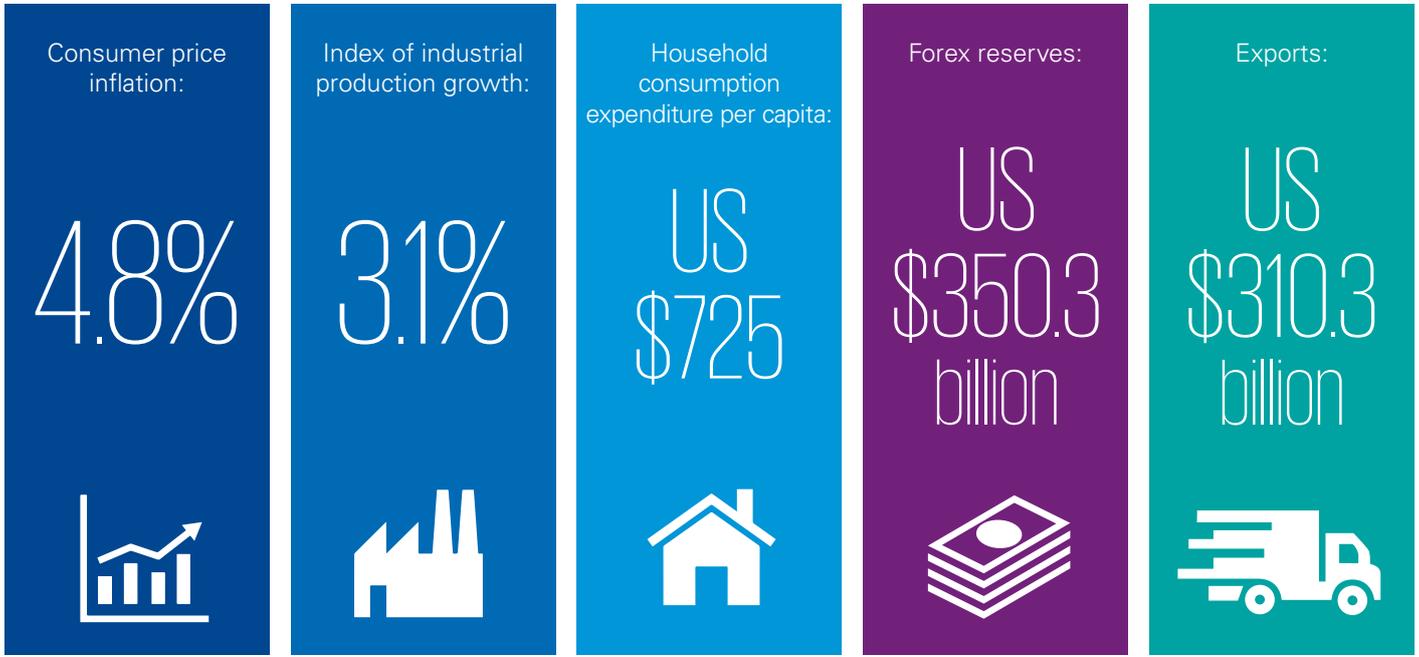
¹¹ Global Economy Faltering from Too Slow Growth for Too Long, IMF Survey, 12 April 2016

¹² Ibid.



India as a growth leader

India overview¹³



The new roster of today's emerging market leaders includes a greater number of countries than in the past, with each country taking steps to increase its economic diversity, develop domestic markets, strengthen regional trading and transition away from commodity exports. China and India remain in the lead but now they are joined by the ASEAN-5 countries of Indonesia, Malaysia, the Philippines, Singapore and Thailand. Other emerging markets with strong performance and high-growth potential

include Mexico, Myanmar, Vietnam, Bangladesh, Turkey and Ethiopia.¹⁴

China's US\$6 trillion economy still dominates the East Asia region. However, the rapid increase in debt to over 250 percent of GDP in March 2016 and of housing prices (especially in first-tier cities) is raising concerns about financial vulnerabilities.¹⁵ In 2015, the People's Bank of China (PBC) implemented five cuts in the benchmark 1 year lending rate and four cuts to the reserve requirement rate. A new round of fiscal stimulus

measures in 2016 includes tax cuts, increases in spending on social welfare (poverty reduction and social housing) and education. These measures are expected to contribute to a record budget deficit of 3 percent of GDP in 2016.¹⁶

At US\$2.5 trillion, India's economy is still not large enough to be considered a change driver for the region. However, the country's GDP growth rate of 7.4 percent exceeds that of China by a percentage point, making it a growth leader among emerging markets.¹⁷

¹³ KPMG research, 2016

¹⁴ Op. cit., The Emerging Economies That Will Shine in 2016

¹⁵ Ibid., Global Economic Prospects: Regional Outlook, East Asia and Pacific Analysis, <http://pubdocs.worldbank.org/en/827551463605616267/Global-Economic-Prospects-June-2016-East-Asia-and-Pacific-analysis.pdf>

¹⁶ Ibid.

¹⁷ Ibid.

Assuming current trends continue, the IMF estimates that India might retain its status of the fastest-growing large economy until at least 2020.¹⁸

National policies in India include an aggressive push for reform, transparent policy-making, faster project clearance and support for big-ticket infrastructure projects.¹⁹

Based partly on reforms for India's foreign direct investment (FDI) regime, FDI to India rose 37 percent from the launch of the 'Make in India' campaign in October 2014 to February 2016, making the country the top FDI destination in 2015, receiving EUR28 billion.²⁰ The computer software and automotive sectors have attracted most of this investment.²¹ Manufacturing activity increased 9.3 percent in the final quarter of FY15/16.²² Indian purchasing manager indices now exceed those of other emerging markets and business start-ups are on the rise, particularly in the e-commerce and financial services sectors. Continued low crude prices have helped keep inflation in check and a boost in wages is lifting urban consumption.



¹⁸ IMF expects India to retain world's fastest growing economy tag, Economic Times, October 2015, http://economictimes.indiatimes.com/articleshow/49245651.cms?utm_source=contentofinterest&utm_medium=text&utm_campaign=cppst

¹⁹ High Growth Markets: Taping the Potential, KPMG research, April 2016

²⁰ India emerges top FDI destination leaving behind China, US in 2015, Hindustani Times, 30 September 2015, <http://www.hindustantimes.com/business/india-emerges-top-fdi-destination-leaving-behind-china-us-in-2015/story-7Dno24ijpNUtLjehW1gnGI.html>

²¹ Op. cit., Global Economic Prospects: Regional Outlook, South Asia Analysis, <http://pubdocs.worldbank.org/en/780341463605620584/Global-Economic-Prospects-June-2016-South-Asia-analysis.pdf>

²² Ibid.



Working with the new paradigm

The traditional strengths of emerging markets — a younger population, rapid economic growth, an expanding, urban middle class and ready access to strong regional markets — will continue to fuel growth in such markets. However, leadership is now being shared by a larger number of countries, with up to a dozen countries now competing for market dominance around the world. At the same time, emerging markets are evolving away from commodity exports, working their way up the value chain toward higher-margin goods and services for both domestic and overseas consumers. Emerging markets are also becoming a source of increasingly sophisticated talent for innovation and advanced technology. Emerging

countries on the ‘new roster’ can also be seen making an attempt at improving transparency and corruption.

Growth in Indonesia, for instance, will be far less commodities-centric than over the past decade as the economy transitions toward a more manufacturing-based, export-oriented economy, as the government looks to boost infrastructure spending and streamline bureaucracy. The Philippines is another example, where robust private consumption and a booming construction sector may see a growing demand for the auto and construction sectors, which, coupled with anti-corruption drives, may see the Philippines become more conducive for investment. India, though not new

on the charts, appears to be better-positioned in terms of transparency as compared to other emerging markets players²³.

Multinational companies, investors and business leaders need to keep in mind how quickly these markets are changing and develop business strategies that reflect the most recent developments and projected trends. Companies will have to reassess their entire architecture, both internally and within the ecosystem at large. With more companies taking leading roles in the global markets, questions on capabilities, presence and right markets will become pertinent. Agility will be key.

