



cutting through complexity

China's chemical industry enters a new era with sustainability

Green economy as a game-changer and growth driver

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Chemicals and Performance Technologies



Introduction

China is in the midst of a great transition. No longer willing to be slotted in the class of big polluters, it has undertaken one of the most comprehensive sustainability action plans in history, and the chemical industry will be fundamental to turning this vision into reality.

Change, however, cannot come at the cost of growth, and China will need to take a delicate balancing act as it moves from the older fast-paced industrial model to a slower pace of development based on upgraded value chains and energy-efficient business.

The chemical industry, meanwhile, has to deal with the current macro-economic forces brought on by a slow US economy and lingering debt crisis in Europe that is dragging down end-user demand. Emerging markets, especially China, are expected to sustain the global economy until the Western hemisphere begins to grow again. Most big-ticket petrochemical and chemical investments are unfolding in the Middle East, Latin America or East Asia, indicating that these regions continue to hold potential, despite some slowdown.

In 2011, KPMG predicted in its chemical industry report that one of the most compelling mega-trends in China will be sustainability and the environment protection industry. This report takes the prediction further and tries to explore how the concept of sustainable chemistry is becoming increasingly strengthened, triggering a new generation of demand for chemical companies.

In China, the forces driving sustainability will come from its new environment-friendly laws. Under the 12th Five-Year Plan (5YP), the country is evolving its regulatory regime to clamp down on energy-guzzling industries and incentivising clean and green energy sectors. Its ambitious urbanisation drive is now being tweaked with 'green' regulations requiring buildings to be energy-efficient. There is greater demand for smart transport that consumes less fossil fuel and an urgent need to stabilise water sustainability. All these factors and large government investment will act as major growth drivers for chemical companies by generating a need for new materials, advanced polymers and specialty chemicals.

As these new range of external demands evolve, chemical companies too will need to refashion their internal operations. To be a beneficiary of the sustainability mega-trend, companies must embed certain strategies into their core business practices. There is a growing realisation that the environment can no longer be decoupled from profit estimates as the costs of ignoring it are too high.

In order to leverage the opportunities generated by sustainability and streamlining business costs, KPMG suggests a four-pronged strategy for chemical companies. A combination of product innovation, assuming more stakeholder responsibility, communication along the supply chain and a high level of sustainability reporting may be the winning formula for chemical companies in China to achieve their next stage of growth.



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Chemical industry combats new challenges

1.1 Complex economic environment

The chemical industry is in a state of both optimism and uncertainty. The world economy has entered a difficult phase characterised by strong downside risks and fragility. Financial and political anxiety generated by the European debt crisis continues to affect high-income countries. These uncertainties may be mitigated partially by growing consumption in emerging markets, which may help sustain major end-use demand for the chemical industry.

A combination of macro-economic complexities has led the World Bank to greatly lower global growth projections to 2.5 percent and 3 percent respectively, for 2012 and 2013. Over the next few years, GDP growth of developed nations is projected to be well below 3 percent, even under the best-case scenarios. For developing countries it will be a relatively weak 5.3 percent in 2012, before strengthening slightly to 5.9 percent in 2013.¹

Chemical makers, however, are optimistic that they should be able to withstand the pessimism triggered by austerity measures in Western Europe and will be well-placed to reap the benefits from the emerging markets as these economies will remain the main drivers of world growth.²

For chemical companies, the prospect of going forward revolves around a complex two-speed world. While emerging nations manage to buck the trend, despite a slowdown in China, a muted American economy and debt-constrained Europe will tend to weigh down industry demand. A continued recession in the developed world may take its toll on East Asian economies unless they are beefed up by more investment spending, higher consumption and fresh opportunities in next-generation sectors like sustainability.

Global growth trend and chemical curve

The global chemicals industry began recovering from late 2009, but production continues to be far below pre-recession levels. Developing countries fared better compared to the relatively mature economies of the West. The recession, however, led to a distinct structural shift in the global chemicals industry as production units moved towards Asian countries.³

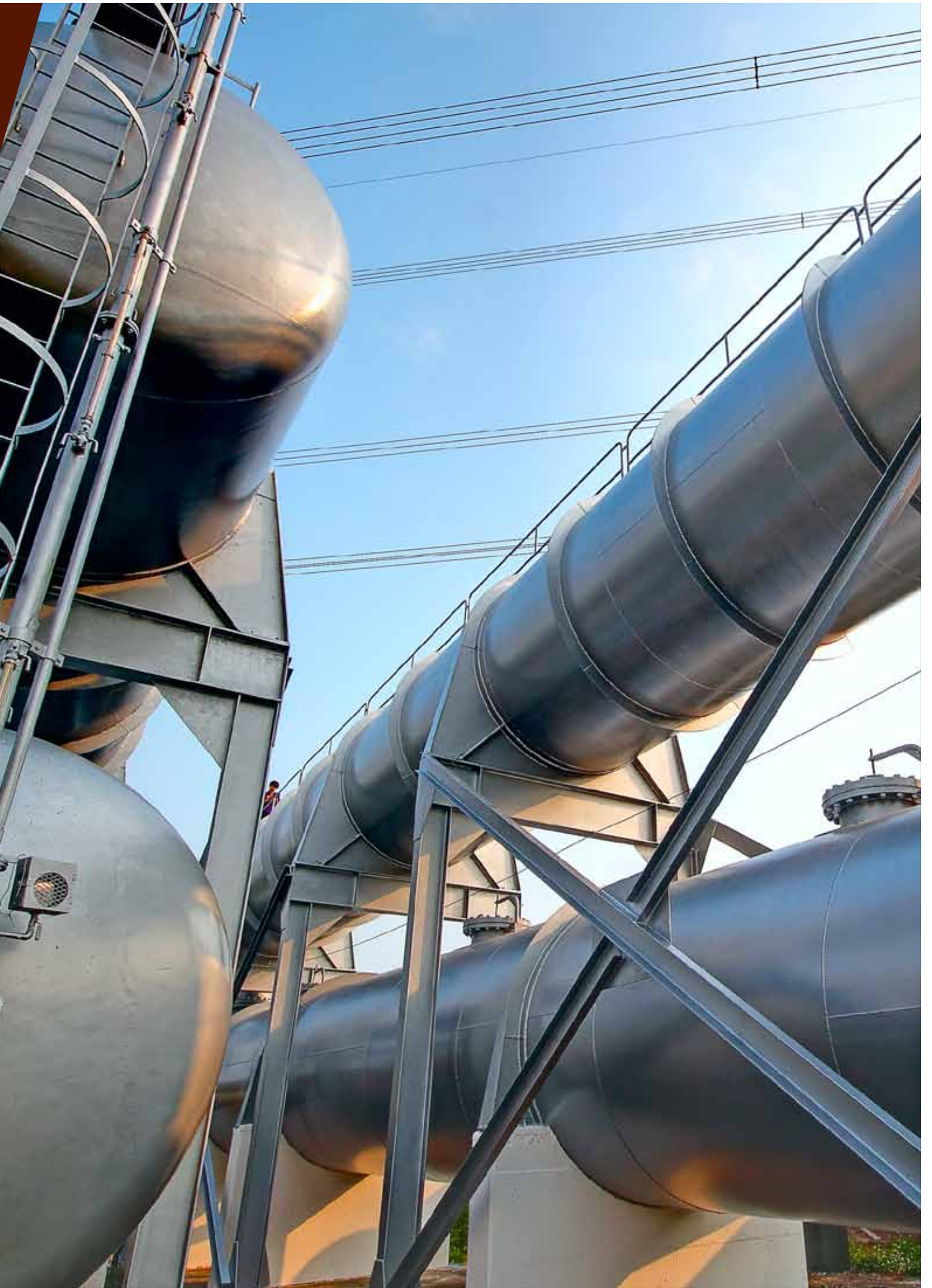
Currently, the volume of demand China or East Asia generates has assumed greater significance. Output of chemicals in emerging markets is expected to outpace production in developed countries. India, Africa, Latin America and other emerging markets will continue to expand,

¹ Managing growth in a volatile world, June 2012, The World Bank

² Cefic forecasts 2012 standstill for EU chem output, 14th June 2012, ICIS News

³ Global chemicals industry to reach US\$5.5 trillion by 2015, Global Industry Analysts, Inc. 15 Feb 2012





with the strongest growth in 2012 expected in specialty chemicals, consumer products, and agricultural chemicals. Globally, output is expected to grow 2.3 percent in 2012 and 4.3 percent in 2013, according to mid-year projections by the American Chemistry Council.⁴

The US chemical sector, which represents roughly 19 percent of global chemicals output, managed to improve its profits in 2011 and overall operating rates rose to 77.4 percent for 2011.⁵ American producers became more competitive globally with access to low-cost natural gas feedstock and chemical exports reached a new peak in 2011, growing 9.7 percent to hit USD 207.4 billion.⁶ However, American chemicals output is anticipated to rise by only 0.5 percent in 2012 due to lackluster demand growth in North America and a slowdown in China, before accelerating to a 2.3 percent growth rate in 2013.⁷

In the European Union, chemicals

production recorded a 1.1 per cent increase in 2011 compared to 2010 and total sales were 10.7 percent higher year-on-year, according to CEFIC Chemicals Trends Report.⁸

In 2012, however, uncertainty returned with the public debt challenge dragging on endlessly. Sector analysts predict a standstill in EU chemicals output for the later part of the year and output during the rest of 2012 will remain nearly 5 percent below the peak levels reached in 2007. Growth in 2013 is expected to pick up slightly to 2 percent, but only if EU policy instills more business confidence and rewards firms which innovate, create jobs and expand operations.⁹

Producers in the two affluent regions are depending on emerging market growth, along with favourable energy costs stemming from an abundance of shale gas to shore up their bottom-lines. Global chemical companies remain focused on exploring growth opportunities in Latin America and

North America

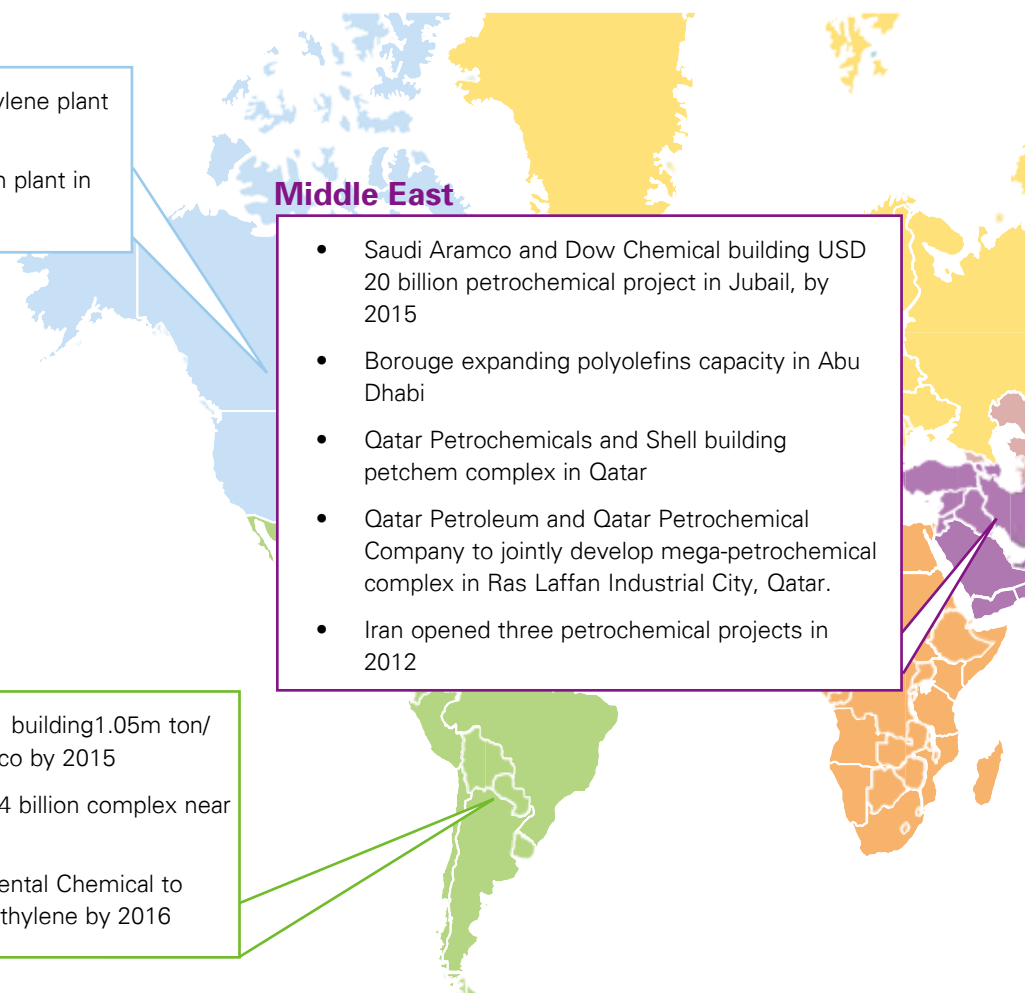
- Dow Chemicals to construct new ethylene plant in Texas by 2017
- Celanese to build methanol production plant in Texas by 2015

Middle East

- Saudi Aramco and Dow Chemical building USD 20 billion petrochemical project in Jubail, by 2015
- Borouge expanding polyolefins capacity in Abu Dhabi
- Qatar Petrochemicals and Shell building petchem complex in Qatar
- Qatar Petroleum and Qatar Petrochemical Company to jointly develop mega-petrochemical complex in Ras Laffan Industrial City, Qatar.
- Iran opened three petrochemical projects in 2012

South America

- Braskem and Grupo Idesa's building 1.05m ton/year ethane cracker in Mexico by 2015
- Comperj, Petrobras' USD 8.4 billion complex near Rio de Janeiro by 2013
- Mexichem MoU with Occidental Chemical to build half million tons/year ethylene by 2016



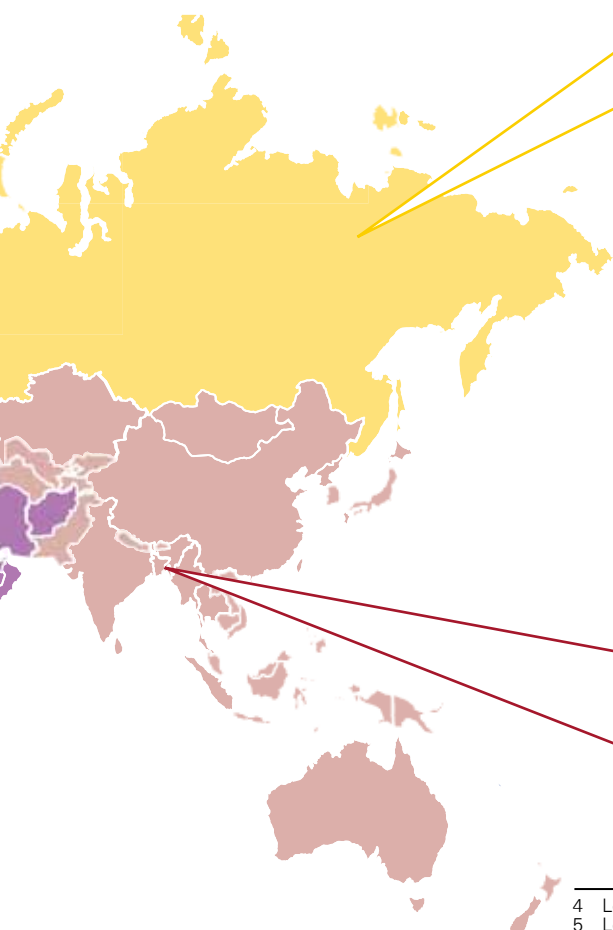
the lucrative Asia-Pacific region. In Latin America, much of the end-use demand is expected to come from infrastructure projects and a growing middle class, while the real game-changer could be the discovery of pre-salt gas reserves in Brazil's Santos Bay and shale gas in Argentina. This gives Latin America the opportunity to develop competitive feedstock advantage for its petrochemical industry.¹⁰

With East Asia heavily dependent on the Middle East, the relationship between the two regions remains strong and interlinked. In the last four years, most of the increase in production capacity of commodity petrochemical products has been in the Middle East and China. However, with the end-use Gulf market so small, almost all additional production in the Middle East began to flood East Asia in 2008, leading to oversupply fears. But as of 2011, these fears were somewhat abated and SABIC, Borouge

and Kuwait Petroleum Corporation have set up refining and petrochemical bases in China to be closer to the market for their value-added products and high-performance polymers.

