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Regions & Locations Guide

For the Chemical and Life Science Industries

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Sustainable Competitiveness

Dear Reader,

In this 2013 edition of 'Regions & Locations Guide for the Chemical and Life Science Industry' we are again focusing on investment and operating conditions in regional markets, chemical parks and life-science clusters. With substantiated market reports and articles on industrial locations, our annual FDI supplement of CHEManager Europe provides essential information for potential investors from the global process industry and assists top executives and strategic decision makers in facilitating investment decisions.

When looking for a site to invest in a production facility or a location to construct an office building or even to set up regional headquarters, companies need to consider several factors. There is a competition among locations for investments but it is not just the growth perspectives of the market, the infrastructure or the attractiveness of frame conditions that tip the scales in favor of one location - the megatrend sustainability has also found its way into investment decisions.

Sustainable competitiveness is a nascent area of research. The "Global Competitiveness Report 2013-2014" by the World Economic Forum develops further the conceptual framework for sustainable competitiveness introduced in 2011. By combining social and environmental indicators with WEF's Global Competitiveness Index, the organization has been able to carry out a preliminary analysis of national sustainable competitiveness. The most important finding of this analysis is that there is no necessary trade-off between being competitive and being sustainable. Many countries at the top of the competitiveness rankings are also the best performers in many areas of sustainability. The report, which we present in extracts on pages 4/5 profiles 148 economies and finds that highly innovative countries with strong institutions continue to top the international competitiveness rankings.

Dr. Michael Reubold

Take the time to study this issue, it will be time well invested.

Dr. Michael Reubold and the Regions & Locations Guide team

Global Competitiveness Index

Institutions and Innovation Increasingly Important for Competitiveness of Locations

Contest of Nations – Excellent innovation and strong institutional environments are increasingly influencing economies' competitiveness, according to The Global Competitiveness Report 2013-2014. The report issued by the World Economic Forum (WEF) profiles 148 economies and finds that highly innovative countries with strong institutions continue to top the international competitiveness rankings.

The report's Global Competitiveness Index (GCI) that also takes countries' sustainability performance into account places Switzerland at the top of the ranking for the fifth year running. Singapore and Finland remain in second and third positions respectively. Germany moves up two places (rank 4) and the United States reverses a four-year downward trend, climbing two places to 5. Hong Kong (7) and Japan (9) also close the gap on the most competitive economies, while Sweden (6), the Netherlands (8) and the United Kingdom (10) fall.

Jennifer Blanke, Chief Economist, Senior Director, World Economic Forum

Sustainable Competitiveness

Sustainable competitiveness is a nascent area of research. In an effort to proceed toward a better understanding of sustainable competitiveness, the report develops further the conceptual framework for sustainable competitiveness introduced by the World Economic Forum in 2011. By combining social and environmental indicators with the GCI, the WEF has been able to develop a preliminary framework for measuring the concept and to carry out a preliminary analysis of national sustainable competitiveness. The most important finding of this analysis is that there is no necessary trade-off between being competitive and being sustainable. Many countries at the top of the competitiveness rankings are also the best performers in many areas of sustainability.

Americas

The United States continues to be a world leader in bringing innovative products and services to market. Its rise in the ranking is down to a perceived improvement in the country's financial market as well as greater confidence in its public institutions. However, serious concerns persist over its macroeconomic stability, which ranks 117 out of 148 economies. The performance of the United States in terms of sustainable competitiveness is, as in the previous edition, modest, with somewhat better results for social than environmental sustainability.

Despite robust economic growth in previous years, Latin America continues to suffer from low rates of productivity and the results show overall stagnation in competitiveness performance. Chile (34) continues to lead the regional rankings ahead of Panama (40), Costa Rica (54) and Mexico (55), which all remain relatively stable. Brazil's (56) results on sustainable competitiveness are in line with its GCI score. Protests recently took place in several of Brazil's cities, and although the causes are complex, some of the country's socioeconomic intricacies play a key role. Inefficient and expensive public transport, rising prices compared to the level of salaries, and poor access to credit, combined with strong income disparities, are undermining social sustainability in the country.

Europe

In Europe, efforts to tackle public debt and avoid a break-up of the euro have taken the focus off addressing deeper competitiveness issues. Southern European economies such as Spain (35), Italy (49), Portugal (51) and notably Greece (91) all need to continue addressing weaknesses in the functioning and efficiency of their markets, boost innovation and improve access to finance in order to help bridge the region's competitiveness divide.

Switzerland remains at top of the sustainability-adjusted GCI and shows a high level of sustainability on both the social and environmental dimensions of the index.

Germany performs relatively well on both aspects of sustainability. On the social sustainability pillar, relatively low youth unemployment, wide access to healthcare, and the presence of a social safety net are the main drivers of the positive assessment. Environmental sustainability is also relatively positive. Stringent and well-enforced regulations and the existence of a large amount of protected land indicate Germany's particular attention to environmental issues.