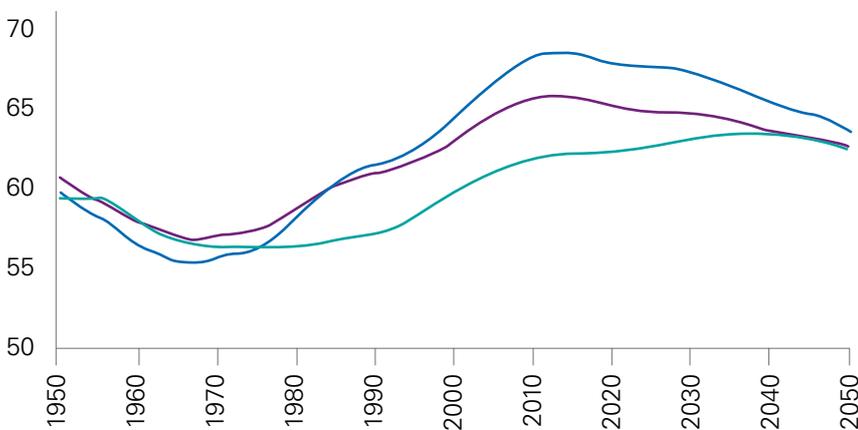


²³ Transparency International July 2016

“Companies will have to reassess their entire architecture, both internally and within the ecosystem at large.”

Share of working-age population

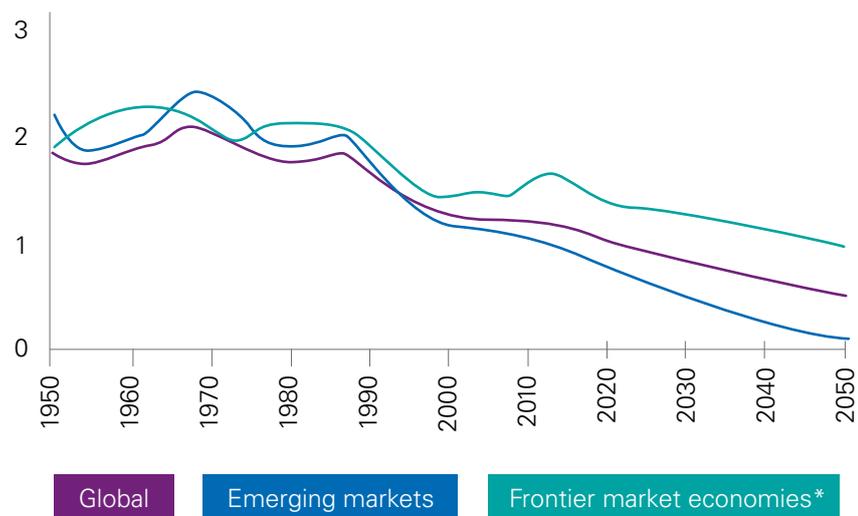
Share in total population, aged 15-64, in percent



Source: World Bank estimates, based on data from UN (2015)

Population growth rate

Annual population growth rate, in percent



Source for graphs: Slowdown in Emerging Markets: Rough Patch or Prolonged Weakness? World Bank Group, Policy Research Note, December 2015.

EM =emerging markets. FM = Frontier market economies that are usually smaller and less financially developed than EM

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Indian agrochemical industry prepares for high growth

By **Biswanath Bhattacharya, Ashish Ladha, Ajit Nafde** and **Anurag Surana**

India is faced with significant challenges to raise its agricultural productivity and production levels to ensure food and nutrition security for a nation with well over a billion people. Low yields, changing rainfall patterns, complex distribution issues and other factors require effective solutions designed to address conditions specific to India. However, the agrochemical industry sector is also developing strategies to leverage opportunities involving insecticides and fungicides, new labor-saving herbicides, catering to exports and innovations in agrochemical solutions.





Doing much more with much less

“Indian agriculture is heavily dependent on the annual monsoon.”

The numbers tell a compelling story. Indian agriculture is critical to the food security of its 1.32 billion people — nearly a fifth of the global population — and the country is on track to surpass China as the most populous nation in the world by 2022.²⁴ However, India has only 2.4 percent of arable land resources and 4 percent of water resources in the world to feed this rapidly growing population.

Obviously, doing much more with much less as compared to many other countries is business as usual for Indian

agriculture, but the challenges do not end there. Indian agriculture productivity is still among the lowest in the world. Yields in India stand at 3 tons/ha compared to the global average of 4 tons/ha. Developed countries such as the US (7), the UK (7), France (7.5) and Germany (7) achieve higher per-hectare yields due to better farming practices.²⁵

In addition, Indian agriculture is heavily dependent on the annual monsoon. In fact, three-fifths of land under cultivation is watered only by rainfall, so a disappointing monsoon (as was



²⁴ 2015 Revision of World Population Prospects, UN, Department of Economic and Social Affairs, July 2015, <https://esa.un.org/unpd/wpp/>

²⁵ Statistics from World Bank, 2015, <http://www.worldbank.org/>

the case in 2014 and 2015) hampers productivity and disrupts yields. At the same time, climate change is leading to new rainfall patterns, with increased drought in some areas or flooding in others due to unseasonal rains. India also has seen a steady decline in arable land since the 1950s, along with shrinking farm sizes. The average size of landholdings is decreasing and the number of operational holdings is increasing, leading to lower incomes for individual farmers. The large number of small farms also makes it difficult to

create an efficient supply chain network to support local farms as well as a modern distribution system to connect agricultural products to markets.

Equally worrisome is a steady rise in the number of serious pests since the 1940s. This includes an increase from 10 to 17 serious pests for rice and an increase from 2 to 19 pests for wheat.²⁶ India now loses up to 25 percent of potential crop production from pests, weeds and diseases.²⁷

“The average size of landholdings is decreasing, and the number of operational holdings is increasing.”



²⁶ Capitalizing on niche opportunities, Emkay research, January 2016

²⁷ India loses 15-25 pct potential crop output due to pests, weeds, diseases, Business Standard, 20 July 2016, http://www.business-standard.com/article/news-ani/india-loses-15-25-pct-potential-crop-output-due-to-pests-weeds-diseases-116072000250_1.html



Supporting the nation's economy

Increase in MSP²⁸ (over FY10-16) in India for select crops

Wheat



34%

Cotton



52%

Soybean



87%

Groundnut



92%

Black gram



84%

Green gram



76%

Red gram



101%

Paddy gram



48%

Source: Department of Agriculture, Cooperation and Farmers Welfare; Government of India (www.agricoop.nic.in)

Despite persistent challenges, the Indian agriculture sector remains a key component of the economy and while it accounts for about 15 percent of the country's GVA (Gross Value Added), nearly 60 percent of rural households rely on agriculture as their principal means of livelihood.²⁹

Although food grains are central to the sector, India is the largest producer, consumer and exporter of spices and spice products. India's fruit production has grown faster than vegetables, making it the second-largest fruit producer in the world. India's horticulture output, comprising fruits,

vegetables and spices, has reached a record high of ~281 million tons (MT) in 2014-15.³⁰ It ranks third in farm and agriculture outputs. Agricultural products constitute 10 per cent of the country's exports and is the fourth-largest exported commodity. In addition, India is the second-largest producer and sixth-largest exporter of sugar, accounting for 14 percent of global output.³¹

Government has been supportive of the agricultural sector through a number of policy measures and initiatives. Not only has there been an increase in minimum support prices (MSPs) across crop

categories but also an overall increase in the outlay for rural welfare schemes. Some of the policy initiatives for the sector include the Crop Insurance Scheme (outlay of US\$0.82 billion in FY17 as compared to US\$0.38 billion in FY16) to insulate farmers against natural calamities and Agri-Credit (highest-ever allocation of US\$134 billion for agricultural credit in FY17)³².

The agriculture sector in India is expected to generate better momentum in the next few years due to increased investments in agricultural infrastructure, such as irrigation facilities, warehousing and cold storage.

²⁸ The minimum support prices (MSP) are a guarantee price to farmers for their produce from the government. In case the market price for the commodity falls below the announced minimum price due to bumper production and glut in the market, government agencies purchase the entire quantity offered by the farmers at the announced minimum price.

²⁹ Ibid.

³⁰ National Horticulture Board, Ministry of Agriculture India

³¹ Ibid.