Battling uncertainty: Despite some degree of rebound in the early part of 2012, chemical companies worldwide are being forced to manage increased levels of uncertainty. Key demand areas such as housing and automobiles are showing complex trends.

The US housing sector remains a weak end-market with lower electronics and construction material consumption. A key consumer of chemicals, it is likely to remain soft through 2012. New housing in the US fell from 2.1 million units in 2005 to just 0.6 million units in 2011. According to American Chemistry Council data, each new American home contains approximately USD 15,000 worth of chemicals and polymers in items such as paint, adhesives, furnishings and appliances.



Europe

- Sibur plans Russia's largest petrochemical complex in Tobolsk, Siberia, by 2017, with 1.5 m tons ethylene capacity
- Rosneft to build mega complex in Nakhodka, Russia by 2017 with 3.4 m tons/year capacity

East & South Asia

- BASF India is planning to invest EUR 150m to build a new chemical production site in western India
- BASF and Petronas in agreement for refinery and petrochemical integrated development (RAPID) complex in Johor, Malaysia
- Siam Cement Group set up a JV with Qatari partners to build Vietnam's first petrochemical complex
- Saudi Aramco unit signs MOU with Pertamina for integrated complex in Indonesia
- Honam Petrochemical will invest up to USD 5bn to set up a petrochemical complex in Indonesia by 2013

4 Long-term growth in chemistry to accelerate, American Chemistry Council, 5 July 2012

5 Looking for growth in the chemical industry, American Institute of Chemical Engineers, Jan 2012

6 Chemical commerce grows and shifts, July 2, 2012, Chemical & Engineering News

7 Long-term growth in chemistry to accelerate, American Chemistry Council, 5 July 2012

8 EU chemicals sector posts full-year 1.1 per cent growth in 2011, CEFIC, 24 Feb 2012 and CEFIC Chemical Trends Report, 27 March 2012

9 EU debt crisis drags down EU chemicals production more than expected, CEFIC newsletter, 14 June 2012

10 2012 Outlook: Will growth endure? IHS Chemical Week, 2-9 Jan 2012

The second major consumer of chemicals and polymers – the auto industry – is working with a complicated demand structure. Due to massive structural change after the economic meltdown in 2008, the global auto industry has veered around six major auto markets: China, India, Japan, Korea, Western Europe and the US. Automakers continue to shift their production facilities from high-cost regions such as North America and Europe to lower-cost regions such as China, India and South America. China and South America together are projected to represent more than 50 percent of the growth in global light vehicle production from 2008 to 2015.¹¹ To remain competitive, major automakers are designing vehicles that will cater to consumers in both mature and emerging markets, while restructuring product portfolios to meet new and stringent energy and environmental policies being implemented worldwide.

Given the chemical industry's sensitivity to the global economy, any negative current in the macro economy gets reflected in their prospects. Global producers have responded to competitive pressures by streamlining operations, relocating manufacturing facilities to low-cost regions closer to end-markets, while attempting to be more nimble in responding to market opportunities.

The largest manufacturers operating on a global scale with plants in numerous countries like BASF, Braskem, Celanese, Dow Chemical, DuPont, Eastman Chemical, ExxonMobil and Mitsubishi are also exposed to several regulatory and compliance issues worldwide.

The global chemical industry invested close to USD 511 billion in new plant and equipment (P&E) in 2011 and this is expected to increase at least 10 percent, going up to USD 557 billion in 2012. Emerging markets, including China and Asia Pacific, will account for the bulk of this investment, with about 90 percent of the USD 800 billion

capital spending until 2016 is expected to go to emerging economies.¹²

Given this context, it appears that China will continue to remain a beacon of demand and investment for chemical companies worldwide. In the KPMG Chemical Industry Report 2011, 'China's chemical industry – The new forces driving change', we predicted five mega-trends which are apparent in China. These include – a rise in domestic consumption, urbanisation, high value-added global supply chains, growth in R&D and sustainability as a major growth driver.

Policy developments in China and experimentation with new economic models over the past year also indicate that not only will the mega-trends and investment patterns persist, but certain forces like sustainability and the green economy will be the growth paradigm of the future.

China economy – A planned slowdown

Early in 2012, the Chinese government cut its annual economic growth target to an eight-year low of 7.5 percent compared to the actual 9.2 percent GDP growth of 2011, aiming to promote a steady and sustainable pace of development, keep prices stable and guard against financial risks by keeping the total money and credit supply at an appropriate level. This is the first time since 2005 that China has lowered its annual economic growth target after setting it around 8 percent.¹³

China has slowed, not only because of weaker global demand but also as a result of earlier deliberate domestic policy efforts to cool an overheated property market. Its GDP growth in the first half of 2012 of 7.8 percent compared to 9.2 percent of 2011, has caused some jitters in world markets and China is left trying to achieve a delicate balancing act between slowing its turbo-paced growth and maintaining a rational level of demand. Policy efforts to alternate between a slowdown and boost in 2012 has sent mixed signals to the world market.

11 Auto Industry Outlook & Review - June 2012, Zacks Equity Research)

12 Looking for growth in the chemical industry, American Institute of Chemical Engineers, Jan 2012

13 World Bank cuts China growth forecast to 8.2 pct, Reuters, 23 May 2012.

The People's Bank of China cut the reserve ratio requirement for banks three times since November 2011 to increase liquidity.¹⁴ In a surprise move to lift sentiment, it cut the benchmark lending and deposit interest rates by 25 basis points in June, the first such rate cut since late 2008.

The real estate sector has borne the full brunt of this contradiction. China is not likely to loosen the reins on its property sector soon. It remains wary of a real estate bubble and is more keen to counter the economic slowdown than to stimulate property investment. The Ministry of Housing and Urban-Rural Development reaffirmed in June that it would stick with its property-cooling regulations.¹⁵ All focus is now on low-cost housing which the central government has been zealously promoting. It has authorised RMB 148 billion for the construction of subsidised housing this year.¹⁶

The good news for the chemical sector is that growing urbanisation will continue to spawn investment in fixed assets – new factories and infrastructure. In the first five months of 2012, fixed-asset investment, which is seen as the strongest force to drive the country's economic growth, increased 20.1 percent compared with the same period last year.¹⁷

The National Development and Reform Commission (NDRC) has approved four new airports and about 100 clean energy projects early in 2012.¹⁸ Funds for building new highways will be fast-tracked as well. High-speed railways will take priority with RMB 500 billion going to rail projects this year.

1.2 China chemical market promises steady growth

The Chinese chemical industry is also trying to respond to the changed policy environment and despite hurdles and slowing growth, it has maintained its pace. Chemical industry analysts predict that growth should be in the high single-digit range,

offsetting weaker demand in Western economies.¹⁹

The domestic sector's performance during 2011 was encouraging, with total profit of the Chinese oil and chemical industry touching RMB 807 billion, an increase of 18.8 percent year-on-year. The gross output value of the Chinese oil and chemical industry rose to RMB 11.3 trillion, increasing by 31.5 percent year-on-year.²⁰ The sector continued to be a big employer, absorbing 6.69 million people, up by more than 8 percent. Its fixed asset investment was RMB 1.4 trillion, up a significant 23.4 percent.

Overall, trading figures were also in the positive, with gross value of imports and exports of the Chinese oil and chemical industry touching USD 607 billion, a jump of 32.3 percent year-on-year.²¹

Chemical trade grew briskly in 2011, with exports to all regions expanding by 29.5 percent and imports up 26.7 percent. By volume, China's trade in organic chemicals leads its other chemical sectors. During 2011, China's negative trade balance for pharmaceutical products increased, while its positive trade balance for fertilizers widened.²²

Although Europe and the US are strongly linked by their trade in chemicals, both regions' growth in trade with China in recent years has been more rapid. In 2011, Europe's exports to China grew 16.8 percent and imports by 17.8 percent. Similarly, U.S. exports to China grew by 13.3 percent, and its imports by 29.8 percent.²³

Notwithstanding the performance of 2011, China did succumb to a continued slowdown in the West. In 2012, the industry is still facing downward pressure due to sluggish demand from export-oriented sectors such as textiles and toy manufacturing, as well as rising production costs, a growing tax burden and large-scale

14 Consumer inflation continues dip, China Daily, 10th June 2012

15 China to stand firm on property controls, China Daily, 9th June 2012

16 'Stimulus 2.0' aims to reboot growth, China Daily, 1st June 2012

17 Consumer inflation continues dip, China Daily, 10th June 2012

18 'Stimulus 2.0' aims to reboot growth, China Daily, 1st June 2012

19 Brief Report of Chinese Oil and Chemical Industry, 2011, Market Info Guide, 23 April 2012

20 Brief Report of Chinese Oil and Chemical Industry, 2011, Market Info Guide, 23 April 2012

21 Brief Report of Chinese Oil and Chemical Industry, 2011, Market Info Guide, 23 April 2012

22 Chemical Commerce Grows and Shifts, July 2, 2012, Chemical & Engineering News

23 Chemical Commerce Grows and Shifts, July 2, 2012, Chemical & Engineering News

losses in the refinery and natural gas sectors, according to China Petroleum and Chemical Industry Federation (CPCIF).

In the first half of 2012, overall profitability of the chemical industry hovered around historical low or middle level. Half-year earnings of multinational companies (MNCs) and large domestic firms are down from last year and most companies have had to revise their full-year forecasts.

Despite this, the industry federation remains optimistic. The CPCIF estimates that the oil and chemical industry's total output may reach RMB 12.73 trillion this year, a 14.5 percent rise year-on-year. The industry's profits are likely to amount to RMB 860 billion in 2012, up 5 percent from a year earlier.²⁴

It also holds on to its prediction that the combined production value of China's petrochemical and chemical industries will maintain steady annual growth of 13 percent during the current five-year plan period, which ends in 2015.²⁵

Petrochemical investment to continue

Investment in the petrochemical sector has been relatively strong during the early part of the year, with the combined investment amounting to RMB 202.4 billion, up 33.5 percent year-on-year, in the first quarter alone.²⁶

The blueprint for development in China's petrochemical industry for the period until 2015 is now clearer with the government approving significant expansion of upstream refining capacity, accelerated growth of high-end materials and products and consolidated operations of companies.²⁷

Government data indicates that China has already become a leading supplier of major petrochemical and chemical products, but there is room for expansion as domestic production does not meet the high demand. The

12th FYP calls for raising refiners' average annual processing capacity of crude oil to 600 million metric tons by 2015, compared with 450 million tons in 2011. The production capacity for processing plants will be increased to 700,000 metric tons per year from 540,000 tons.²⁸

Considering the potential of the sector, giant chemical companies are also expanding into the refinery sector. Sinochem Corp's first major refinery, the 240,000 barrel-per-day (bpd) Quanzhou plant on China's southeast coast has won approval from the country's environmental watchdog, paving the way for the state-owned firm to push on with the USD 4.6 billion venture. The plant, which Sinochem aims to start operating by late 2013, would be one of the major greenfield refineries China wants to add during this period.²⁹

China National Petroleum Corp's (CNPC) Guangdong-based mega joint refinery with Venezuelan partner Petroleos de Venezuela has started construction and is set to open by late 2014. The RMB 58.6-billion project, in which CNPC will hold a 60 percent stake and the PDVSA will hold the remaining 40 percent, has a designed annual processing capacity of 20 million metric tons, or 400,000 bpd, making it the country's biggest integrated refining complex ever built at once.³⁰

Kuwait Petroleum Corp broke ground on a USD 9.3 billion joint venture with Sinopec for a refinery with an annual capacity to refine 15 million tons (300,000 bpd) and an ethylene plant with an annual 1 million ton capacity to come online in 2015. The project is in Zhanjiang in Guangdong province.³¹

1.3 Feedstock: Shale gas shifts dynamics

The biggest game-changer of recent times has been the proliferation of shale gas drilling in North America and the sudden advent of cheap feedstock.

24 Petrochemical industry expected to slow down, China Commodity Marketplace, 8th Aug 2012

25 Chinese petrochemical industry gets 5-year-plan goals, Xinhua, 8 Feb 2012

26 China's petrochemical sector growth slows further in Q1, Xinhua, 30 April 2012

27 China's petrochemical sector growth slows further in Q1, Xinhua, 30 April 2012

28 China's petrochemical sector growth slows further in Q1, Xinhua, 30 April 2012

29 Sinochem's \$4.6 bln refinery gets environmental nod, Reuters, 28 July 2012

30 CNPC, Venezuela joint refinery set for 2014 opening, China Daily, 3 March 2012

31 Kuwait Invests in China Petrochemical Joint Venture, Oil Price.com, 28 Nov 2011

Between 2007 and 2009, proven shale gas reserves in the US jumped from 23.3 trillion cubic feet to 60.6 trillion cubic feet. The US Energy Administration expects reserves to continue expanding, driving production from just 2.91 trillion cubic feet in 2009 to 8.09 trillion cubic feet in 2015 and then steadily climb to 13.56 trillion cubic feet by 2035.

The resulting price impact on the gas market has been significant. The discovery of ample and low-cost shale gas has helped the US Henry Hub Gas Price decouple from the price of US crude oil, thereby enabling the US market to enjoy historically low gas prices. In March 2012, the US gas price fell to just USD 2 per million BTU, its lowest point this century. Over the same period, the price of US crude has rocketed up almost 360 percent to reach a four year high in March 2012 of USD 18.3 per million BTU.³²

China, where natural gas resources are substantial and ethylene factory capacity is increasing at a rate equal to the rest of the world combined, may emerge as another epicenter of cheap feedstock.

China has claimed the largest shale gas reserves in the world with explorable reserves of 25.1 trillion cubic metres, nearly double US estimates of 13.6 trillion cubic metres. The fields are mostly in Sichuan province and sparsely populated regions in the interior.³³

It is now planning an investment blitz to unlock these vast reserves, convinced it can match the energy revolution under way in the US. Shale gas is seen as an attractive proposition for nations as it offers abundant clean energy or energy with lower carbon intensity, an important aspect when it comes to fixing national goals. But to date, China has not started commercial production of shale gas.

³² KPMG reaction magazine, Seventh Edition, July 2012

³³ China claims world's biggest shale gas reserves, Reuters, 1 March 2012



There is now a growing urgency in Beijing to encourage the development of unconventional energy sources. Shale gas remains an integral part of the overall energy strategy and the government has outlined a plan that will see China producing 60 to 100 billion cubic metres of natural gas annually by 2020 from shale sources.³⁴

To further encourage key players, China has also announced its intentions to open up some shale gas blocks for private companies. That in itself is a major policy change as the USD 7.8 trillion industry was until now mostly restricted to state-owned enterprises.³⁵ Foreign companies, however, are not too enthusiastic over shale gas prospects in China as they are barred from participating in bidding directly for blocks.

Sinopec is in the forefront of developing the unconventional energy sector and is now working on a shale gas project in the Fuling block in Chengdu. It is also in talks with US and Canadian companies to secure stakes overseas. Sinopec is exploring other sources like coal-bed methane, bio-mass energy and clean utilisation of coal, making significant headway in 2011. Coal-bed methane discoveries were made in Yanchuannan, Zhijin and Heshun blocks while shale gas was found in Jiannan (west of Hubei and east of Chongqing) and Yuanba (northeast Sichuan). The first horizontal well for shale oil was drilled in the deeply depressed zone in Biyang Depression in Henan Oilfield.

Role of coal chemicals

While shale gas has turned the world of petrochemicals upside down, another alternative sector, coal chemicals, which is now gaining commercial traction, also has the potential to change the feedstock balance. China has the world's third-largest proven coal reserves, holding 13 percent of the global total, after the US and Russia. While most of the coal is for power production, a fast growing sector is the conversion of coal to a range of chemicals. As of now, the coal sector is connected to

five different chemical supply chains: methanol, olefins, PVC, aromatics and ammonia/urea.

China made an early start in using coal as a feedstock for chemical production. As oil prices steadily increased, it grabbed the opportunity to convert its cheap and plentiful coal supplies to chemicals, constantly looking out for new technologies for converting coal to chemicals.

China's coal chemical technology is almost on par with global companies. There is not much gap between China and other countries when it comes to high-end technology and the experience of running such large projects. The defining factor, however, will be the price of oil in the future. In case of continuing high oil prices, coal chemical plants will make more financial sense. From the environment angle, access to enough water resources will remain an overriding concern,

– **Bill Zheng, Head of business development at Asiachem.**

About six coal-to-olefins (CTO) projects are expected to come on stream by 2016, most supporting the manufacture of polyethylene and polypropylene resins. Another 13 coal-to-chemical projects are at various stages of development.³⁶ To date, most coal chemical projects have targeted the fuel market with products such as synthetic oil, methanol and dimethyl ether (DME), but slowly, units are aiming for higher value-added markets for plastics and fibres. According to AsiaChem, in 2012, the Ministry of Energy listed 15 deep processing coal projects worth RMB 400 billion in investment. Spread over Xinjiang, Inner Mongolia and Ningxia provinces, the projects focus on coal to oil, olefins and natural gas.

Recently, Shenhua Group, China's largest coal producer, went into a 50:50 joint venture with General Electric to

³⁴ Abundant shale gas reserves augur well for China's clean energy dreams, China Daily, 3 Aug 2012

³⁵ Abundant shale gas reserves augur well for China's clean energy dreams, China Daily, 3rd Aug 2012

³⁶ China invents and reinvents coal to chemicals, ICIS, 16 April 2012

form the GE Shenhua Gasification Technology Co. The venture combines GE's expertise in industrial gasification technologies with Shenhua's skill in coal-fired power generation. Coal gasification is a process that converts coal from a solid to a gaseous form through catalysis. The gasified products can be used as fuels, raw materials for chemical products and for electricity generation.³⁷

Zhong Tian He Chuang Energy Co, a joint venture between Sinopec and China Coal Group, plans to build a polypropylene plant in Ordos (Inner Mongolia) based on Ineos Technologies' Innovene PP process. Ineos licensed its technology to the 350,000-ton/year plant that will produce a full line of PP resins, including homopolymers, random copolymers and impact copolymers, to serve the Chinese market.³⁸

Since 2011, however, China has been implementing stricter controls on proliferating coal-to-chemical projects due to environmental and technology concerns. Adopting technology for extracting petrochemicals from the cheapest fossil fuel available poses environmental risks, which is now seen to be in conflict with China's commitment towards cutting its greenhouse gas emissions target.

The Chinese government initially encouraged capital investments, but it struggled to rein them in when the flood of new capacity rolled past demand. Last year, the NDRC centralised approval of these projects, stripping local governments of these powers. A coal-based olefin plant must at least have a 500,000-ton/year capacity, while a 1m-ton/year limit is set for coal-to-methanol, coal-to-methyl tertiary butyl ether (MTBE) and coal-to-liquids facilities. For coal-to-natural gas projects, the capacity must be at least 2bn cubic metres/year, while a coal-to-monoethylene glycol (MEG) plant must at least have a 200,000 ton/year capacity.³⁹

1.4 Bulk to specialties: Product pie changes

China's chemical industry is now firmly in the process of upgrading itself and the demand for more sophisticated chemicals is driving much of the change. The Chinese government will try to rationalise the manufacture of key products like nitrogen fertilizers, agricultural chemicals, chloro-alkaline, sodium carbonate, calcium carbide and vehicle tires. At present, these products are highly concentrated with only six companies generating annual sales revenue of RMB 100 billion. The government plans to allow at least 10 large companies to operate in this segment.⁴⁰

More significantly, the 12th 5YP places special attention on developing organic materials, resins, synthetic fibres and monomers. In China, there is a general oversupply of low-end petrochemical products and a shortage of more sophisticated and higher-valued items. The 5YP aims to increase the output of new materials, specialty chemicals and synthetic materials – all products dependent on imports as of now.

The current 5YP for the chemical industry will gradually weed out companies and industries of low production efficiency and high-energy consumption but will encourage investments in sectors with high-added value.⁴¹ Given this emphasis, commodity chemicals could start to lag specialties in 2012 after strong gains over the last two years. Gains in basic chemicals will slow in 2012, with specialty chemicals experiencing average growth as end-use industries further progress. In 2013 as well, specialties will continue to grow faster than basic chemicals, which is fairly typical as the global business cycle matures.⁴²

Boom in specialties: In China, more than 50 percent of chemical sales come from basic chemicals. As the economy matures, specialty chemicals will grow faster than the industry average. According to the National Bureau of Statistics of China, revenue

37 GE, Shenhua form coal tech venture, China Daily, 11th May 2012

38 Sinopec, China Coal JV plans PP project in Ordos using Ineos' Innovene process, 20 Feb 2012, Petrochemical News

39 China tightens controls on coal-to-chemical projects on risks, ICIS, 14 April 2011

40 CPCIF website

41 China's petrochemical sector growth slows further in Q1, Xinhua, 30 April 2012

42 2012 Forecast, Can growth endure? IHS Chemical Week 2-9 Jan 2012

growth in specialty chemicals was at 21 percent for specialty chemicals but only 7 percent growth for the average chemical industry.⁴³

The Chinese specialty chemicals market saw total revenue of USD 74.6 billion in 2011, representing a compound annual growth rate of 10.9 percent between 2007 and 2011. (Source: Specialty Chemicals in China, 7th May 2012, Market Research Report) A peculiar characteristic of the sector, however, is its intense fragmentation. There are almost 10,000 domestic specialty chemicals companies in China, far more than for any other chemical segment, but they are unable to meet China's demand due to technological lag.⁴⁴ Local specialty chemicals companies are yet to develop their product portfolios adequately to provide complete solutions to customers.

Much of China's demand is met by global leaders such as BASF, Clariant, DSM, Evonik, Rhodia and Wacker, or through imports. As a consequence, the government is promoting a gradual shift towards value-added specialty chemicals sectors – this is also part of a general trend to move away from large-scale, polluting primary chemicals products.

This emphasis is also reflected by the rise in direct investment of foreign specialty chemicals companies. Belgian-based Solvay plans to build a new plant for fluorinated polymers at its industrial site in Changshu, Jiangsu province, in 2012, after the acquisition of French entity Rhodia last September. The project, which is scheduled to be operational in 2014, is expected to need an investment of EUR 120 million. The company's focus will be to manufacture products for end-use markets such as photovoltaic and lithium batteries and will serve the fast growing markets in China for electrical & electronics, wire & cable, automotive, consumer and industrial applications.⁴⁵

Morgan Stanley Private Equity Asia has invested USD 300 million in China's Tianhe Chemicals Group and created a strategic partnership with the specialty chemicals company in order to aid its expansion overseas. Tianhe is China's largest manufacturer of lubricant oil additives that perform functions including friction reduction, cleansing and heat dissipation in motor oil and other lubricants. It also supplies specialist fluorochemicals - commonly used in waterproofing and solvents.⁴⁶

In April 2012, Sinopec SABIC Tianjin Petrochemical Company launched a polycarbonate production complex with a 260,000-metric-ton/year capacity, in the Tianjin Binhai New Area. Demand growth for polycarbonate is the fastest among the top five engineering plastics in China.⁴⁷

Evonik, a world leader in specialty chemicals, is investing EUR 350 million to construct new production facilities in Shanghai and Jilin in north China. In addition, the company broke ground in March on its new organics production facility at its site in Shanghai. It will supply innovative ingredients and specialty surfactants based on renewable raw materials for personal care, household care and the industrial specialties industry.⁴⁸

Swiss specialty chemicals company Clariant is also focused on huge growth opportunities in China. In late 2011, Clariant opened an ethoxylation plant in Daya Bay in Huizhou, Guangdong province, and expects to see double-digit sales growth in China this year.⁴⁹

Pharmaceuticals & fine chemicals:

Within the specialties market, the fine chemicals segment has proved to be especially lucrative, with total revenues in 2011 rising to USD 25.6 billion.⁵⁰

In the pharmaceuticals sector, the fine chemicals market is becoming even more competitive. The main dynamic is the shift of manufacturing to countries such as China and India. The global pharmaceutical outsourcing market is growing, particularly in

43 Specialty Chemicals in China, 19 Oct 2011, Chem Manager

44 Specialty Chemicals in China, 19 Oct 2011, Chem Manager

45 Solvay to invest in Changshu for new plant, 23rd April 2012, China Daily

46 MSPE Asia invests \$300m in China's Tianhe Chemicals, Asian Venture Capital Journal | 22 Mar 2012

47 Sinopec, Sabic joint venture for large scale petchem project in Tianjin, 3rd April 2012, Sinopec website

48 Evonik targets Asian chemicals market, 2nd April 2012, China Daily

49 Clariant looks for sales catalyst as some foreign firms withdraw, 11 Nov 2011, China Daily

50 Specialty Chemicals in China, 7th May 2012, Market Research Report

the fields of highly potent active pharmaceutical ingredients (API) and biopharmaceuticals.

China, along with India, has the fastest growing domestic pharma markets, expected to grow at a CAGR of 14 percent from 2010 to 2015. (Pharmaceuticals: Cover Story, IHS Chemical Week, 6-13 Feb 2012) In fact, China's pharmaceuticals industry output is expected to reach USD 1.57 trillion by 2020, offering great opportunities for development.⁵¹

According to the international healthcare market researcher IMS Health Inc, it forecasts that the market will grow at an average annual rate of 20.1 percent to reach RMB 694 billion by 2015.⁵²

1.5 Industry structure - Moving towards upgrade and integration

The main concern of the 12th 5YP for the chemical industry is to upgrade the sector to meet China's longer-term sustainability and energy saving targets. The government has set new and more restrictive standards concerning the consumption of water and energy, carbon emissions, polluting chemical exhaust and the volume of industrial waste created during petrochemical production processes. Energy consumption at oil refineries will also be lowered. Tighter restrictions will have an impact on enterprises with less efficient manufacturing processes.

According to the China Petrochemical and Chemical Industry Federation, in 2012, the petrochemical industry will focus on technological innovation and new growth points, including new materials, new energy and coal chemical engineering.⁵³

The focus will be on new materials as China enters the next stage of growth by developing high-end equipment manufacturing, energy saving and environmental protection, biomedicine and new energy vehicles. The Ministry of Industry and Information, in its plan released this year, estimates that the

scale of this industry will reach RMB 2 trillion in 2015, with annual growth exceeding 25 percent.⁵⁴

Companies like Dongyue and China Lumena, which have relatively large market capitalisations, will be the new face of the chemical sector. Dongyue manufactures and sells green refrigerants, fluoro-polymers, organic silicone, and chloralkali ion-exchange membranes, and is China's largest manufacturer of Chlorodifluoromethane (HCFC-22) refrigerant and polytetrafluoroethylene (PTFE) polymer. Its core products have a broad spectrum of applications, including the water treatment industry.

China Lumena New Materials, a leading manufacturer, is also engaged in mining, processing and manufacturing of natural thenardite products. The company manufactures and sells polyphenylene sulfide (PPS) products, including resins, compounds and fibres. In 2011, Lumena acquired Sino Polymer New Materials and established itself as an important manufacturer of specialty chemicals.

New demands in advanced polymers, engineering plastics and new materials is forcing the chemical sector to change. Many small and medium-sized mainland enterprises are developing new materials with applications in various industries, such as nanotechnology, superconductivity, and specialty glass. As China's environmental regulations get more stringent, demand for newer, energy-efficient products with wide-ranging applications will rise as will a need for chemical companies themselves to be environmentally compliant.

Industrial parks aid integration

China's determination to meet its energy targets and streamline the chemical sector may be an achievable goal due to the nature of its industrial structure. The country developed a successful model for industrial parks ever since its opening up three decades ago. Alongside multi-functional development zones,

⁵¹ China's pharmaceutical industry to hit 10t yuan, China Daily, 6th July 2012

⁵² The right chemistry for pharma firms, China Daily, 9th Jan 2012

⁵³ Petrochemical industry '11 output to exceed 11tr yuan, Xinhua, 12 Jan 2012

⁵⁴ Stocks that can benefit from the '12-5' Plan for China's new materials industry, South China Research Limited, 27th March 2012

specialised chemical industrial parks have also come into their own, with huge investments flowing into them for more than a decade. Over the years, these investments have sparked off a high-performance chemical industry producing not only basic chemicals, but increasingly fine and special chemicals.

The main goals of the chemical parks had originally been to restructure and improve technological standards in the Chinese chemical industry and promote regional economic development by making investment more attractive to foreign and domestic companies. Now, they are important locations from which the targets of carbon emissions can be met. The traditional parks in Shanghai, Nanjing and Tianjin, apart from those in the coastal region, have consistently been upgraded and serve as platforms to trial new environmental regulations. Chemical industrial parks have been at the forefront of integrating services for eco-friendly use.

Recently, the Shanghai Chemical Industrial Park (SCIP), which is one of the largest modern petrochemical industrial complexes in China,

established the SCIP Natural Wastewater Treatment System. This is a model project for the treatment of industrial effluent and marks the onset of an expanding market in natural water treatment systems in China. AECOM is leading the 74-acre Natural Wastewater Treatment System designed to treat over 6 million gallons per day of partially treated industrial wastewater. It will polish effluent in preparation for recycling water back to the industrial facilities and discharge into Hangzhou Bay.⁵⁵ SCIP also has an 'utilities island' integrating the supply of water, electricity, steam and industrial gases.

Integration is taking many forms. At Jilin Chemical Engineering Economy Park in northeast China's Jilin province, the management is trying to promote a circular economy by integrating recycling within the large-scale petrochemical base. Recycled products such as plastic bags made of coke tins, tissues transformed from varied petrochemical materials and toothpicks made of amyllum, are some of the by-products. The Jilin park houses more than 90 percent of the province's essential production factories for petrochemicals.⁵⁶

Industrial parks – blowing in clean change

Since 15 September 2011, local authorities are required to suspend approval for construction, reconstruction or expansion of projects and activities related to manufacturing or storing dangerous chemicals outside industrial parks, the exception being made for technical reform projects that can save energy and reduce emissions to ensure environmental protection.