³² Union Budget of India 2016-17

Arable land vs. total land (as per FY12)

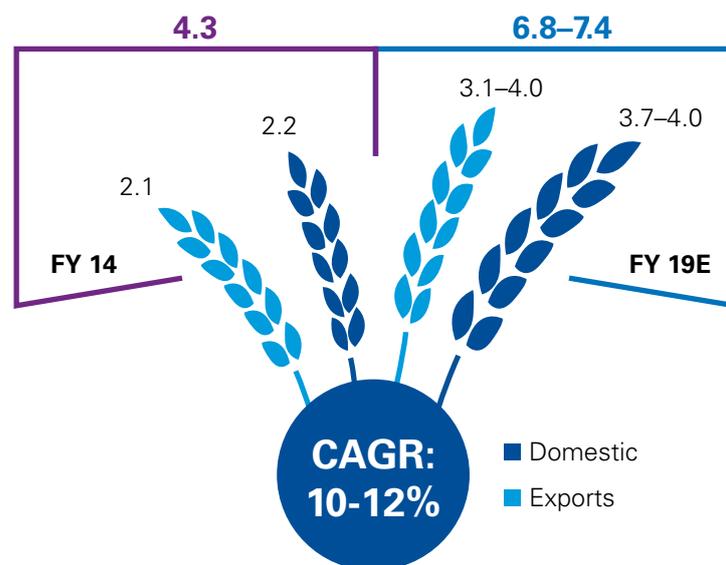
Country	Population (mn)	Arable land (mn ha)	Arable % of total land
China	1,361	139	15
India	1,243	145	49
USA	316	165	18
Brazil	198	59	7
Japan	127	4	12
Germany	81	12	33
France	64	21	39
Italy	60	8	26
Spain	46	14	27
Argentina	42	27	10
Canada	35	42	5
Australia	23	47	6

Source: World Bank, HDFC sec Inst Research

Factors such as reduced transaction costs and time, improved port gate management and better fiscal incentives would contribute to the sector's growth.

Supporting the agriculture sector, India has become the fourth-largest producer of agrochemicals in the world, trailing only the US, Japan and China. This manufacturing segment generated a value of US\$4.3 billion in FY14 and is expected to grow at 10-12 percent annually to reach US\$6.8-7.4 billion by FY19.³³ Approximately half of the demand comes from domestic consumers and the rest from exports. During the same period, the domestic demand is expected to grow at 7-9 percent per year and exports at 12-14 percent per year.

Indian crop protection market (US\$ billions)

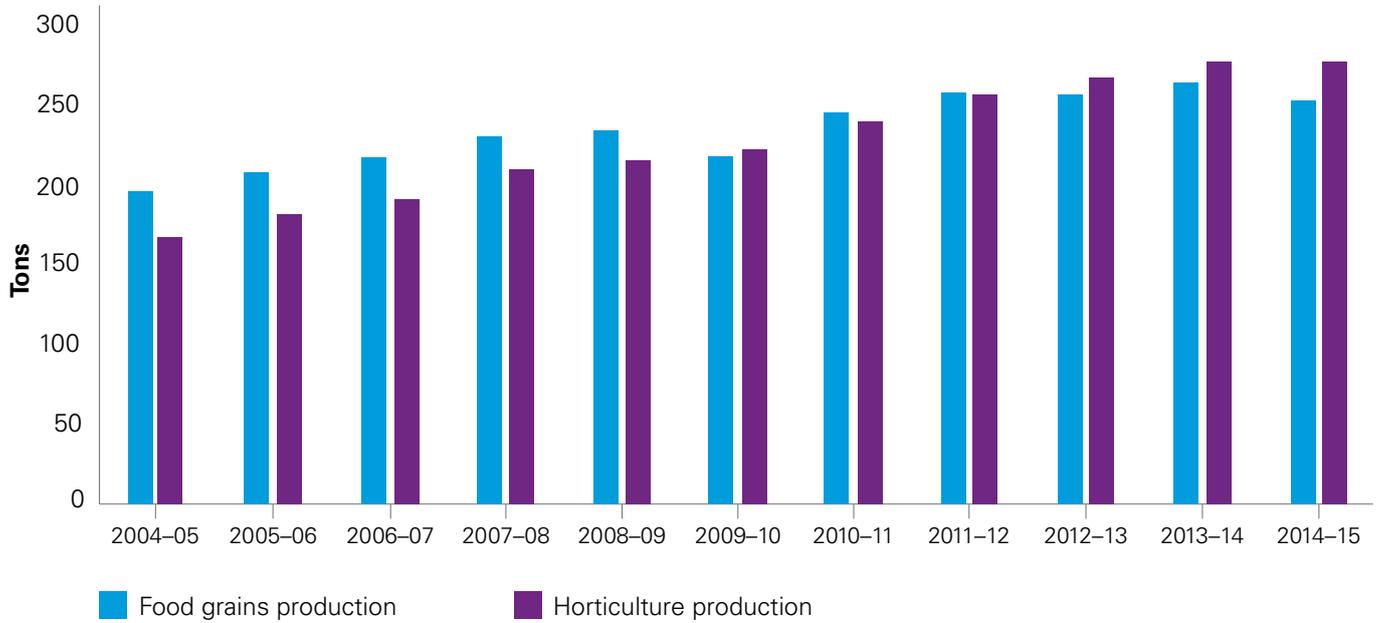


Source: Industry and analyst reports, KPMG in India estimates

³³ Industry and analyst reports, KPMG in India estimates

Trends and developments

Trends in foodgrains and horticulture production*



Source: KPMG research

* Food grains include cereals, pulses and oilseeds. Horticulture includes fruits, vegetables, flowers and spices.



Increased foreign direct investments (FDIs), new tax structures and shifts in crop production are only a few of recent changes in the fast-moving agriculture sector.

Japanese agrochemical companies are increasing their presence in India through acquisitions, joint ventures (JVs) and other strategies. The largest acquisition over the past year has been a majority stake in Excel Crop Care by Sumitomo Chemical.³⁴ Mitsui Chemicals and PI Industries have announced a JV to work on agrochemical product evaluation, data generation and product distribution.³⁵

The GST (Goods and Services Tax) Bill was recently approved by the Rajya Sabha, replacing a large number of different state and local taxes. Distribution costs account for 4 to 6 percent turnover

for agrochemical companies and are likely to get impacted by the GST. With the unification of tax rates and India emerging as a single market, companies have an opportunity to optimize their supply chains and warehouse locations.

Another important shift is the increase in fruits and vegetable (F&V) acreages due to strong demand for high nutrition food groups. More demand and a focus on quality produce from modern retail and food processing units supports better prices realization for the farmers for F&V produce. While the share of cultivated land for fruits and vegetables has doubled over the last two decades, it is still less than 10 percent in total, so there is significant room for growth in this sector. The increasing demand for F&V will also encourage the growth of fungicides in the domestic market.³⁶

“With the unification of tax rates, companies have an opportunity to optimize their supply chains and warehouse locations.”



³⁴ Sumitomo Chemical to take majority stake in Excel Crop Care, 7 June 2016, <http://economictimes.indiatimes.com/markets/stocks/news/sumitomo-chemical-to-take-majority-stake-in-excel-crop-care/articleshow/52628282.cms>

³⁵ Mitsui Chemicals and PI Industries to establish JV in India for agchem registration, Chemweek, 31 May 2016, http://www.chemweek.com/markets/fine_chemicals_biotech/agricultural_chemicals/Mitsui-Chemicals-and-PI-Industries-to-establish-JV-in-India-for-agchem-registration_79694.html

³⁶ Pocket Book of Agricultural Statistics, Directorate of Economics & Statistics, 5 February 2015



Key opportunities

“There is a greater degree of comfort with respect to data protection in India.”

Chemical companies should take note of the following opportunities for the Indian agrochemical industry:

Opportunities for exports

In addition to the growth of its domestic market, India has also emerged as a preferred global supplier and destination for outsourced manufacturing. Indian agrochemicals contract manufacturers have showcased their capabilities to global innovators with regard to the delivery of uncompromised product quality, supply security, respect for product/process patent and domestic and international regulatory compliance. There is a greater degree of comfort among global innovators with respect to data protection in India, which should not only increase the number of innovative products launched in India but should also give a boost to the contract manufacturing industry in India.

Off-patent products

More than 15 active ingredients worth US\$4.1 billion are expected to go off-patent by 2020.³⁷ This provides significant export opportunities for Indian companies which have expertise in manufacturing generic products.

Growth in herbicides and fungicides

In the past, the availability of cheap labor for manual weed picking has limited growth for herbicides. But today's labor shortages, rising labor costs and

new genetically modified crops have increased the use of herbicides, which is likely to be the fastest-growing segment within agrochemicals.