The working committee of China Petroleum and Chemical Industry Federation and the Research Centre for Technological Innovation, Tsinghua University, and related research and data collection,

has jointly developed the first chemical industrial park evaluation system in China which was due to commence in June 2012. This system, based on industrial park and industry cluster theories and the Scientific Outlook on Development, includes five areas: comprehensive economic power; infrastructure and facilities; cost of public utilities; environmental protection, energy saving and emissions reduction and independent innovation.

Ma Cong Yue, CPCIF division chief, specializing in chemical industrial parks

⁵⁵ AECOM website

⁵⁶ Recycling park breathes new life into old industry, China Daily, 21st June 2012

Selecting right location

Embarking on a manufacturing green-field investment can be quite a daunting task for an organisation, especially in China. Selection of the right location with a suitable business environment, infrastructure, proximity to suppliers and customers, talent, cost and strategic alignment to the overall China plan are important considerations. KPMG China takes a holistic approach to analyse and recommend suitable options across these evaluation criteria to assist organisations to conduct due diligence and obtain board approval for their investment plan. During the course of our approach, we will conduct key interviews with tenants in the shortlisted industrial zone to ascertain the commitment and 'after-sales' support of the local government.

Apart from the selection criteria, we also develop end-to-end financial models to assess the investment feasibility and financial projections including the comparison of key costs and incentives across the locations. KPMG China can provide a direct ramp-up approach leveraging on our relationships with the provincial, city and industrial zone governments; we are supported by our Centre of Excellence, a research unit to compile and benchmark key market data and cost including past incentives & subsidies given by the government.

Ning Wright, partner, KPMG China, Management Consulting

Chinese companies opt for smarter systems

A significant change which chemical companies in China will see in future is of business process and supporting operating system upgrades. Local companies will have to start leveraging their deep knowledge of the market and customers to develop new systems that go beyond the basic chemical value chain. With MNCs offering customer-tailored solutions based on performance-driven pricing, Chinese firms have a long way to go before they catch up.

A move into providing solutions and services requires a significant upgrade of a company's go-to-market capabilities. It is critical to identify the markets in which companies can sustain leadership. Chinese companies are now beginning to experiment with idea generation, cross-functional and regional cooperation and adopting a disciplined process that holds project managers responsible for strategy execution and portfolio management.

The SOE-dominated petrochemicals industry, where foreign investment is restricted, is trying to upgrade its systems through R&D partnerships. The government intends to harness the relatively strong research capabilities of multinationals as it improves its own domestic industries.

Sinochem Group, one of the largest SOEs, has taken the issue of systems and operations upgrade seriously. Its stated objective is "to organise global resources and market in a smart way," while carrying on constant transformation. In the past, Sinochem Group was a specialised state-owned foreign trade company, with a monopoly over operating and import and export rights of bulk stocks such as oil and fertilizer. Over the years, it has reformed its systems to improve the industrial chains for its major businesses and organise its global resources. Sinochem intends to leverage its market operation and services to take advantage of its "M&A, integration and collaboration" channels. The company has also strengthened its cooperation with upstream and downstream partners at home and abroad by means of stock equity and covenants and is slowly integrating low-carbon economy in its business model.⁵⁷

ChemChina is making safe production a top priority according to its 2011 sustainability report. It has put in place an improved safety management system called SHE, which stands for safety, health and environmental protection. The group based the system on an approach used by Qenos, an Australian plastics maker acquired by ChemChina's subsidiary China National Bluestar in 2008 and adapted the process to meet its own needs. The ChemChina SHE system has 20 elements for safety management that involves all employees, risk control and responsibilities at all levels. ChemChina is also focusing on finding 'hidden dangers' in its production process. It has developed a remote system that can monitor seven major danger points and pollution sources with online video.⁵⁸

⁵⁷ Focus on Transformation of Development Model and Independent Innovation, 8th March 2012, Sinochem Group Website

⁵⁸ ChemChina stresses need for safety in the workplace, China Daily, 4th July 2012

Information and integration

The 12th 5YP's 'Integration of Information and Industrialization' urges the upgrade of ERP systems and also a higher level of sustainability, covering the whole process of purchase, sales and management. We see that most SOEs and private enterprises use different ERP systems in their subsidiaries, which makes it difficult to combine data at a group level.

For the purpose of maintaining sustainable growth, operational efficiency and return on investment improvement, it's necessary for those big players to conduct a series of business transformation and IT construction projects. Lacking large-scale program management experience and difficulty of ensuring vendor delivery quality are the two key areas for them to conduct a

qualified integration and upgrade.

KPMG is one of the companies that provide supervision services for the whole program as an independent third party.

This is also a big challenge for those who want to open the door to overseas business. We can see that the systems are sometimes behind regarding the high speed of business expansion. We are now helping those big players on building up their own 'enterprise based centre' in terms of strategic systems. We also focus on IT management and operation capability after system implementation in the 'post-integration' state."

Philip Ng, partner, KPMG China, Management Consulting

Role of global companies in research and upgrade

Multinational chemicals companies currently represent nearly 20 percent of total FDI in China's chemicals sector. Major players such as Bayer, BASF, Dow Chemical, and Akzo Nobel, who have established bases in China, are changing the nature of their operations. Much of their investment is going into the specialty chemical sector which requires high-end engineering. Companies are working on products ranging from chemical inputs in personal care products to high-performance tyres, pharmaceuticals, food and healthcare.

More importantly, they are changing the way they conduct customer-oriented research. Foreign companies are increasingly investing in R&D and design and development (D&D) operations to better serve the Chinese market. Proximity to customers is essential to ensure innovations are driven by local requirements. As a result, there is a large increase in investment in R&D capabilities in China. The annual number of design and development projects with foreign

investment has risen four-fold since 2003, while the number of new manufacturing projects has declined from 118 in 2003 to just 16 in 2011.⁵⁹

According to Dutch specialty chemical company DSM's research, per capita demand for chemical products in developed economies was five to six times greater than in emerging economies, showing the latter's huge market potential. This awareness has propelled DSM to accelerate its deployment rate in China. In late 2011, it opened its China Science and Technology Center as part of a strategy to be a MNC with a local approach in both the Chinese and Asian markets. The Shanghai Center will be the company's main innovation base in China and form a vital part of DSM's global science and technology innovation network.⁶⁰

In some sectors, foreign companies are being edged out by competitive Chinese manufacturers in the commodity chemicals sector. But they are still well placed to respond to rising Chinese demand while also developing new types of specialty chemicals to serve both global and China-specific markets. In this race to expand in specialty-chemical-related new materials, multinationals are seeking to expand organically and via M&A activity as quickly as they can.

In expanding operations in China, multinationals must grapple with increasingly complex supply chains. Companies originally geared toward export manufacturing are now establishing distribution and sales networks in China and greater Asia. These companies are now planning to integrate pan-Asian facilities and ancillary R&D facilities within the overall manufacturing and distribution footprint. For instance, Qatar Petro Chemical and Exopack Advanced established logistics and distribution facilities earlier this year. Strategies like these offer companies new ways of taking advantage of the market. Also, foreign companies are now more willing to contribute significant intellectual property while executing their growth plans in China.

⁵⁹ Market research by US consultancy group

⁶⁰ DSM Opens Its China Science and Technology Center, DSM Website, October 2011

Solvay, which acquired Rhodia, will combine the R&D facilities of both companies into one world-class R&D centre at Rhodia's campus in Changshu's Xinzhuang Industrial Zone. A new EUR 4-million building will be added to the existing Rhodia research centre with sections dedicated to polymer formulation and processing and will include an injection molding facility for customer trials. The merged R&D campus will also include several state-of-the-art fully equipped laboratories aimed at radically reducing time-to-market product development.⁶¹

Chinese outbound investment seals integration

While acquisitions and partnerships involving multinationals have come to play a central role in the chemical industry, the tide is turning with more Chinese companies going overseas. Local companies have become particularly aggressive in its acquisitions abroad. Outbound direct investment (ODI) is set to soar in the coming years, with double-digit growth rates predicted. It grew 1.8 percent in 2011 from the previous year to USD 60 billion.⁶²

The trend is clear – ODI is on a fast-growth track and this will continue for some decades, mainly due to increasingly appreciating currency, China's large foreign exchange reserves and domestic companies expanding abroad. Asia, Europe and Africa are the top three destinations for China's ODI targets. But since the European debt crisis broke out, Europe has led the growth and will probably continue to do so.⁶³

The government will also shift its direct-investment focus, both foreign and outbound, to quality instead of quantity. The NDRC, in its FDI and ODI development plan for the 12th 5YP, reiterated its intention to bring home advanced foreign technology, talent and management when attracting foreign capital or seeking overseas acquisitions. The government will encourage multinationals to set up regional

centres, R&D centres, procurement and financial management centres. It will also encourage foreign companies to invest in advanced service sectors such as modern logistics, software development, engineering design, consultancy and intellectual property service industries.⁶⁴

More outbound investment means that Chinese companies need to swiftly learn effective post-merger integration or joint-venture management. Strategies for manufacturing, R&D, staff recruitment, talent development, and customer service must be developed that take into account the combination of multiple organisations into an efficient, seamless operation.

ChemChina announced two large outbound deals in 2010-11, each exceeding USD 2 billion. Additionally, large Chinese chemical companies are even considering mid-cap chemical MNCs for acquisitions. Zhejiang Hengyi Group Co, China's largest chemical fibre supplier for the textile industry, will build a petrochemical plant in Brunei with a total investment of USD 6 billion. The project, the largest overseas investment by a privately-owned Chinese firm, is designed to process 15 million tons of crude oil a year and churn out products such as p-xylene and aromatic hydrocarbon.⁶⁵

1.5 Chemical sector in transition mode

The main concern of the 12th 5YP is to meet longer-term sustainability and energy saving targets. The government has set new and stringent standards concerning carbon emissions and is promoting energy-efficient sectors with determination. Those who respond to the challenges early will find opportunities waiting.

Availing this space, however, will not be easy. The chemical sector needs to set its house in order by weeding out low efficiency, high-energy consuming units and focusing on value-added products. Internally, companies must modernise and streamline their operation to be globally competitive

61 Solvay to invest in Changshu for new plant, 23rd April 2012, China Daily

62 ODI growth rates set to increase sharply, China Daily, 1 June 2012

63 Energy sectors remain major focus of China's ODI, 9th Aug 2012

64 Government stresses quality for FDI, ODI, China Daily, 27th July 2012

65 Chinese company invests \$6b in Brunei, Xinhua, 1 Dec 2011

Target identification is key

For large outbound M&A transactions, state-owned companies usually partner with banks or private equity firms for financial integration. Inbound investment has declined due to the financial crisis in Europe. For multinationals, large overseas acquisitions have slowed and internal funding is only available for medium-sized acquisitions. Foreign companies remain concerned about the future trends of the Chinese economy and will take some time to define their China strategy.

As of now, target identification is very slow for Chinese companies

when it comes to outbound acquisitions. SOEs are eyeing high-tech and specialty sub-sectors, along with energy. Chinese companies, these days, are careful not to plunge head-long into big buys and are instead taking up to two years to study the market.

These companies are only going for those specialty sectors which have large application potential in the domestic market, such as the auto sector.

Although Chinese companies have strong acquisition skills, integration

skills are still lagging. KPMG's network can help local companies gain an insight and industry knowledge about target companies.

Local markets may not always be transparent and KPMG can provide financial and business insights. We can help domestic companies look for sector differentiation while picking up targets for acquisition, be it South America or Africa for resources or Europe and US for technology.

Rainbow Wang, partner, KPMG China, Transaction & Restructuring

and invest more in R&D to make products tailor-made to the local market. Chinese companies are also pursuing overseas investment in a strategic and planned manner, intent on taking advantage of weakness in the European economy. Overseas acquisitions will give them access to more sophisticated product lines which can be harnessed to meet demand back home.

China has gone through several development phases in the past three decades. Initially, the focus was to

show the world how big a market it is; it then turned itself into the 'factory of the world' to become a productive manufacturer and a strong competitor. Foreign companies were invited to set up production bases, and now, in this crucial transitional phase, Chinese planners have realised the need to create a base for innovation and a green economy. Central to the growth and profitability of chemical companies will be their ability to derive opportunities from this new age-of-sustainability model.



China chemical industry: Building business value through sustainability

2.1 Chemical industry on revised growth path

The chemical industry is fundamental to turning the vision of sustainability into reality and is at times better placed than any other sector to tackle environmental challenges. Due to its deep integration in the supply and value chains, the onus often falls on the industry to manage chemicals safely throughout their life cycle and translate research and innovation into action, while making businesses fundamentally viable.

Ever since the path-breaking Rio Earth Summit of 1992, there have been drastic changes to the world business environment. A KPMG report in April 2012, 'Expect the unexpected – Building business value in a changing world', highlights how the human and environmental footprint of industry sectors has been growing at an unsustainable rate and some sectors could even lose profits through exposure to external environmental costs. Business leaders in the chemical sector, however, are uniquely placed. Not only can they adopt strategies and structures that minimise environmental footprint, but actually provide solutions to the industrial and consumer world to move towards sustainable solutions.

The concept of sustainable chemistry is thus becoming increasingly strengthened in the developed world – involving a wide range of stakeholders from the scientific community, corporations, public authorities and environmental and consumer advocate associations.⁶⁶ China, which has taken the first steps to adopt sustainability as an industrial model, has a long way to go, but there is reason for optimism because of the scale and swiftness with which change can occur here.

Sustainable chemistry: From global to local

For the chemical sector, this is perhaps the most appropriate time to accelerate adoption of 'sustainable chemistry' models, while working out value-creating business strategies that factor in sustainability.

'Sustainable chemistry' is commonly defined as, "the design, manufacture and use of efficient, effective, safe and more environmentally benign chemical products and processes. Within the broad framework of sustainable development, government, academia and industry should strive to maximise resource efficiency through activities such as energy and non-renewable resource conservation, risk minimisation, pollution prevention, minimisation of waste at all stages

⁶⁶ German Federal Environment Agency website



of a product life-cycle, and the development of products that are durable and can be re-used and recycled.”⁶⁷

The evolution of sustainable chemistry into a business model, however, is extremely challenging and time-consuming, requiring collaboration between international bodies and governments at the macro level, a change of mind-set at the corporate level and their commitment to micro-manage sustainability along the value chain and communicate effectively with the last stakeholder at the consumer level. All the while, the challenge for chemical companies remains identifying opportunities from the sustainability agenda set by governments and regulations and converting them to meet product demand.

Regulatory framework defines direction

The architecture of sustainable chemistry involves, first and foremost, good monitoring systems and effective regulations and efforts to minimise risks related to the use and release of chemicals.

Over the last four years, the regulatory landscape has evolved substantially worldwide, but it is far from being standardised. While regulatory instruments are purely voluntary at the global level, at the national level, a network of voluntary and increasingly mandatory legislation and reporting standards are being put into practice.

A voluntary, yet critical, element in moving towards sustainable chemistry is the European Chemicals Regulation (REACH), which emphasises transparency in information about chemicals and the importance of identifying risks from chemicals and making the knowledge public. These requirements apply in particular to annual production volumes of 10 tons or more per producer and importer.

In its first ever sustainability report, released in May 2012, the European Chemical Industrial Council (CEFIC) declared the intent of the European

industry to play a key role in ensuring that by 2050, over 9 billion people live with clean water, food and sustainable energy, within the resources of the planet.⁶⁸ The CEFIC report provides 17 key performance indicators that serve as a benchmark of industry sustainability efforts that the sector plans to measure itself against in the future. The 70-page document lists three pillars of sustainability – planet, people and profit – which need to be addressed in a holistic manner.⁶⁹

The role of governments, however, in promoting mandatory regulation cannot be understated, but the emerging trend is an emphasis on combining the voluntary and mandatory approaches. The challenge for governments is to determine the appropriate minimum level of mandatory requirements.

China regulation evolves to set industry standards

There is wide recognition that international regulatory standards need to be followed worldwide as environmental degradation is a complex problem involving local governments, businesses and communities. China, as one of the world's most industrialised nations with a maturing consumer base, has made efforts to refine its laws and regulations to achieve a balance between environmental pressures and business viability.

A number of laws enacted over the years have had wide ramifications for business, especially the chemical sector. Enlightened and strengthening legislation over the years has compelled companies to be more compliant, weave in risk factors into their cost model, provided growth opportunities and helped improve reputation.

One of the most comprehensive legislation in recent years is the **Circular Economy Promotion Law**, which became effective from 1st January 2009. Meant to encourage sustainable economic development, the law when fully implemented, will have a profound impact on foreign-invested companies and the

⁶⁷ OECD website

⁶⁸ CEFIC Sustainability Report, 2012

⁶⁹ Chemicals policy and pollutants, REACH, Sustainable chemistry, 17 April 2012

entire Chinese economy. 'Circular economy,' specifically refers to "reducing consumption, reusing products or components and recycling activities conducted in the process of production, circulation and consumption." This mandate must be factored into industrial, economic and social planning at every level of government and its impact is expected to be felt at every stage - from water use in public and private spheres to planning of industrial parks.⁷⁰

The **Energy Conservation Law**, first promulgated in 1997, and later amended in 2008, helped initiate a system of accountability making local governments and officials responsible for energy conservation targets and energy evaluation. The amended **Energy Law** was intended to be the basic law to guide and co-ordinate other laws in China's energy sector, covering all forms of primary energy including coal, oil, natural gas, renewable energy and nuclear energy as well as secondary energy such as electricity, thermal power and petroleum products. It also defined 'new energy', 'renewable energy', 'clean energy', 'low carbon energy' and 'high carbon energy', setting the paradigm for a sustainable economy.⁷¹

China has consistently fine-tuned and amended its laws, making them relevant to changing industry status. The **Renewable Energy Law** of 2005, was amended in December 2009, to address the gaps in producing and transmitting renewable energy. The 'mandatory connection' policy required grid companies to connect and purchase all renewable energy generated. This policy, however, remains mired in complexities. The second aspect of this law is aimed at streamlining the renewable energy fund that provides financial incentives for the renewable energy industry. China has instituted feed-in tariffs for a variety of renewable energy technologies to compensate grid companies for the additional cost of purchasing this expensive energy source. The incentives regime has

often acted as a catalyst for the sector, helping boost demand.⁷²

More far-reaching regulations like the **Ozone Depleting Substances Regulation** has had significant impact on industries. In June 2010, China enacted ODS Regulations that would control over-consumption, trade, import, export and production of ozone depleting substances. It has imposed annual quota limits for ODS producers and consumers. Servicing firms and recovery and recycling businesses must register with their local or Provincial Environmental Protection Bureau.

The latest amendment to the **Clean Production Promotion Law**, which came into force on 1st July 2012, will be a landmark step towards upgrading industries. Under this law, "production technologies, processes, equipment and products which waste resources and seriously pollute the environment will be phased out within a stipulated period." Various government departments will have to prepare and release such lists to enable implementation. Strict regulations have also been issued regarding packaging of products, directing enterprises to reduce waste and avoid excessive packaging. The ruling will have long term impact on the polymer industry as grades used in packaging will need to be compliant.⁷³

Under this broader framework, the chemical industry was brought under greater scrutiny and regulation. In 2011, the government decided to limit the construction and expansion of chemical plants and launch a nationwide safety campaign to target all enterprises involved in the production and use of hazardous chemicals. In a notification, it said that the Ministry of Environmental Protection (MEP) will no longer accept applications for any new projects related to the production and storage of hazardous chemicals outside industrial parks from 15 September 2011.⁷⁴

70 China Law Update

71 China Environmental Law Initiative

72 China Environmental Law

73 Ministry of Environment website

74 China MEP to restrict the construction of chemical plants and launch a nationwide inspection, 16 Sept 2011, REACH Website

In late 2010, authorities beefed up the chemicals management system with a revised version of 'China REACH', affecting all production activities and the import and export of new chemicals in China. The regulation expands China's existing regime for new chemical substances by increasing the volume and complexity of data that must be supplied to the authorities before import or production. The revised 'Regulations on the control over safety of hazardous chemicals (Decree No. 591)' came into effect on 1 December 2011, incorporating more reforms and stringent enforcement provisions from the Chinese authorities.⁷⁵

Higher environmental standards for chemical plants near water bodies and harsher penalties for those who break the law are becoming increasingly important. In June 2011, the State Administration of Work Safety announced that they would prioritise and strengthen inspections of companies which manufacture, store, sell or use chemicals contained on the list of hazardous chemicals. Chemical companies doing businesses in/with China need to pay more attention to regulatory compliance as enforcement of chemical legislation becomes stronger. These recent developments in chemicals management regulations have undoubtedly created more challenges for foreign chemical enterprises involved in the Chinese market, but the development is a positive one. European regulatory standards, although crucial, cannot remain a stand-alone experience, as the complexity and scale of environmental degradation needs to be handled in every part of the globe.

2.2 Sustainability in China – Managing risks, enabling growth

In an increasingly globalised economy, sophisticated international regulation can be effective only when implemented and integrated at the ground level. Over the past few years, China has strengthened regulation, compelling industries to assess the risks associated with flouting environmental norms. It has started

to embrace green economics, further encouraging companies to embed sustainability concerns into their long-term business plans.

So far, efforts to transform the Chinese economy from its growth-driven frenzy into a sustainable model remained a top-down approach, scripted by grand blueprints. The onus of sustainability cannot remain with the government alone and companies in China need clear-cut strategies to ensure future growth. Within the sustainability paradigm, at one level, companies must have well-laid out risk assessment and management strategy to build a safe operating environment for their business. At another level, sustainability itself provides tremendous growth opportunities for the long term, which chemical companies must identify and work on.

The Chinese government's target-oriented planning is likely to unleash an unprecedented wave of demand for 'green products'. As newer forms of end-use demand grow, the chemical sector will need to find ways to harness these opportunities, while minimising their own roles as contributors to environmental degradation. Chemical companies thus find themselves uniquely placed in China – as key players and beneficiaries of the sustainability agenda.

a. Risk management – key strategy in sustainable development

For chemical companies, the framework of sustainability as a business model starts with assessing, managing and minimizing risk. Each company, with the help of internal and external experts, must analyze and assess for itself the risks involved in operating a business in a particular country – both at various levels. At the macro level, the regulatory framework is vital to risk assessment. China has so far been able to identify and characterize the hazards and risks associated with the chemical sector and identified appropriate preventive measures, penalties and incentives.⁷⁶ This has set clear parameters for

⁷⁵ 'China's chemical regulatory innovations' paper by Olivia Sun presented at the 2012 GlobalChem Summit, US, 13 March 2012

⁷⁶ Priorities in chemical risk assessment and management in China, UNEP, ILO, WHO

foreign and domestic companies in China to work out their risk assessment and management goals.

Over the past few years, China has worked closely with the European Union. China has reformed its regulatory framework for managing the risks posed by chemicals. Its current regulations, measures and guidelines cover hazardous chemicals and the testing and registration of new chemicals. It has also developed a far more comprehensive national policy, legislation, law enforcement and made efforts at public participation and worked closely with the European Union to reform standards, procedures and legislation integrating it into China's regulatory framework.⁷⁷

For any risk assessment, companies must work around the fine prints of relevant regulations and guidelines. For instance, the Circular Economy Promotion Law identifies 'key enterprises' in industries (such as steel and coal) that use large amounts of energy or water and put them under special supervision and administration. The law also mandates regular publication of a catalogue listing techniques, materials, equipment and products that are 'encouraged,' 'restricted' and 'eliminated.'

In addition, enterprises have to wade through a complex criss-cross of laws and regulations enacted over years. Chemical companies have to be cognizant of the Energy Law (amended 2008) which encourages foreign investment in developing clean and alternative energy, yet it is important for them to assess other regulations like Renewable Energy Guidance Catalogue and a Catalogue for the Guidance of Foreign Investment Industries (Revised 2007) to ensure the target investment is indeed 'encouraged' and is not 'prohibited' or 'restricted.'

Companies must also acquaint themselves with legal liabilities. For instance, under the Circular Economy Promotion Law, enterprises that produce or sell prohibited equipment or products can be fined anywhere

between RMB 50,000 to RMB 200,000. In case of 'serious' violations, businesses can be shut down.

Businesses that import prohibited materials or equipment may be fined as much as RMB 1 million, with a minimum fine of RMB 100,000. The law also provides for a variety of other fines and the possible revocation of business licenses.

The more benign aspects of the law include incentives to foster development of sustainable economy. The circular economy law encourages provincial and municipal governments to establish funds to support development of sustainable economy, including funds for research and development of new technology and information products. Tax preferences are given to industries and activities that promote the conservation of energy, water and materials.

Chemical companies in China have worked out elaborate and innovative strategies to assess and mitigate risks. Dow Chemicals has extended its 'product safety and risk management' strategy to China. According to the company, "Risk management refers to the steps taken to prevent adverse effects of a chemical, taking into account societal values, legal requirements, and the costs of the control option." Dow requires industrial workers to wear personal protective equipment to prevent exposures; ensuring proper ventilation at workplace to reduce exposure; providing warning labels to inform users about potential effects of working with a product; mandating air permits or water permits to reduce releases from industrial facilities, among others.⁷⁸

BASF too has an extensive strategy for risk assessment and mitigation. It is focused on compliance, environmental protection, health and safety and adherence to these standards are monitored by different systems and checked by internal and external audits. The main areas of sustainability and risk management include product safety, climate and energy, water, human and labor rights, human capital

⁷⁷ Towards 2020, Making chemicals safer, 2009 European Commission
⁷⁸ Dow Chemicals website

development, biodiversity, renewable resources and sustainable products.

BASF has taken risk management further by going beyond company borders. It has involved supplier and external stakeholders in its sustainability standards. Based on risk matrices, BASF evaluates and audits new and existing suppliers. Business partners, especially agents, distributors and contractors are subject to compliance checklists with transparency in communication.⁷⁹

For Akzo Nobel, risk management is a key strategic process and an essential element of corporate governance. Its risk management framework has provision for higher risk appetite and is tackled from strategic, operational, financial and compliance platforms. Strategically, Akzo Nobel is willing to take considerable risk related to growth, innovation and sustainability. Although return on investment may be slow and uncertain, the company says substantial funds go into research, development and innovation. With respect to operational risks, the company engages in high safety standards, employee engagement and talent development. It opts for prudent financing strategy and strict cash management policy and gives high priority to compliance issues, with zero

tolerance policy for breach of its 'code of conduct.' (Risk management - Akzo Nobel report 2011)

Risk assessment and its mitigation is a continuous process - dealing with current threats, as well as identifying emerging risks. Companies use internal and external expert teams to isolate and identify risk scenarios and work with the management to incorporate it within the business planning and review cycle. Typically, a chemical company faces macro risks like weakening economic climate and high raw material prices which can be managed through comprehensive plans to improve performance in the areas of supply, sourcing and margin management.

b. Ambitious green economy plan spawns growth opportunities

The 12th Five Year Plan - 5YP (2011-2015) calls for total transformation of China's economic structure while tackling sustainability at two levels. At the preventive level, it incorporates new limits on energy consumption and sets targets for reducing pollution and carbon emissions. On the proactive level, China is making heavy investments to promote a green economy through products, clean technologies and renewable energy.

The chemical industry is pivotal to ensuring that the goals of sustainability in China are met effectively. Besides managing and regulating the intrinsic hazards of the industry, developments in four major sub sectors – energy, construction, water sustainability and transportation – are likely to shape the growth trajectory of the chemical industry as a whole. Innovation portfolios of major companies operating in China are now designed to address these emerging opportunities by offering solutions for some of the most pressing needs arising out of urbanisation and climate change.

Local protection of human health & environment – By 2015, Dow will achieve on average a 75 percent improvement of key indicators for EH&S operating excellence from a 2005 baseline.

Chemical companies set sustainability targets

The Dow Chemical Company (Dow) has set strong sustainability goals for 2015 in 2005. According to Dr. Dong Lingzhen, Asia Pacific EHS and Sustainability Director, Dow, the company's 'Sustainable Chemistry – by 2015' commitment aims to increase the percentage of sales to 10 percent for products that are highly advantaged by sustainable chemistry.

Breakthroughs to global challenges – The company is committed to achieving at least three breakthroughs by 2015 that will significantly help solve global challenges. On June 25, Dow announced their 1st breakthrough.

Addressing climate change – Dow will maintain absolute greenhouse gas emissions below 2006 levels.

Energy efficiency & conservation – Dow will reduce energy intensity by 25% by 2015 – from a 2005 baseline.

Product safety leadership – Dow will publish product safety assessment for all products by 2015.

Contributing to community success – By 2015, achieve individual community acceptance ratings for 100% of Dow sites where we have a major presence.

Emission targets spell growth and risks

The 5YP lays out a series of targets aiming to instill sustainable development practices into domestic industries. By 2015, China will slash domestic energy consumption per unit of GDP by 16 percent, and carbon dioxide emission per unit of GDP by 17 percent, from 2010 levels. It also intends to cut carbon intensity by 40-45 percent from 2005 to 2020 as part of a longer-term plan.⁸⁰

Other goals include efforts to reduce major pollutant emissions, such as heavy metal and chemical waste from manufacturing processes, by around 8-10 percent.⁸¹ The plan has made energy-guzzlers in China, including steelmakers and coal-fired power plants, scramble to reduce emissions to avoid having their business licenses revoked by the government.