Innovations in agrochemistry

The current labor shortage is accelerating the introduction of slow release or controlled release types of formulations which avoid multiple sprays. Moreover, we also see increased introduction of combination products, having broad spectrum efficacy and longer duration of control. Farmers are also investing more in seed treatment agrochemicals that help ensure disease resistance along with better and more uniform germination.

Market development for agrochemical products in India has its own challenges, including fragmented land holding, regional variations in crop patterns and language, low awareness among farmers about the new products, etc. Top Indian agrochemical companies have not only developed deep distribution networks, but have also invested in farmer engagement initiatives, conducting awareness camps for farmers and providing complete farm extension services. As a result, several multinational corporations (MNC) have co-marketing or co-distribution arrangements with Indian players, using the latter's distribution channels. We expect this trend to continue, however, the nature of alliances would evolve.

³⁷ India Agri Inputs, Investec research, May 2015

Conclusion

In many ways, the Indian agrochemical industry represents both the challenges and opportunities of today's emerging markets. Backed by government support for rural and agrisector and increasing cross-border collaboration with global innovators, crop protection and crop enhancement solutions are being developed based on global best practices and the latest technologies. Properly designed and executed, current initiatives can help India enhance its status as a global manufacturing hub of high-quality crop protection chemicals.

“The Indian agrochemical industry represents both the challenges and opportunities of today's emerging markets.”

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Building a sustainable chemical supply chain

By **Steve Tonner**

Climate change is one of the biggest issues today for global chemical companies. Their supply chains — long, lean and increasingly complex — are especially vulnerable to disruptions from major storms, flooding, drought, rising temperatures and other climate-related events. As with most crises, climate change presents both risks and opportunities for the chemical industry. Successful companies and their suppliers are rethinking their supply chain strategies, helping to mitigate risk and support sustainability in the twenty-first century.





A changing climate for businesses

Businesses and climate change

Changing conditions:

Potential impacts:

Increased rain and intense rainfall

Could contribute to increased flooding, disruption to agriculture and related infrastructure, damage to manufacturing infrastructure and facilities, affecting supply, production and distribution.

Lower precipitation and changing rainfall patterns

Could lead to drought and increased water scarcity, disrupting agriculture, changing population growth patterns, reducing hydroelectric generation and discouraging foreign investment in affected regions.

Heat waves and higher average temperatures

Could contribute to crop loss and reduced yields, lower worker productivity and increased illness.

Greater frequency and intensity of storms and hurricanes

Could result in more flooding and wind damage to manufacturing sites, ports and ground transportation facilities.

Rising sea levels

Could result in increased coastal flooding, especially during high tides and storm surges. Repeated damage to infrastructures and transportation could eventually cause companies to relocate.

Across multiple industries, the debate is settled: global warming is a reality, caused primarily by rising levels of greenhouse gases (GHGs) produced by human activity. According to the Intergovernmental Panel on Climate Change (IPCC), our global climate since the 1950s has been marked

by a decrease in cold temperature extremes, an increase in warm temperature extremes, an increase in extreme high sea levels and an increase in the number of heavy precipitation events in a number of regions.³⁸ These observations have been echoed by

a growing body of evidence from scientific studies around the world.

Already, chemical companies are reporting instances in which changing weather patterns have affected their demand markets and feedstock sources. Syngenta and Sasol note that

³⁸ Climate Change 2014 Synthesis Report: Summary for Policymakers, Intergovernmental Panel on Climate Change (IPCC), Fifth Assessment Report, 2014

³⁹ Syngenta earnings, sales down on tough markets, ChemChina deal expected to close by year-end, Chemweek, 22 July 2016, http://www.chemweek.com/home/top_stories/80953.html. See also planned shutdowns, drought hurt Sasol's nine-month sales, Chemweek, 9 May 2016, <http://www.chemweek.com/business/finance/79240.html>

droughts in Asia/Pacific and Southern Africa have been a factor in reduced sales.³⁹ Adama attributes 'exceptional weather conditions', including drought in Europe, Canada and South Africa, and a late start of the rainy season in India, to reduced market demand and lower company earnings.⁴⁰ Reichhold has announced a price increase on their coconut alkyd resin products due to changing weather. The company states that typhoons, drought and extreme rain over the last 2 years have cut copra outputs by 25 percent, causing a spike in coconut oil prices.⁴¹

In the US, a major 4-year drought has battered California, which produces the vast majority of the nation's fruits, vegetables and nuts. With water at a premium, farmers are shifting to different crops and farming methods.⁴² Industries that support the agricultural process, such as agrochemical manufacturers, are seeing large sales drops and the potential price effect of inventory build-ups.⁴³

Climate change is also increasing regulatory pressure on companies to reduce GHG emissions, adjust

their energy mixes away from fossil fuels, contain water usage and take other steps to limit the impacts of operations on the environment. At the Paris Conference on Climate Change in December, 2015, world leaders from almost 200 countries signed an agreement to cap carbon emissions in a historic effort to keep global temperature rises well below 2° Celsius. These and other regulatory structures, such as the European Union's Emissions Trading System, will influence the chemical sector for years to come.



³⁹ Adama swings to a third-quarter net loss, reduces exposure to Brazil, ChemWeek, 10 November 2015

⁴¹ Reichhold ups coconut alkyd resin prices on tight feedstock, ChemWeek, 15 March 2016

⁴² California drought transforms global food market, Bloomberg, 11 August 2014, <http://www.bloomberg.com/news/articles/2014-08-11/california-drought-transforms-global-food-market>

⁴³ Which Industries Are Most Affected by the California Drought? Alphasense, 4 August 2015, <https://www.alpha-sense.com/blog/which-industries-are-most-affected-by-the-california-drought/>

Financial impacts

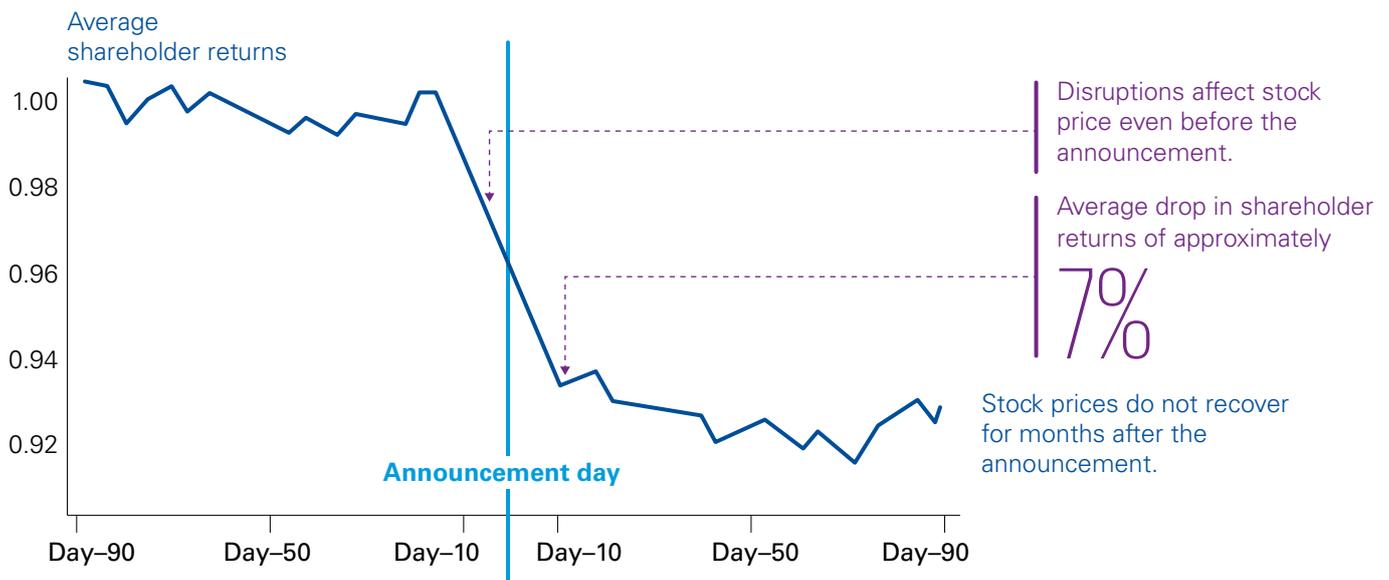
As governments increase their levels of commitment to creating a carbon-neutral world, investors are expecting companies to become more transparent about both the physical impacts of climate change, such as extreme weather and the financial impacts from climate-related regulation, market dynamics and stakeholder pressure.