Ambitious targets aimed at reducing the carbon footprint is a very pressing risk factor for Chinese companies. Sinopec is re-working its energy mix trying to increase unconventional and renewable resources, upping investment in unconventional hydrocarbon resources like shale gas and coal-bed methane, bio-mass energy and the clean utilisation of coal. It has signed up for the major pollutants discharge reduction target and has tightened environmental protection regulations. The company is trying to integrate R&D capacities with

four waste gas control projects and five flagship projects focusing on waste water treatment, among others.⁸²

New energy and emerging industries: China is building its renewable energy architecture with specific targets and heavy investment. It plans to increase non-fossil fuels in overall primary energy use from the current 8 percent to 11.4 percent by 2015, making it an important growth driver for chemical companies providing energy efficiency solutions.⁸³

According to revised targets set by the National Energy Administration (NEA) in 2012, renewable energy – including solar, hydro, wind, geo-thermal power – would account for more than 9.5 percent of the country's total energy consumption by 2015.⁸⁴ In fact, with China's solar energy sector surging ahead, the NEA revised its 2015 target for installed solar power capacity to 21 gigawatts (GW) from 15 GW in 2011.⁸⁵

It is estimated that the transition to a global green economy may generate a market exceeding USD 1 trillion by the end of the 5YP period.⁸⁶ The State Council last year earmarked seven strategic emerging industries - energy saving and environment protection, next-generation IT, biotechnology, high-end manufacturing, new energy, new materials, clean energy vehicles – as core to China's new growth model, with these sectors expected to account for 8 percent of China's GDP in 2015 and 15 percent by 2020.⁸⁷ In May 2012, the State Council planned to launch 20 major projects related to these seven industries, the details of which are pending.⁸⁸

Environment market and chemical end use demand: Since 2009, China has invested nearly USD 50 billion annually in the renewable energy sector as the combination of industrial pollution and increasing urbanisation grew alarmingly. The 5YP estimates that about RMB 3.4 trillion in investment will be needed to fund environmental protection efforts until 2015.⁸⁹

Renewable energy development targets by 2015 Chemical sectors affected (a sample)		
	2015	2009
Hydropower capacity (GW)	260	196
Pumped storage hydropower capacity (GW)	30	N/A
On-grid wind power capacity (GW)	100	17.6
Solar power capacity (GW)	21	0.16
Biomass power capacity (GW)	13	1.09
Geothermal, tidal power capacity (MW)	110-120	28.1
Ocean power capacity (MW)	50	N/A

Source: National Energy Administration

80 Government funds green purchases, 17th May 2012, China Daily

81 12th Five Year Plan hailed as 'greenest FYP in China's history', China Briefing, 5 April 2011

82 Sinopec sustainability report, company website

83 12th Five Year Plan hailed as 'greenest FYP in China's history', China Briefing, 5 April 2011

84 China hikes 2015 solar power target by 40 pct, Reuters, Aug 8, 2012

85 China hikes 2015 solar power target by 40 pct, Reuters, Aug 8, 2012

86 China set to vigorously develop green economy, Renewable Energy World.com, 1 Feb 2012

87 12th Five Year Plan, China Water Risk Website

88 China boosts strategic emerging industries, 30th May 2012, Xinhua

89 Swedish firms tap China's green tech market, China Daily, 25th April 2012

In order to boost demand for environment friendly products, China will provide financial subsidies to the tune of RMB 26.5 billion (USD 4.2 billion) to encourage consumption of energy-saving products, mainly automobiles and household appliances. The subsidies will be available for household appliances including air conditioners, refrigerators and washing machines for one year. Of these subsidies, RMB 6 billion will be used to promote use of energy-saving vehicles with engine capacities of 1.6 litres or less, and RMB 2.2 billion to subsidise energy-conserving light bulbs and LEDs.

With this amount of public investment, China's environmental protection industry is expected to continue growing at an average of 15 to 20 percent per year, and its industrial output is expected to reach USD 743 billion, up from USD 166 billion in 2010. The multiplier effect of this emerging sector is estimated to be 8 to 10 times larger than other industry sectors.⁹⁰

Chemical companies are already launching plans to ride the wave of China's energy efficiency drive. For instance, Air Products & Chemicals,

a US industrial gas producer, plans to invest up to USD 880 million in China in 2012 and unveiled two large-scale gas-processing plants late last year. It will bring its most advanced technologies, including those that can 'capture' carbon dioxide, to China and help local companies reduce emissions.⁹¹

Construction makes space for green products

China's frenzied urbanisation has rendered sustainability a tremendous challenge, but there is hope that construction of megacities will throw up opportunities as well. Global boomtowns are known to generate green innovations, and given China's ambitious target of reaching a 70 percent urbanisation rate by 2030, it is imperative for urban life to be more energy efficient.

Over recent years, Chinese planners have shown enthusiasm for adopting green practices in urban life by improving upon regulatory practices. The focus has gradually shifted from pollution control to framing mature regulations and providing incentives for sustainable urban construction. This shift in focus can have tremendous implications as the building sector

⁹⁰ China set to vigorously develop green economy, Renewable Energy World.com, 1 Feb 2012
⁹¹ Air Products to invest \$880m in China, 16th Dec 2011, China Daily



alone accounts for 40 percent of all energy consumption and greenhouse gas emissions worldwide.⁹²

The Chinese government, in its own study, has estimated that its construction sector will possibly account for more than 30 percent of total social energy consumption by 2020, becoming a major energy user.⁹³ This number can be effectively lowered by investing in 'green buildings'. The Ministry of Finance and Ministry of Housing and Urban-Rural Development set a target in May 2012 that 'green buildings' should account for 30 percent of new construction projects in China by 2020.⁹⁴ This target, if implemented, would leverage a green market worth trillions of Yuan, as developing energy-efficient buildings would also effectively drive the growth of new chemicals, special polymers, building materials, new energy and related service sectors.⁹⁵ Despite the uncertainties of China's property market, chemical companies have been investing in developing construction chemicals geared toward sustainability.

Products including concrete additives, insulation materials and pigments help in reducing energy use of buildings. Since 2008, BASF has tracked the energy-saving targets and guidelines of the government and worked on its products accordingly, by launching insulation technologies such as polyurethane foam for roof and exterior walls as well as double-glazed polyvinyl chloride framed windows and energy-saving flooring systems.⁹⁶ Dow Building & Construction too has come up with elastomeric reflective roof coating solutions to achieve a 25 percent reduction in energy consumption. These coating materials are effective in reducing energy cost and reducing the urban heat island effect.⁹⁷

Water sustainability: A major growth driver

Over the past ten years, China has made massive efforts to tackle its severe water pollution and scarcity

crisis. More than 300 million rural Chinese lack clean drinking water because of polluted waterways—over half of China's major rivers and lakes, and 35 percent of groundwater supplies are undrinkable as of now.⁹⁸

Traditionally, China's water policy has focused almost entirely on flood control. Water conservation and the need to protect the environment appeared on the policy agenda only in the early eighties and as the crisis deepened, water management and conservation got more attention. The 5YP tackles the problem more extensively, stressing on elaborate investment in water infrastructure and construction of water conservation structures, improved irrigation and clean-up and treatment of water bodies. It also proposes accelerating the construction of wastewater treatment and recycling pipes and stringent water management systems.⁹⁹

China's State Council has approved plans to spend USD 536 billion on environmental protection before the end of 2015, of which USD 60 billion will go on urban wastewater systems, including re-use.¹⁰⁰ Significantly, the 5YP, for the first time, puts the spotlight on reducing water pollution in non-urban areas. During this period, wastewater treatment coverage should rise to 85 percent nationwide. Larger, more developed cities will be required to attain treatment rates of 90 percent, while smaller cities and towns need to reach 80 percent.¹⁰¹

This opens up new demand regions for the chemicals sector. The market for specialty chemicals and services in water treatment in China is worth USD 8-10 billion a year and leading producers have set aggressive growth targets for water treatment chemicals and services.¹⁰² Moreover, this sector is not subject to cyclical booms and busts and growth rates are likely to remain above industrial and GDP growth rates.

92 Chemical firms increase investments in green construction, January 2010, ICIS

93 Tackling Sustainability in China, 13 Jan 2012, Policy Innovations Website

94 China to boost construction of green buildings, 7th May 2012, Xinhua

95 China to boost construction of green buildings, 7th May 2012, Xinhua

96 BASF China website news

97 Dow Construction Chemicals Asia Pacific Website, Dec 2011

98 Chemical Insight & Forecasting: IHS Chemicals

99 China Water Risk Website

100 Five years to clean up China's wastewater, January 2012, Global Water Intelligence

101 Five years to clean up China's wastewater, January 2012, Global Water Intelligence

102 Water treatment: Scarcity and sustainability drive growth, Chemical Week, 16-23 Jan 2012

BASF, a leading provider of water treatment chemicals, expects strong growth and is adding capacity in China with the production unit at Nanjing Chemical and Industrial Park expected to be fully operational by end of 2012. The unit will produce quaternised-cationic monomer and cationic polyacrylamide flocculants used in water treatment.¹⁰³ Dow Chemicals has ambitious sustainability targets and is attempting to reduce desalination costs by 35 percent by 2015.

Advanced polymers ride on smart transport wave

Urban transport will have a great impact on sustainable development. China is now the leading producer of motorised vehicles, but in the long run, this may turn out to be counter-productive as riders are a significant contributor to pollution. Although the auto sector is an important pillar industry, there is also a strong political will to encourage energy saving via environment-friendly transportation.

The 5YP has earmarked electric vehicles as a sector to be promoted intensely. A new industry development plan for energy-saving and new-energy

the promotion and high-end research related to lithium batteries and battery materials.¹⁰⁵

Chery Automobile, one of China's largest auto manufacturers, has tied up with SABIC Innovative Plastics for advanced materials solutions that raises fuel efficiency through weight reduction.¹⁰⁶

China has also been promoting public transport in successive five-year plans. Subway construction, high-speed rail network and bus rapid transit systems are high priority in many large centres. Analysts expect a boom in China's railway equipment manufacturing industry in the coming years, along with demand for advanced materials.¹⁰⁷ Companies such as Dow Corning see tremendous potential ahead. Dow Corning provides silicone structural sealants that help make the Shanghai Metro's platform screen doors more effective and energy-efficient. Its weather-proofing sealants also reduce the amount of energy consumed by the environmental control system, including heat in winter and air-conditioning in the summer at metro stations.¹⁰⁸

2.3 Four-fold strategy to build sustainability management model

In the long run, the environment market in China will see quantum changes and what the chemical industry does now will set the tone for its future growth. The sector is grappling with ambitious goals set by China's planners and must find ways to leverage the opportunities generated by sustainability targets, while handling new and emerging risk factors.

To be successful in this complex market and achieve growth, companies need to internally restructure their organisations to integrate sustainability into core business practices. For this, they will have to execute strategies in line with its business costs and targets and establish a series of KPIs (key performance indicators) to achieve results.

Sustainability risk and opportunity assessment

KPMG can assist in identifying and prioritising sustainability risks and opportunities, developing responses and related implementation plans, and providing recommendation on integration with existing systems.

Sustainability management maturity assessment

KPMG can assist in assessing the current state of your sustainability management practices, identifying gaps with where you want to be and providing prioritised improvement recommendations.

vehicles has set a production and sales target of 500,000 all-electric and plug-in hybrid vehicles by 2015 and more than 5 million by 2020.¹⁰⁴ China intends to become the biggest producer of new energy vehicles by 2020. In 2011, China announced a grant of RMB 100 billion specifically focusing on

¹⁰³ BASF Website

¹⁰⁴ More green cars needed, China Daily, 24th April 2012

¹⁰⁵ Fourth annual China clean energy vehicle-green transport summit, 2011)

¹⁰⁶ SABIC Innovative Plastics helps Chery take the fast lane to the global auto market, Case Study, SABIC website

¹⁰⁷ China Plans 40,000 km high-speed rail network by 2015, 25th July 2012, RTI News)

¹⁰⁸ Dow Corning website news, July 2012

A four-pronged strategy that includes product innovation, stakeholder responsibility, supply chain management and sustainability reporting may be the winning formula for chemical companies in China to achieve their next stage of long-term growth.

a. Enabler's role with product innovation

The chemical industry plays its biggest and most important role as 'enabler' of a sustainable economy with its product innovation skills. While sustainable development means achieving a balance between people, planet and profit, for the chemical industry, the most fundamental element remains 'products.'

Innovative products and initiatives from the chemical industry will play a crucial role in addressing the challenges the world faces today, and in helping provide solutions to those that lie ahead.

Renewable or green chemicals and renewable energy form the core of the evolving carbon economy. Enlightened regulations and customer demand for green products are major catalysts driving the global renewable commodity plastics and chemicals market.¹⁰⁹ Most products of the consumer industry, from household goods, through medical appliances or electronic devices to automotive parts, could only be developed on the basis of product innovation by the chemical industry.

The potential for 'green plastics' is high in China and companies are focusing on advanced polymers and materials with niche applications. Some of the commodity polymers and their renewable counterparts which will see demand growth are high-density and linear low-density polyethylene, polypropylene, polystyrene, polyester fibres, polyethylene terephthalate (PET) bottle resin.¹¹⁰

Other examples include polycarbonates, which have become the basis for optical storage media. Liquid crystals make flat-display

technology possible and companies such as Bayer have seen an increasing demand for energy-efficient solutions provided by its LED technology.

In the energy market, generation and storage of renewable energy will be the fastest growing segment for the next 20 years. DuPont is a critical player in the solar industry and its materials have set new photovoltaic (PV) industry standards around the world. Patented products are said to have doubled the efficiency of solar modules over the last decade. DuPont spent USD 2 billion in 2011 on R&D, a significant portion of which is focused on reducing global dependence on fossil fuels through advanced materials and technologies that improve efficiency, lifetime and cost-competitiveness of solar energy.

Evonik, a leader in specialty chemicals, broke ground on its new organics production facility in Shanghai in early 2012. The plant will supply innovative ingredients and specialty surfactants based on renewable raw materials for personal care, household care and the industrial specialties industry. Evonik is also expanding its research and development center in Shanghai with an investment of EUR 23 million, focusing on developing materials which can be used by Chinese manufacturers of fuel-efficient vehicles. Evonik will also spend more than EUR 350 million to construct new production facilities for specialty chemicals in China, to be operational in 2014.¹¹¹

BASF and Sinopec are working on the feedstock end of next-generation materials. The two have signed an MoU to explore the possibility of building a world-scale isononanol (INA) plant in Maoming, China. INA is used as the feedstock for production of next-generation plasticizers such as diisononyl phthalate (DINP) and non-phthalate plasticizer Hexamoll DINCH. DINP is widely used as a plasticizer in industrial applications such as automotive, wires and cables, flooring, building and construction while Hexamoll DINCH is the plasticizer of choice for sensitive applications.¹¹²

¹⁰⁹ IHS Chemical Renewable Commodity Plastics - Mapping a Sustainable Market

¹¹⁰ IHS Chemical Renewable Commodity Plastics - Mapping a Sustainable Market

¹¹¹ Evonik targets Asian chemicals market, 2nd April 2012

¹¹² BASF and Sinopec sign MoU to explore building a world-scale isononanol plant in Maoming, 31st July 2012, BASF website news

AkzoNobel : Sustainability through products

Strategy and planning:

Sustainability is now a top priority while framing management strategy at AkzoNobel, China. In September 2010, AkzoNobel announced a new 'Value and Values strategy' encompassing stakeholders, financials, safety performance, eco-efficiency improvement and products. Going forward, these ambitions will form the basis of AkzoNobel's reporting culture and further development of the local market.

Production: AkzoNobel China's sustainability theme is reflected in its products, which have strong impact on reducing energy consumption; caring for customers' health and working environment; reducing carbon footprint and wastage, etc.. The company makes a wide range of paints, coatings and specialty

chemicals. As of 2011, AkzoNobel owned 29 manufacturing facilities, including the €370 million Ningbo multi-site, an innovation center, a service center and a nationwide network of sales offices in China. These operations are supported by a team of 7400 people. AkzoNobel sees long-term demand by customers for sustainable solutions; innovative technologies that help reduce the use of raw materials and simplify manufacturing processes.

Developing the value chain:

- Research, development and innovation - Each business unit will implement the global sustainability framework with China specified strategy. AkzoNobel continues to invest in environmental-friendly products in future.
- Investment decisions –

Sustainability is a constant consideration factor in investment decisions.

- Sourcing – The company educates and monitors suppliers on sustainability performance and capability to influence consumers to choose environment-friendly coating materials.
- Manufacturing - AkzoNobel prioritizes sustainability during the entire process from manufacturing to distribution.

AkzoNobel has an edge over competitors because:

- Sets an example before suppliers
- The company makes itself responsible for the claims it makes

Dr. LIN Liang Qi – president of AkzoNobel China

b. Stakeholders extend sustainability dialogue

The chemical industry's products and services play a crucial role in addressing environmental concerns by providing sector-wise solutions. An important aspect of this is conducting stakeholder dialogue at every level. Externally, joining forces with stakeholders ranging from governments, suppliers, vendors, to local communities and customers in order to communicate a company's beliefs and targets is an essential part of operations these days. Internally, communication flow between shareholders, directors and employees is also becoming critically important to modern companies.

Organisations such as CEFIC are making it their core agenda to communicate the chemical industry's contribution to sustainable development by joining forces with all stakeholders, including governments and civil society. CEFIC is investing in encouraging processes and products that have reduced the environmental burden by using tools such as risk assessment, risk management and life cycle assessment.

China too has been consolidating its network of stakeholders from the chemical industry to enhance their sensitivity to sustainable practices. The Association of International Chemical Manufacturers (AICM) represents more than 40 major foreign-investment enterprises in China's chemical industry, whose members' business covers manufacturing, transportation, distribution and disposal of chemicals. The organisation is committed to promote globally recognised chemical management principles among all stakeholders and build a contributive role of the chemical industry to the economy.

Multinationals have made holistic efforts to introduce the concept of stakeholder responsibility in China. BASF, together with nine partners, kicked off the third round of its '1+3' Corporate Social Responsibility project in 2012, a program designed to improve sustainability performance along the chemical industry value chain. Supported by the China Business Council for Sustainable Development (CBCSD), the '1+3' concept connects a major stakeholder such as BASF

with three types of business partners along the supply chain – the customer, supplier and logistics service provider – which are mostly small and medium-sized (SME) enterprises – with the aim of promoting sustainability by sharing best practices in the area of environment, health and safety. This business model for sustainable supply chain management gives space to small enterprises to act responsibly as they form the bulk of the industrial space.

Dutch companies DSM and AkzoNobel have also invested in stakeholder relationships. DSM maintains close communication with CBCSD, which is

made up of Chinese and international companies, government and local community representatives. Akzo Nobel also has a number of projects at the community level in China, mostly related to health.¹¹³

For Bayer, diversity in approach is one of its strengths. It recently developed the 'Bayer-China Rural Development Project' in Wanzhou, Chongqing. The project is an example of effective communication between the local government, community and company representatives using Bayer's participation in diversified industries, covering education, agricultural, healthcare and infrastructure.

113 AkzoNobel, DSM websites

The Dow Chemical Company– Engaging stakeholders

Dow has played an active role in engaging various stakeholders - including customers, suppliers, communities, civil society, academia, and governments.

Since 1992, Dow has developed a strong advisory team called the SEAC (Sustainability External Advisory Council), which provides an important outside-in perspective on environment, health and safety; sustainability; and business issues for the Company. Council members include leaders from non-governmental organizations, academia, the business community and environmental and sustainability communities.

Dow has established strategic partnerships and collaborations with academic institutions across the globe to advance scientific research and develop the world's next generation of scientists and leaders with sustainability thinking. It includes the global Sustainability Innovation Student Challenge Award (SISCA) program since 2008 to encourage sustainability innovation among young generations as well as scholarship programs at local universities, such as Tsinghua

University (Beijing), Fudan University (Shanghai), and Shanghai Jiao Tong University in China.

The company works with governmental institutions and agencies worldwide to advance the role of chemistry in addressing various challenges and promote safe management of chemicals. For example, Dow has collaborated with the United Nations Environment Programme (UNEP) and the Ministry of Environmental Protection of the People's Republic of China (MEP) on a joint project of "Promoting Safer Operations and Emergency Preparedness in the Value Chain of the Chemical Sector" via workshops, drill and project review to promote safer production, chemical safety management and emergency preparedness in the chemical sector in China. The learning would allow for the replication of project results and promotion of industrial chemical safety in other industrial areas and sectors, both within China and globally.

Dow has committed experts to assist International Council of Chemical Associations (ICCA) to build capacity in the global chemical industry to

ensure the spread of Responsible Care and to work with many Asia Pacific countries' local authorities to develop a science-based, risk-based, cost-effective regulatory framework for chemical management programs based on Global Product Strategy (GPS) principles. Dow has provided speakers/ trainers for Responsible Care conferences and Global Product Strategy workshops in Asia Pacific region (including China, India, Indonesia, Japan, Korea, Malaysia, Philippines, Singapore, Taiwan, Thailand, and Vietnam, etc.).

Dow has also provided product stewardship and product regulatory training to >475 distributors in various countries in the Asia Pacific region since 2008.

According to Dr. Dong, Dow wants to be a leading company in advancing all aspects of sustainability, openly collaborating with key stakeholders, and contributing to the development of local economy and the sustainable growth of the chemical industry and preserving value for its investors, customers and potential customers.

Dr. Dong Ling Zhen, Asia Pacific EHS and Sustainability Director, The Dow Chemical Company.

Stakeholder engagement

KPMG can assist in identifying your key stakeholders, mapping and prioritising sustainability issues material to the business, understanding stakeholder concerns and the associated weighting of the different sustainability issues, as well as developing plans to engage stakeholders.

along respective product chains. Adopting recognised environmental management systems such as the international ISO 14001 standard and EU Eco-Management and Audit Scheme (EMAS II) that emphasise environmental performance indicators will make Chinese businesses internationally competitive and open up new markets.

Companies in China are focused not only on manufacturing, logistics, distribution and exports, but on growing consumer demand for sustainable products. The development of China's supply chain infrastructure and its sustainability is one of the priorities of the government.

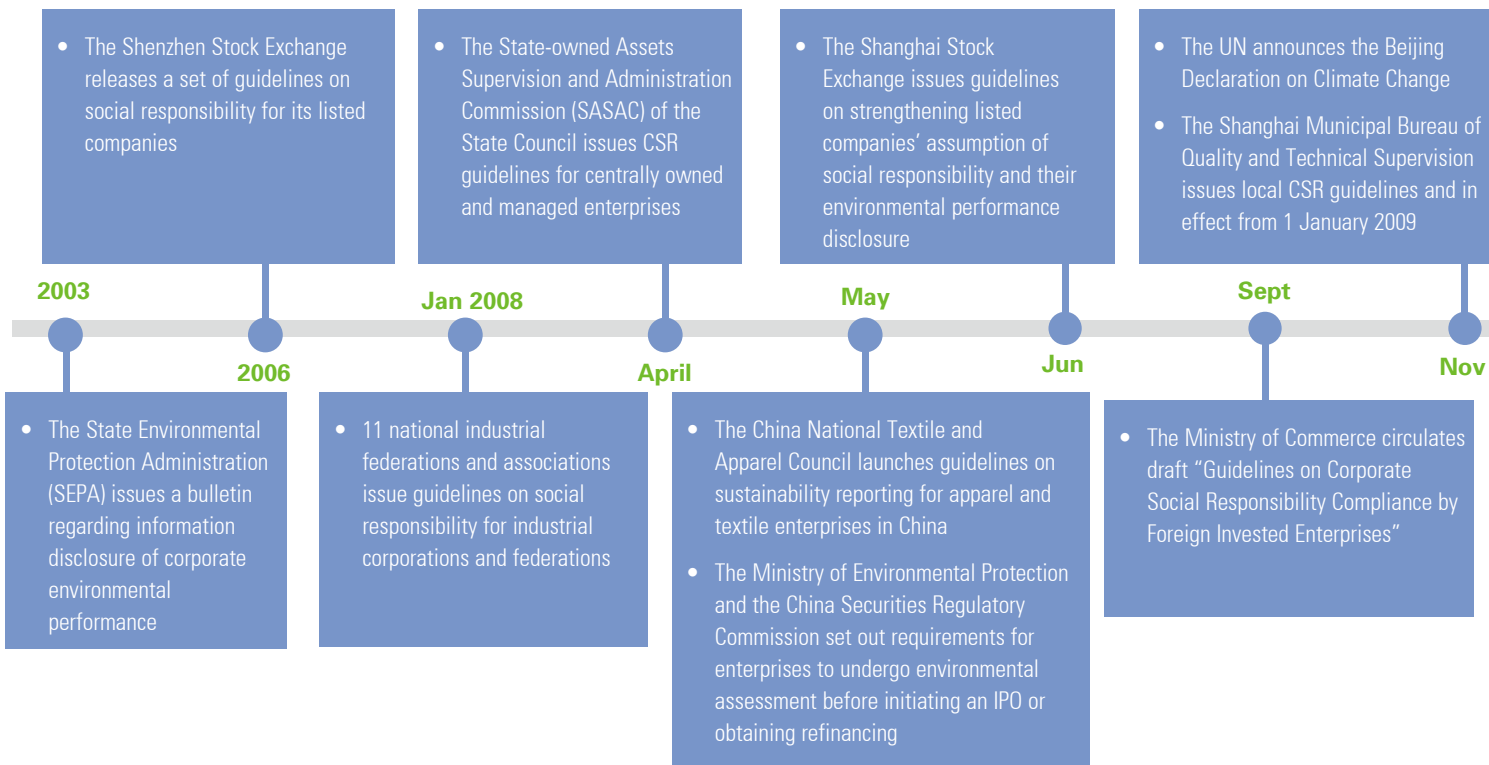
Shifting away from the earlier emphasis on low cost manufacturing and energy intensive industries, Chinese government policy is now focusing more on positive contributions to corporate social responsibility (CSR) initiatives. The 5YP prioritises sustainable development of supply chains through social responsibility.¹¹⁴

Forging a green chemical supply chain, however, involves deep scrutiny, communication and collaboration.

c. Greening the supply chain

Over the last 30 years, China's turbo-charged industrial policy has helped push it to the centre of the international stage, transforming it into the world's most confident manufacturer, the largest exporter and destination for investment. But the strategy of the past may not be the model to take the country to a sustainable future. China needs a sustainable industrial and trade policy that involves entire supply chains.

The scope and size of environmental challenges linked to Chinese economic activity through various global product chains is mammoth, but the need now is to quantify the explicit nature of those challenges and seek solutions



Source: KPMG CSR presentation 2012

¹¹⁴ China CSR Imperative: Integrating Social Responsibility into the China Supply Chain Industry Insight 2012, American Chamber of Commerce, Shanghai

Increased regulation, cost optimisation measures, and rising consumer concerns about business ethics need to be at the core of supply chain operations.

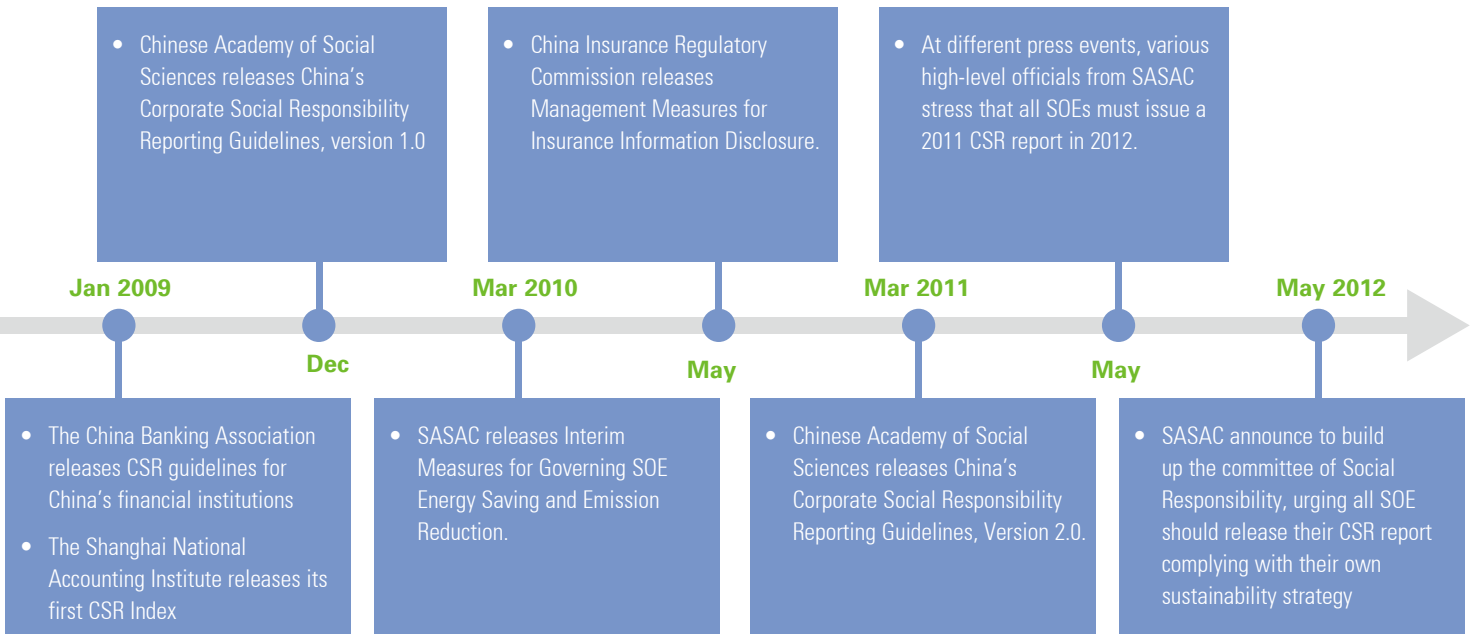
Dow Chemicals and BASF have invested heavily in the sustainability of their supply chains. One of Dow's ongoing efforts is through redesigning supply chain networks by maximising equipment loading and increasing the use of product exchanges and swaps to help lower mileage and reduce the company's carbon footprint. Dow has also customised transportation channel networks, which saves millions of dollars in energy costs. BASF has been evaluating and identifying high-risk suppliers through its Safety Matrix program, which was established several years ago.¹¹⁵ For Akzo Nobel, collaboration is the key word when it comes to implementing a sustainable supply chain that ensures seamless, integrated material flow from supplier to customer.

Sustainable logistics: Sustainable chemical logistics forms an important part of the supply chain. China, which

until very recently had a relatively small chemical industry, has seen growth outpace the rest of the world. Transport Intelligence estimates that from 2011 to 2015, Asia Pacific will experience the highest levels of growth of chemical logistics, expanding by an average of nine percent per year between 2011 and 2015.¹¹⁶

Companies such as Sinochem International have invested significantly in logistics by developing the entire chain of shipping, tank container multimodal transport, freight forwarding and warehousing, terminal and depot services. Sinochem owns the largest hazardous chemical fleet and ISO tank lorries in China, which the company claims is in accordance with the strictest safety standards.

In terms of shipping, Sinochem International has established a comprehensive and effective safety management system in line with the ISM code, and won ISO9001-2000 standard certification. It is China's only qualified company to transport high-end chemical products like TDI and



115 Sustainability tools strengthen chemical supply chain, ICIS, 30 March 2009
 116 China to drive chemical logistics market, 29 March 2012, Logistics Asia

MDI. In 2011, Sinochem strengthened its partnership with Newport, a US company, to make inroads into international logistics, winning contracts from BASF, Dow Chemical and Optimal.