The Financial Stability Board's recently announced disclosure task force on

climate-related risk is just one example of increasing investor scrutiny.⁴⁴ Other examples include the Portfolio Decarbonization Coalition (PDC) of institutional investors, that aims to decarbonize US\$600 billion of assets under management⁴⁵ and the Principles for Responsible Investment (PRIs) Montreal Carbon Pledge, which commits investors to measure, disclose and reduce the carbon footprints of their portfolios.⁴⁶

Investment strategies that do not adequately consider the implications of climate change may be exposed to additional risks. *The Economist* estimates that climate change will result in US\$4.3 trillion of losses in privately held assets due to damage caused by extreme weather, including droughts, floods and storms and lower returns and slower economic growth.⁴⁷

How supply chain disruptions hurt shareholder value



Source: Building Resilience in Supply Chains, World Economic Forum, January 2013. Cited in Supply Breaks Slash Share Values 7%, CFO.com, 6 February 2013.

⁴⁴ <http://www.financialstabilityboard.org/2015/12/fsb-to-establish-task-force-on-climate-related-financial-disclosures/> Retrieved 15 December 2015

⁴⁵ <http://unepfi.org/pdc>

⁴⁶ Ibid.

⁴⁷ A Guide on Climate Change for Private Equity Investors, Institutional Investors Group on Climate Change (IIGCC), PRI and KPMG



Multiple risks for chemical supply chains

Climate change poses new and not widely recognized risks to global chemical supply chains. Ironically, many of these risks are the result of efforts by companies over the years to create leaner, longer and more cost-efficient supply chains that have supported a competitive advantage in global markets.

Just-in-time inventory processes introduced in the 1990s have been able to significantly cut inventory carrying costs. However, without any reserve capacity, even a minor disruption from a weather event can result in a major disruption in supply. Moreover, the sheer length of these supply chains extending across multiple regions and climate zones adds to risk. In the search for low-cost suppliers (as well as new markets), many chemical companies in the West have established supply chains in emerging markets, many of which are located in warmer climates that are more subject to tropical storms and floods.

Today's chemical supply chains are also more vulnerable to disruption because they have evolved into supply networks with a large number of interdependent, first-tier, second-tier and third-tier suppliers. Support functions have also grown to better manage standardization,

security, finance and insurance. In a complex supply environment like this, the loss of even a single component e.g. the supplier for a crucial catalyst, for example can bring the whole supply chain to a halt. Recent 'onshoring' and 'rightshoring' strategies have started to reverse the trend to greater physical distances as companies continue to search for the best combination of cost, quality and risk.⁴⁸ However, networked, disaggregated supply chains remain in place for many global chemical companies.

Other characteristics also increase risks for chemical supply chains. Both manufacturers and their suppliers are heavily reliant on utilities, drainage systems, water supply systems and other infrastructure, all of which can be compromised by weather events. Storms and floods can lead to breaches of environmental permits or trigger major accidents, with potentially serious consequences for the supply chain. Storage and distribution infrastructures also tend to have long lifetimes, so they are exposed to climate risks over a longer time span. Finally, the chemical industry is highly globalized and, therefore, has to deal with a wider range of impacts than local industries that have shorter, simpler supply chains.

“Climate change poses new and not widely recognized risks to global chemical supply chains.”

⁴⁸ Rebalancing your sourcing strategy, Forbes, July 2014, <http://www.mckinsey.com/business-functions/business-technology/our-insights/rebalancing-your-sourcing-strategy>

Rethinking the supply chain

Resilience measures for the supply chain

Supply chain element	Critical features	Weather-related hazard	Vulnerability and risk	Resilience measure
Supplier	Suppliers are geographically clustered	<ul style="list-style-type: none"> — Storms lead to flooding of supplier's facilities — Storms projected to become more frequent with climate change 	Loss of stock due to flooding of facilities	Availability of alternative suppliers to maintain supply following disruption
Manufacturer	Single manufacturing location	<ul style="list-style-type: none"> — Storm surge shuts port facility — Port is in an area anticipated to suffer more storms and typhoons over time 	Insufficient stock due to transport delays	Increase stock levels to provide buffer against supply disruption
Local power generation	Vulnerable to high winds	<ul style="list-style-type: none"> — Storm damages infrastructure — Future change to storm frequency not known 	Loss of power due to storm damage to infrastructure	Back-up power generation to provide continuity
Local workforce	Single transport route for workforce	<ul style="list-style-type: none"> — Transport route blocked by flood — Future severity of floods anticipated to increase 	Flood blocks transport route leading to remote working	Develop remote working contingency plans

Source: Building Resilience in Global Supply Chains, World Business Council for Sustainable Development



Nothing has changed about the basic goals of supply chain strategy. Companies still need demand-driven, low-cost delivery of supplies. Accepted approaches such as just-in-time delivery, low inventory levels and strong supplier-manufacturer relationships are as valid now as they have been for years. What has changed is the need for systems that can withstand, recover and adapt from increased levels of stress, whether from long-term developments, such as rising temperatures or sudden events like typhoons.

In a word, supply chains need to be resilient. New infrastructure

and developments are considered reasonably resilient in terms of expected mean changes in climate conditions. However, they may not be resilient to changes in extreme events that are projected to become more intense and more frequent.

In many ways, resiliency has become a moving target. The ability to tolerate surprises is essential. Systems are only truly resilient when they can continually adjust to new and unexpected threats and thereby reduce vulnerability to disruption as well as restore functionality after an event. As such, resiliency

involves strengthening defenses and developing multiple pathways, providing alternatives if a route is inoperable and creating an ability to recover quickly. Multiple responses are likely to be necessary and strategies to build resilience can take many forms. Examples of responses could include identifying critical raw materials (which may not necessarily be Tier 1 materials), developing alternative suppliers for these, finding alternative logistics pathways and supporting supply chains that can 'flex' to rapid changes in demand.



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In an historic move, 195 countries met in Paris in December 2015 and committed to limit global warming to 'well below' 2°C above pre-industrial levels and to 'pursue efforts' to keep it to 1.5°C. If the goal agreed upon in Paris is to be achieved, it will require a transformation of global energy systems, transport and industrial processes over the next few decades. Businesses face both risks and opportunities in this transition since they must deliver the bulk of the necessary emissions reductions and investment. Chemicals businesses, especially in the petrochemical sector, will face increasing pressure to align their own carbon reduction strategies and targets with the agreed global goal.

Some of the key points the chemical industry needs to consider are to:

- Ensure that the business fully understands and is prepared for the potential financial, environmental and social impacts of climate change on the supply chain, including the effects of extreme weather such as storms and flooding on critical suppliers, possible disruption to the supply of key raw materials and increasing water scarcity in many regions.
- Understand the future risks and opportunities your business faces from carbon reduction regulation, changing market dynamics and

stakeholder pressure and be prepared to communicate your strategy clearly to investors.

- Develop and communicate a clear and consistent position on the issues of carbon and climate change, and showing what your business is doing to reduce emissions.
- Understand how the carbon reduction commitments made by the countries in which you operate are likely to affect your organization. Align your strategy with these goals.



A five-step approach to resiliency

“Supply chain resiliency depends on proper risk management and a systems approach. Building resilience is an iterative and continual process.”

Supply chain resiliency depends on proper risk management practices and a systems approach. Companies also need to keep in mind that building resilience is an iterative and continual process, one that requires a thorough understanding of the supply chain and its vulnerabilities.

A study of supply chain resilience by the World Business Council for Sustainable Development⁴⁹ suggests five steps that companies can consider in developing a resilient supply chain:

- 1 Map the supply chain and identify critical features**
 An effective map is based on understanding the principal material flows, stocks and locations in the supply chain. Companies need to identify the numbers, locations and diversity of organizations, products and business connections at each stage of the chain, identify interface points with other industries and identify laws, policies and regulations that might affect critical features in the event of disruption.
- 2 Determine weather-related hazards**
 Companies should consider what weather-related hazards have impacted the supply chain in the last 5 to 10 years, as well as weather-related hazards that are known to occur in the geographical areas where elements of the supply chain are located.
- 3 Identify vulnerabilities and evaluate risks**
 Large companies often have an existing mechanism or framework for assessing supply chain risk. Extreme weather and climate change are additional elements which should be considered within such frameworks. Climate change will potentially change the likelihood and severity of events, so an assessment should consider the existing level of risks and how climate change might amplify those risks.
- 4 Define and apply resilience building measures**
 Once the risks facing the company have been identified, resilience-building measures can be defined. They should ideally be conceived and applied with close attention to benefits and consequences across the supply chain system. This approach requires a collaborative outlook, a holistic approach to considering risks and mitigation and a willingness to consider changes to supply chain structures and components.
- 5 Monitoring and review**
 The analysis process will be iterative, with monitoring and review being an important aspect. Information should continue to be gathered to review and understand how the supply chain has been affected by extreme weather events, to interpret records of climate-related impacts to gain further insight into risk ratings and to review the effectiveness of resilience-building measures.