C2C practice: As a concept, sustainability in the supply chain needs to be built up over time and must be understood by all parties along the value chain. Closing the loop is an important aspect of the supply chain paradigm. The cradle-to-cradle (C2C) philosophy of designing chemicals that can harmlessly decompose or be reused and regenerated infinitely is considered one of the holy grails for a sustainable supply chain.

The need to recycle more chemicals and materials is now an economic imperative for the chemicals industry. Historically, the main driver behind the recycling and reuse of chemicals and materials was concerns about environmental pollution and the preservation of the Earth's resources. Now, a new impetus stems from worries about shortages of raw materials which are pushing up commodity prices.

The recycling and reuse of chemicals and materials is thus becoming essential not just for the sake of the environment but for the future of global economies. A growing number of specialty chemical companies are responding to the pressure for

Bayer – Sustainability at Its Core

Bayer is committed to the concept of sustainable development. In specific terms, this entails a commitment to safeguard the long-term commercial success of the company through innovative products, environmental stewardship, and stakeholder dialogue.

Bayer focuses on green solutions and often spearheads market trends that can better contribute to climate protection. For instance, the company leads the ECB (eco-commercial building) program, a green solution concept initiated in 2010. The ECB program builds an interdisciplinary network of construction industry players like suppliers, planners, engineers and service providers to offer customized and one-stop solution for energy-optimized buildings and even zero-emissions buildings. In 2011, Bayer incorporated 28 more partners to the global ECB network to ensure that durable, high-performance materials such as Bayer's own polyurethane insulation solutions become even more firmly established in construction practices.

The company is just as dedicated to improving its internal processes in order to ensure sustainability. At Bayer's manufacturing sites, striving for energy efficiency is a constant effort. Production technologies are first of all designed to achieve more energy efficiency. For example, Bayer's Oxygen depolarized cathode technology revolutionizes chlorine production as it requires 30% less electrical energy in this crucial step of the chemical production process. The company's gas-phase phosgenation for TDI production in its Shanghai site uses up to 60% less energy and emits 60,000 tons fewer CO₂ compared to another world-scale plant of the same size. Energy efficiency efforts at Bayer's plants go beyond finely designed technologies, they also include a systematic approach to reducing energy consumption in running units with a tool called E2 (energy efficiency). Via this check & improvement tool, Bayer has successfully identified economic and technologically feasible measures that could realize CO₂ reduction of up to 350,000 tons each year.

As a thought leader, Bayer is also actively engaged in the community in efforts to promote environmental stewardship. The company champions more climate friendly production processes in the chemical industry, offering solutions like E2. In China, the largest construction market in the world, Bayer has established an Eco-construction & Material Academy in collaboration with Tongji University in order to promote and drive this concept in China. Indeed, Bayer continues to pursue dialogue with its stakeholders by engaging in continuous and intensive exchange of views with interest groups related to the company: stockholders, business partners, staff, media, non-governmental organizations, suppliers and authorities.

Dr. Michael Baum, Chief Financial Officer & Deputy General Manager, Bayer (China) Limited

more effective recycling schemes by adopting reuse of materials as a business venture.

BASF, Dow Chemical, Eastman Chemical, Solutia, PPG Industries and SABIC have been working on finding solutions. A group of mainly Dutch chemical companies, including DSM and AkzoNobel, consultancies and technology specialists, have set up a project called Factory of the Future to demonstrate the feasibility of a chemical plant designed to operate a continuous loop system derived from C2C principles.¹¹⁷

d. Sustainability reporting: Buzzword for future growth

Chemical companies which manage to integrate product innovation with enlightened supply chain management and transparent communication with stakeholders will have an edge over others. The fourth and final step in this sustainability management programme is sustainability reporting - a process for publicly disclosing an organization's economic, environmental and social performance and the way it is being managed.

business imperative. Today, companies are beginning to discover that corporate reporting not only provides financial value but new business opportunities as well.

According to a KPMG study, financial value overwhelmingly comes from two sources: direct cost savings and enhanced reputation in the market. 'Green' products, for example, not only reduce waste and cost to provide direct savings, but also provide dividends by way of enhanced reputation, from both investors and consumers.¹¹⁸

Over the years, companies have evolved to produce corporate sustainability reports (CSR) for both internal and external reasons. Internally, it can identify and manage sustainability risks and opportunities; assess the progress of its initiatives and ensure employee welfare. Externally, sustainability reporting protects and enhances a company's brand and reputation; meets regulatory, legislative, government and listing requirements; addresses stakeholder demands and demonstrates a management that is proactive.

Applying a 'sustainability lens' to corporate reporting can result in four major benefits. A company can achieve **revenue growth** – by introducing environmentally or socially responsible products and services, penetrating new 'responsible' consumer markets and increasing market share due to improved competitive positioning.

It can have better **risk management** by identifying and managing operational events and risks; responding to regulatory changes appropriately and understanding issues that will impact on clients' business and creditworthiness.

CSR helps build **corporate reputation & brand enhancement** by aligning key trends affecting customers and clients and identifying opportunities to enhance corporate reputation. Finally, cost **optimisation** through increased resource and operational efficiency; reduction in waste and compliance with regulatory requirements makes a

Supply chain review

KPMG can assist in conducting supply chain audits against your supplier code of conduct or international/industry standards to help you gain confidence over your suppliers' sustainability performance

The bottom-line to sustainable development now means integrating environmental protection and social responsibility into business processes so they contribute to long-term economic success for a company. Sustainability reporting is thus an essential tool for a company aiming to be a responsible corporate citizen with long-term growth prospects.

Why do we need CSR: Corporate Responsibility (CR) reporting, once seen as fulfilling a moral obligation to society, is now being recognised as a

117 Rocking the cradle, Specialty Chemicals Magazine, 2011
118 KPMG Survey of Corporate Responsibility Reporting 2011

company better prepared for growth.

Reporting trends in China: In recent years, the number of companies releasing sustainability reports has increased at a phenomenal pace, globally as well as in China specifically. Egged on by the central government, Chinese state-owned companies, including oil and chemical giants, adopted a policy of 'corporate social responsibility' and began to explore what constituted CSR.¹¹⁹

Under pressure from the government, regulatory and supervisory bodies like SASAC and stock exchanges, Chinese companies have been compelled to increase reporting activities. In 2006, the Shenzhen Stock Exchange issued guidelines on CSR, while the Shanghai Stock Exchange issued its own norms in 2008.

Quantity: Reporting trend gathered momentum between 2009 and 2011 with a large number of CSR reports being released in China. According to a survey published by KPMG in 2011, at least 95 percent of the 250 largest global companies now report their corporate responsibility activities, while reporting rates in the global chemicals and synthetics sector has gone up from 62 percent in 2008, to 68 percent in 2011.

Over the last few years, sustainability reporting in China has also seen a substantial increase. In 2004, only six reports were released here, but that number grew to over 600 by 2009. By 2011, almost 60 percent of China's largest companies have been reporting on corporate responsibility metrics, bringing the country on par with global leaders.¹²⁰

A total of 817 CSR reports were released in mainland China from January 1st to October 31st in 2011, up 23 percent from a year earlier, which had 663 CSR reports. While SASAC requires all state-owned enterprises to issue reports and appoint CSR departments, the good news is that reporting by private enterprises increased 41.7 percent in 2011 from a year earlier.¹²¹

Quality: Although the quality of reports has improved, the overall level remains far from satisfactory. Despite growing momentum in reporting, data quality remains questionable. Lack of data measurement and collection guidance, weakness in data quality control and the lack of independent third party opinion are major problem areas.¹²² However, report structures have become more comprehensive and standard, over a period of time, with more emphasis on the human factor. Many reports now include stakeholder evaluation or third party assessment to enhance their credibility.

Credibility: Reporting credibility has also improved and the number of reports adopting multi-compiling standards has increased. Most companies have been able to present their social responsibility performance objectively. They include stakeholder evaluation from the government, employees, media and industrial institutions. The number of reports compiled according to specialized standards, such as Guideline on Fulfilling Social Responsibility by Central Enterprises issued by the State-Owned Assets Supervision and Administration Bureau, GRI G3, CASS-CSR, reached 152 in 2011, with 73 percent increase year-on-year.

Country reports: The number of Chinese versions of social responsibility reports released by foreign-funded companies has also gone up. Country reports have become the main form of social responsibility reports released by foreign-funded companies. To adapt to the fast evolving standards in China, foreign-funded enterprises release Chinese reports, which comprehensively present social responsibility concepts, measures and performance implemented in China. However, the total number of reports released by foreign-funded enterprises is relatively small – a gap these companies need to fill. Moreover, these reports tend to disclose relatively more about social and environmental activities and less information on sustainability as business integration model.

119 Carrots and sticks – Promoting transparency and sustainability, KPMG Advisory, United Nations Environment Programme, Global Reporting Initiative, Unit for Corporate Governance in Africa, 2010

120 KPMG Survey of Corporate Responsibility Reporting 2011

121 Overview of CSR Reporting in China, 14th Dec 2011, CSR-China

122 Corporate Social Responsibility, March 2012, KPMG presentation

How to ensure quality: For some years now, leading companies have combined their corporate reporting and financial reporting, often by merging the two into the annual report. KPMG, however, believes that there is greater value to be gained once both sets of information are treated as part of the company's comprehensive business performance reporting, both to internal management and external stakeholders.

The problem, however, often stems from a proliferation of reporting standards at the global and national level. Indeed, in an increasingly globalised and complex world, international standards, codes and guidelines addressing sustainability reporting are continually evolving. This wealth of standards is a sign of an increasingly diverse and mature international framework for sustainability reporting. However, there is a risk of overlapping, conflicting, and sometimes even competing standards may crowding the reporting landscape.

Since there is a need to promote synergies between the different initiatives and enhance coherence and convergence, some governments, stock exchanges and industry bodies are now referring to global frameworks

like GRI (Global Reporting Initiative), Sustainability Reporting Guidelines or UN Global Compact in disclosing a company's sustainability performance. The GRI Sustainability Reporting Guidelines is globally applicable and sets out general principles and indicators that companies can use to measure and report their economic, environment and social performance.

Future of reporting in China:

As corporate reporting gathers momentum, the question now is not who is reporting, but who is not reporting. However, given the relatively recent development of reporting in China, it is too early to make a detailed assessment of progress and impact. Not surprisingly, the quality of reporting varies significantly depending on the level of commitment by a company and the quality of its underlying internal management systems. When reporting in China, there is still a strong emphasis on social commitments and activities although many companies do attempt to produce extensive quantitative data.

Looking ahead, one of the challenges for China will be to extend reporting to companies beyond the larger, state-owned enterprises and publicly listed companies. A second challenge



will be to extend reporting to SMEs, which often have limited incentive to invest in environmental and social management. Independent third party audit and assessment is necessary to establish credibility.¹²³

Sustainability reporting

KPMG can assist in addressing the challenges of collating quality report information by adopting a sustainability report indicator system, as well as developing or improving your entire China sustainability report, or to provide independent assurance over the report or selected indicators/claims.

State-owned companies, under the directive of SASAC, have been trend-setters in publishing CSR reports – many using GRI guidelines as a reference. Large companies such as Sinopec, CNOOC, ChemChina and Sinochem Group have been sensitive to this need. In June this year, Sinochem brought out its sixth annual sustainable development report. Multinationals, on the other hand, often do not produce China-specific sustainability reports, although they may publish sophisticated global integrated reports. If foreign companies want to make a mark in a China which is moving towards a sustainable economy, they would need to package their best practices for the local market.

Multinationals, on the other hand, often do not produce China-specific sustainability reports, although they may publish comprehensive global integrated reports. If foreign companies want to make a mark in China, they would need to package their best practices for the local market. BASF China has taken an early lead and has been publishing country-centric reports. In mid-2012, the company published its fourth integrated report, 'BASF in Greater China Report 2011', on economic, environmental and social performance.

According to the report, BASF recorded sales of over EUR 6.5 billion in Greater China, while successfully managing emissions and strengthening its commitment to sustainable development. In its 2011 report, BASF focuses on its improved environmental metrics and role of product innovation in sustainable development. BASF has made significant headway in water protection by improving waste water treatment facilities, reducing solid waste and increasing waste recovery. One of BASF's crucial focus areas in China is increasing overall sustainability of the value chain by involving external stakeholders, companies and partners through the unique '1+3' project. The Shanghai government has recognized these efforts by listing BASF's employee volunteer program 'Goodwill Teacher' as one of the top 10 best case studies for corporate social responsibility.¹²⁴

¹²³ Carrots & Sticks - Promoting transparency and sustainability, KPMG, Global Reporting Initiative, Unit for Corporate Governance in Africa, UNEP
¹²⁴ BASF in Greater China Report 2011



Conclusion

Chemical industry to sustain transition to green model

China is trying to transform its powerful industrial model into an economy driven by sustainability. The next decade of transition is likely to be difficult as shortage of resources and growing environmental pressure increase the cost of its economic growth. A rising income gap and loss of cheap-labor cost advantage will also begin to hurt China's industrial development as it tries to transition to the next stage.

In the next few years, the chemical industry will face several challenges, but there is room for optimism too. According to a survey conducted by KPMG, in April and August 2012 among chemical industry players in China, the mood was positive. Chemical enterprises surveyed by us predict a 10 percent growth for their companies in the next five years, mainly from the China market.

Macro-economic factors, however, remain a cause for concern. Companies anticipate three major factors which will influence their business plans - performance of developed economies, upstream supply situation from Middle East and regulatory changes in various countries. Although regulations and enforcement will get more stringent, multinational companies feel they are ahead of the curve and will not be adversely affected. For foreign enterprises, challenge to growth in the next five years will come from strong domestic players who have cost advantage. Change in government policies and intellectual property continue to be risk factors.

In the long term, growth will depend on the macro direction Chinese planners carve out for the country. Economists indicate that China has entered a 'later phase of industrialization' and this is the key stage where it needs to upgrade the current industries while developing strategic emerging ones. The chemical industry will play a vital role in affecting this transition – both as a participant and beneficiary.

The government has outlined two mega goals – First, cutting carbon emission on an ambitious scale and promoting clean energy. This means every sector of China's economy and industry will be affected in a fundamental manner. Second, it will make more efforts to improve the quality and structure of industrial products in the next five years.

These targets have tremendous implications for China's chemical industry. Companies will need to constantly assess, manage and format their risk mitigation strategies so as to remain compliant with regulatory regime changes and other macro economic factors. Sustainability targets are unleashing new waves of demand for upgraded material and companies will need to apply themselves intensely into product innovation and invest more in research and development.

Sustainability, however, cannot remain the sole preserve of the government, which is why big companies will need to shoulder their share of responsibility. This, enterprises are doing effectively by

investing in new products, seeking alternative feedstock, communicating with all stakeholders and training supply chain participants to be more environment conscious. More importantly, the chemical industry is becoming aware of the importance of being transparent and reporting their activities in a manner that stands up to high standards of scrutiny.

Chemical companies operating in China agree that they will have to deal with complex human resource issues. Most foreign companies are relying increasingly on local staff to play upper management roles and this trend will continue. Companies surveyed by KPMG agree that sustainability will be crucial and will become an integral part of strategic planning process and key business decisions. The difficulty lies in overcoming the knowledge gap as most organizations are unable to link their business strategies to larger sustainability goals.

These hurdles will need to be worked out. In the coming years, China can make a smooth transition to a cleaner economy only if chemical companies succeed in making sustainability a core business practice, deeply embedded in their cost and profit structures.



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