⁴⁹Building Resilience in Global Supply Chains, World Business Council for Sustainable Development

Conclusion

The global chemical industry has built its success on being able to adapt to change and climate change is only one of many challenges that will shape the industry for years to come. To support a greener future, chemical companies have taken steps to control energy consumption, develop energy-saving products, reduce GHG intensity and decrease their water footprints. However, companies need to invest further in designing, developing, expanding and maintaining a new generation of global supply chains that will

be fully resilient in the face of disruptions from climate change.

Supply chain sustainability also opens the door to key business opportunities. As an 'industry of industries', the chemical sector is in a unique position to help other sectors improve their sustainability performance. In the same way, chemical manufacturers can find new ways to save resources, reduce business risks and cut costs by working with their suppliers to improve resilience and remain competitive in today's markets.



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Steve joined KPMG in 2008 after more than two decades in the chemical industry in R&D, marketing and supply chain roles. In his current role, he helps companies manage their environmental risk exposure, including exposure to climate-related risks. Steve's clients include major multinational companies in mining, infrastructure and manufacturing, as well as the Australian Government.

Brexit and the chemical industry

By **Paul Harnick**

The British exit or 'Brexit' from the European Union (EU) has created instability across the UK, with knock-on effects felt around the world. For the UK and global chemical industry, the overall impact will be hard to predict until the detailed negotiations on the terms of the UK exit are well underway. The KPMG Brexit team offers an assessment of current conditions and a point of view for how chemical companies in the UK and beyond can best adapt and find opportunities for change in the potential movement of capital, people, goods and services impacted by Brexit.



The election contest was contentious and highly volatile, but on the morning of June 24, the results were clear: 52 percent voting to leave the EU versus 48 percent voting to stay.

Brexit will be remembered as a pivotal event in the UK's history. The country has long supported formal economic ties with the EU, joining the European Economic Community (EEC) in 1973. The EEC was also known as the Common Market, which later evolved into the present EU.

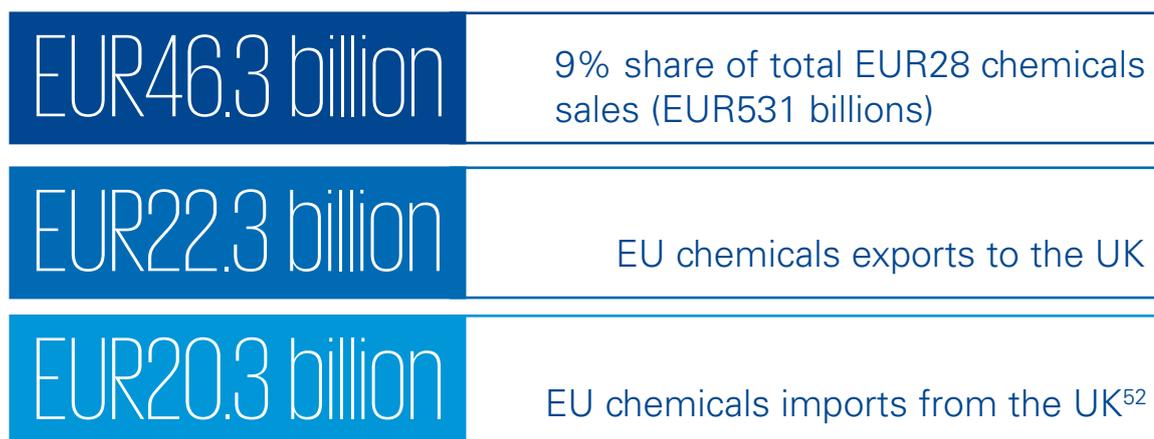
Formally leaving the EU requires invoking Article 50, which the UK Government has committed not to trigger until March 2017. There will then follow a formal exit period, officially set at 2 years. At the current time, there is little consensus on how long that will actually take, nor what the final trade deal between the UK and the EU might look like. While it is important to avoid falling into the realm of speculation, the impact may be large and there is much that chemical companies can be doing now to prepare.

UK by the numbers⁵⁰

National economy



UK chemical sector



⁵⁰ Statistics from Cefic statement on impact of Brexit on the chemical industry, Cefic press release, 24 June, 2016, <http://pr.euractiv.com/pr/cefic-statement-impact-brexit-chemical-industry-143130>. See also Brexit creates and opportunities: Are companies prepared to exploit them?, Supply and Demand Chain Executive, 4 August 2016, <http://www.sdexec.com/article/12241094/brexit-creates-risks-and-opportunities-are-companies-prepared-to-exploit-them>

⁵¹ Britain still the largest foreign investor in the US, FinancialTime, 12 August 2016

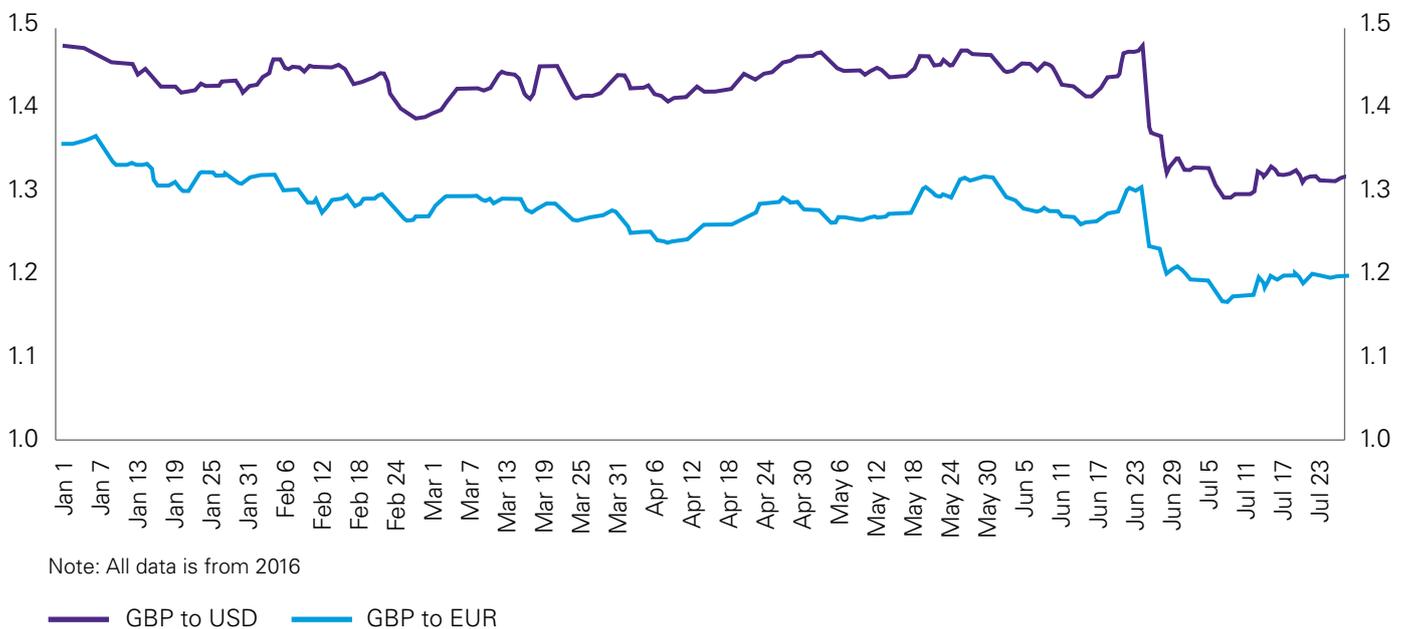
⁵² Op. cit., Cefic statement on impact of Brexit on the chemical industry

Chemical sector confidence tracker (July 2016)

	Europe CMCI change	Producer CMCI change	Buyer CMCI change	Trader CMCI change
Business conditions compared with past 12 months	↓ 14.2	↓ 12.9	↑ 11.0	↓ 9.4
Business conditions next 12 months expectations	0.03	↑ 6.2	↓ 11.5	↑ 8.4
Order book volumes versus 12 months ago	↓ 2.5	↑ 3.2	↓ 3.9	↓ 2.1
Order book volumes in next 12 months	↑ 1.7	↑ 8.1	↓ 11.4	↑ 10.0
Profitability compared with last 12 months	↑ 1.7	↓ 5.3	↑ 12.2	↓ 3.0
Profitability in next 12 months	↓ 2.6	↑ 10.1	↓ 14.6	↑ 1.1

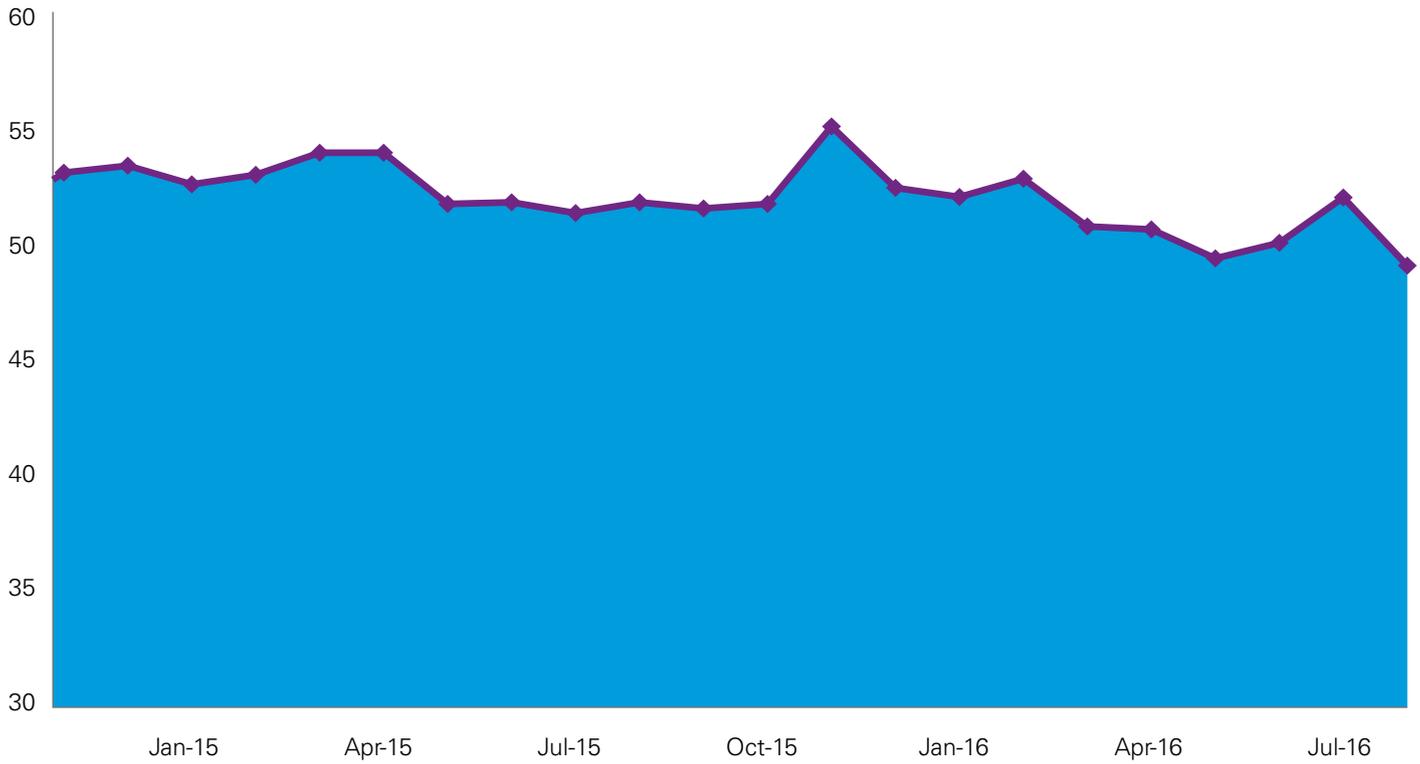
Source: ICIS News, 26 July 2016

GBP to USD and EUR



Source: US Forex, <http://www.usforex.com/forex-tools/historical-rate-tools/historical-exchange-rates>

UK PMI – January 2015 to July 2016

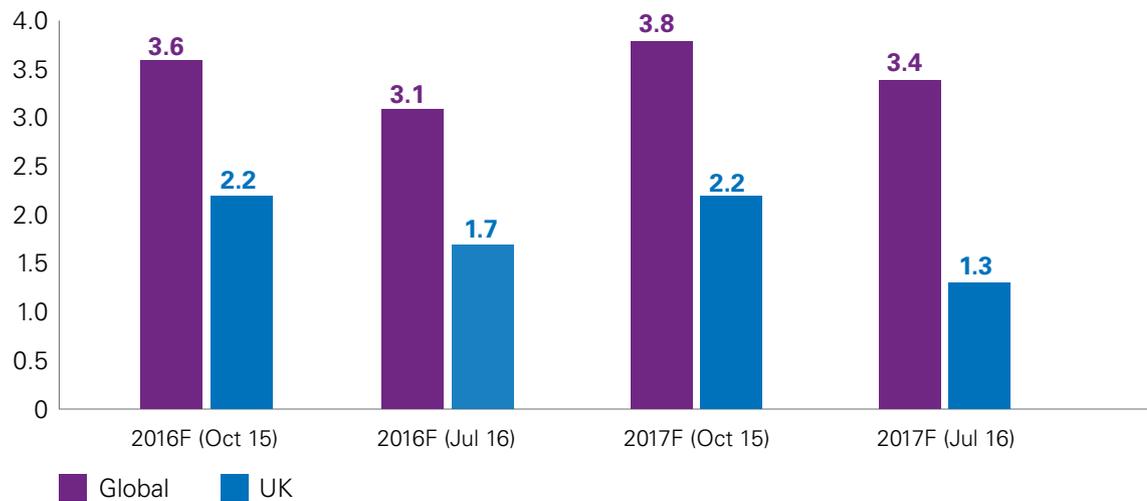


Source: Investing.com

UK and Global GDP forecasts for 2016 and 2017

World economic outlook database

Economic outlook projections (%)



Source: IMF



Turbulence across the economy

The old business adage is still true: all markets hate uncertainty. The mere prospect of a Brexit in the months leading up to the election was enough to pull UK indexes downward. And since global markets can hardly ignore what happens to the world's fifth-largest economy, repercussions have been felt around the world.

Continuing a slow decline for most of 2016, the Purchasing Manager's Index suffered a sharp drop in June.⁵³ After the election, the pound, already hesitant, immediately plunged in value to 30-year lows.⁵⁴ From June to July, many analysts and business leaders were divided as to whether the country would enter a recession. The Bank of England, having issued warnings of a recession in May, issued GBP150 billion of lending to help ensure stability for the economy.⁵⁵

By August, a somewhat brighter picture had emerged.⁵⁶ The pound had stabilized and showed some measure of recovery and business confidence has increased somewhat since the election.⁵⁷ According to recent analysis, Britain is not expected to fall into a recession after the vote to leave the EU and the downturn in the economy is expected to be temporary.⁵⁸

Nevertheless, the International Monetary Fund (IMF) has revised its forecasts downward for the UK, dropping from 2.2 percent in October 2015 to 1.3 for 2017 (as of April 2016).⁵⁹ IHS has substantially cut its UK GDP growth forecasts to 1.5 percent from 2.0 percent for 2016, 0.2 percent from 2.4 percent for 2017 and 1.3 percent from 2.3 percent for 2018.⁶⁰ Many factors influence these projections, of course, but Brexit cannot be ignored as a significant one.

In terms of the impact on the global chemical industry, the consensus appears to be that there will be some potentially serious disruptive effects. In the UK, Steve Elliott, chief executive of the Chemical Industries Association, said, "It is not the decision that our sector wanted [but] I am confident that an important and resilient industry such as ours can prosper in this new situation."⁶¹ He added that while business "craves certainty," it is also used to operating in "challenging and changing" circumstances.

Overall, the impact on the chemical industry supply chain and the potential increase in the cost of doing business through increased tariffs and other taxes may be significant.

“In terms of the impact on the global chemical industry, the consensus appears to be that there will be some potentially serious disruptive effects.”

⁵³ UK economy suffered a 'dramatic deterioration' after Brexit vote — Markit, 22 July 2016, <http://www.ft.com/fastft/2016/07/22/uk-economy-suffered-dramatic-deterioration-after-brexit-vote-markit/>

⁵⁴ Pound Plunges to 30-Year Low as U.K. Stocks Slide on Brexit, Bloomberg, 23 June 2016, <http://www.bloomberg.com/news/articles/2016-06-23/pound-tumbles-on-results-from-northeast-england-in-eu-referendum>

⁵⁵ Bank of England releases £150bn of lending amid warnings on stability, Guardian, 5 July 2016, <https://www.theguardian.com/business/2016/jul/05/bank-of-england-releases-150bn-pounds-risks-financial-stability>

⁵⁶ British Pound Advances on Dollar, Euro Even as Manufacturing PMI Confirms Need for Lower Interest Rates, Poundsterling Live, <https://www.poundsterlinglive.com/gbp-live-today/5252-manufacturing-pmi-data-gbp-to-eur-and-usd>

⁵⁷ Ibid.

⁵⁸ Brexit downturn won't become a recession, think tank predicts, The Times, <http://www.thetimes.co.uk/article/brexit-downturn-won-t-become-a-recession-think-tank-predicts-vqk706q07>

⁵⁹ World Economic Outlook: Too Slow for Too Long, IMF, April 2016

⁶⁰ Ibid.

⁶¹ UK chemicals industry 'pragmatic' about impact of Brexit vote, Chemical Watch, 24 June 2016

In addition, many UK chemical and pharmaceutical firms and scientists are concerned that economic conditions will get tougher, exports of the products of chemistry will drop, several European pharmaceutical institutions will relocate to other EU countries and UK scientists' ability to collaborate with their EU colleagues will get harder.⁶² On the HR front, there is also a huge question mark over the long-term immigration status of EU nationals employed by companies in the UK.

Across the Channel, the chemical producers' trade group Verband der Chemischen Industrie (VCI) expects major disruptions in chemical sales and investments across the EU, especially in Germany.⁶³ VCI analysts note that the UK was the fourth-largest export market for Germany-based chemicals and pharmaceuticals producers in 2016, with EUR12.9 billion in sales, representing 7.3 percent of total exports for the sector that year. Investor confidence in Germany fell 1.6 percent in May, partly because of fears over the UK's possible exit from the EU.⁶⁴ The Netherlands also expects to feel the impact of Brexit. The country's chemical, rubber and plastics production could shrink by as much as 4.8 percent as a result of Brexit, according to The Netherlands Bureau for Economic Policy Analysis (CPB).⁶⁵



⁶² UK chemistry enterprise feels 'Brexit' pain, 24 June 2016, C&EN, <http://cen.acs.org/articles/94/web/2016/06/UK-chemistry-enterprise-feels-Brexit-pain.html>

⁶³ Split opinions over Brexit impact on petrochemicals markets, ICIS.com, 17 June 2016, <http://www.icis.com/resources/news/2016/06/17/10008857/split-opinions-over-brexit-impact-on-petrochemicals-markets/>

⁶⁴ Ibid.

⁶⁵ Brexit costs arise from free trade, The Netherlands Bureau for Economic Policy Analysis, 7 July 2016, <http://www.cpb.nl/sites/default/files/omnidownload/CPB-Policy-Brief-2016-07-Brexit-costs-for-the-netherlands-arise-from-reduced-trade.pdf>



KPMG point of view

KPMG member firms have been working with clients to understand the implications of the UK's relationship with the EU for years, including advising industry trade bodies such as the Society of Motor Manufacturers & Traders (SMMT), informing the strategic thinking of individual companies as they consider trade tariffs or providing immigration law advice to EU CEOs working in the UK.

According to Karen Briggs, Head of Brexit at KPMG in the UK the firm's dialogue with clients shows that they need expert support on mitigating the risks and taking advantage of the opportunities that arise from Brexit. In the chemical industry, where a large proportion of the manufacturing base in the UK is owned by non-UK companies, these issues are as relevant in Frankfurt, New York, Houston, Amsterdam, Tokyo, Riyadh and Shanghai as they are in London. For example, non-EU companies with European headquarters in the UK

may be affected by limitations on the free movement of capital and labor as well as goods and services. Above all, changes in tax issues could encourage international corporations to relocate their UK holding companies to EU member states.

KPMG in the UK is advising our clients to implement our 2:2:2 approach: consider the next 2 weeks, 2 months and 2 years to assess the path ahead. Many of our clients have been seeking advice on their immediate risks. However, KPMG firms are now seeing clients look further ahead to what opportunities might lie ahead in the next 2 years. These opportunities might include strengthening trade relationships with China or gaining a competitive edge with other players in emerging economies. KPMG firms are also engaging international clients and are observing, interestingly, predatory intentions from other European nations considering what competitive advantage Brexit might mean for them.

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KPMG in the Industry

CIA Annual Dinner



Working for chemical and
pharmaceutical businesses

KPMG in the UK recently hosted a table at the CIA's Annual Dinner in London. It was also an opportunity to meet and have some topical discussions with members of the UK chemicals community.

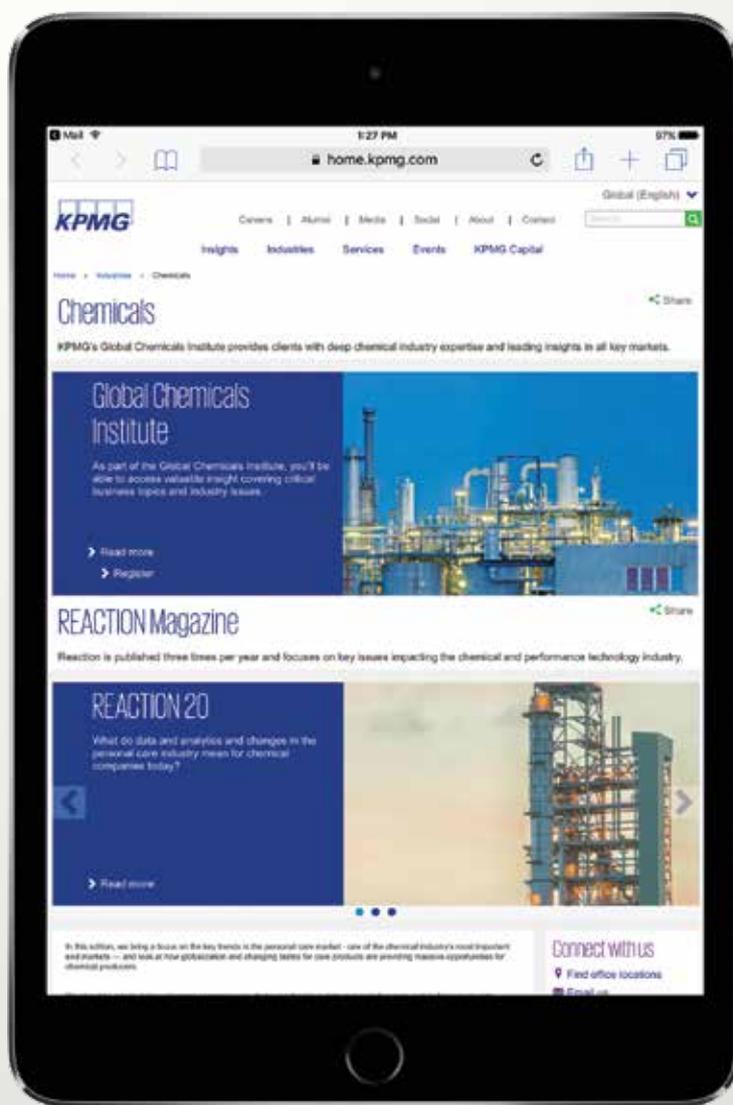
12th Annual Chemicals Wine Dinner, Shanghai



More than 30 senior executives from leading chemical companies attended the 12th Annual Chemical Sector Wine Tasting and Networking Dinner in Shanghai. This long-standing event always attracts top management from across China to gather and discuss current events and issues in an informal setting. Mike Shannon and Paul Harnick joined Norbert Meyring to bring an international perspective to complement the local knowledge of KPMG China. Mike Shannon commented on how Shanghai is one of the few cities where you can gather such a variety of high-caliber sector executives in one place. This really creates a unique opportunity to have such strong engagement.

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