BRICS Countries

Some of the world's largest emerging market economies must also engage business, government and civil society to implement long-overdue reforms. Of the five BRICS, the People's Republic of China (29) continues to lead the group, followed by South Africa (53), Brazil (56), India (60) and Russia (64). Among the BRICS, only Russia improves its ranking, climbing three places, while Brazil drops eight places. The Russian Federation is endowed with rich natural resources—including some of the largest water reserves in the world and wide-

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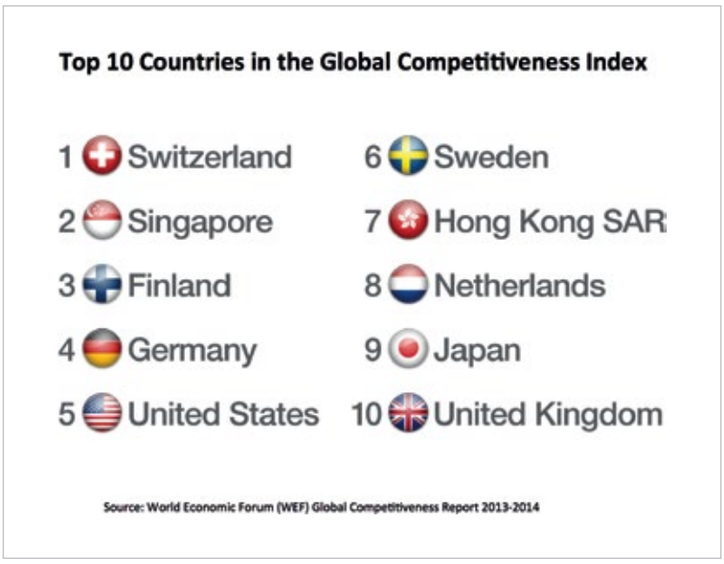

spread forests. The consequence is that Russia still performs relatively well on several environmental indicators in international comparison, despite the depletion of those resources.

Asia

Among the Asian economies, Indonesia jumps to 38, making it the most improved of the G20 economies since 2006, while Korea (25) falls by six places. Behind Singapore, Hong Kong, Japan and Taiwan (China) (12) all remain in the top 20. China's (29) competitiveness, however, is overall less positive once the sustainability measures are taken into account.

India's (60) sustainable competitiveness is characterized by concerns in both areas of sustainability. On the social sustainability side, India's performance is hindered by lack of access to basic sanitation and health services for many of its citizens. And India's environmental performance also hinders the achievement of sustainable competitiveness. Developing Asian nations display very mixed performances and trends: Malaysia places 24th while countries such as Nepal (117) and Pakistan (133) are near the bottom of the ranking. Bhutan (109), Laos (81) and Myanmar (139) join the index for the first time.

Middle East and Africa

In the Middle East and North Africa, Qatar (13) tops the region's rankings, with the United Arab Emirates (19) entering the top 20 for the first time. Saudi Arabia (20) falls two places. Israel ranks 27. Egypt (118) drops a further 11 places on last year's index. Bahrain (43), Jordan (68) and Morocco (77) also decline. Elsewhere in the region, Algeria moves up to 100 and Tunisia re-enters the index at 83.

In sub-Saharan Africa, Mauritius (45) overtakes South Africa (53) as the region's most competitive economy. South Africa's social sustainability is undermined by high income inequality and youth unemployment. In addition, the country has not yet achieved universal access to sanitation. From an environmental point of view, South Africa's performance is weakened mainly by increasing CO2 emissions and strained water and fish stock resources. With only eight countries in the region featuring in the top 100, profound efforts across the board are clearly needed to improve Africa's competitiveness. Among low-income economies, Kenya makes the biggest improvement, rising by ten places to position 96. Nigeria (120) continues to be ranked low, highlighting the need for it to diversify its economy.

A Shift in the Narrative of the Global Economy

"Innovation becomes even more critical in terms of an economy's ability to foster future prosperity," said Klaus Schwab, Founder and Executive Chairman of the World Economic Forum. "I predict that the traditional distinction between countries being 'developed' or 'less developed' will gradually disappear and we will instead refer to them much more in terms of being 'innovation rich' vs. 'innovation poor' countries. It is therefore vital that leaders from business, government and civil society work collaboratively to create education systems and enable environments which foster innovation."

Xavier Sala-i-Martin, Professor of Economics at the Columbia University, USA, said: "The report highlights a shift in the narrative of the global economy from one year ago, when fire-fighting still characterized much of global and regional economic policy. This has now given way to an increasing urgency for leaders to make wide-ranging structural reforms to their economies."

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Global Investment Opportunities in Pharmaceuticals

Geographic diversification may be a favorable strategy for multinational pharmaceutical companies, but it is vital that firms recognize both the rewards and the risks present in a market, whether developed or emerging. Business Monitor International (BMI)'s Risk/Rewards Ratings (RRR) tool provides a globally comparative and numerically based assessment of a market's attractiveness. In BMI's Q4/13 RRRs, the Asia Pacific region scores 53 out of 100, below Western Europe (67), but compares favorably against Americas (51), Central and Eastern Europe (52) and Middle East and Africa (42) regions. The indicators used to assess the attractiveness of a pharmaceutical market are now visible, improving the transparency of the rating system and enabling the identification of regional or group outperformers across single indicators.

In the Middle East, Saudi Arabia will continue to attract the interest of foreign pharmaceutical companies, and not just that of multinationals. An increase in the number of joint venture (JV) agreements with local partners shows that generic drug-based foreign players are also targeting the rising demand for a range of medical treatments. Healthcare modernization and facility expansion should further support this increasing demand, which is already being driven by epidemiological factors.

These are findings of an analysis on the Middle East's Pharmaceuticals Investment Opportunities released in the BMI whitepaper 'Middle East Investment Opportunities in Pharmaceuticals: Risk/Reward Analysis'. The whitepaper includes country comparative risks and rewards ratings tables for the pharmaceuticals industry in each country, as well as specific analysis on three countries of interest – Egypt, Saudi Arabia (and South Africa) – including headline expenditure projections and key trends and developments.


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It is expected that Egypt's pharmaceutical market will experience negative shorter-term issues on account of the protracted political turmoil. The whitepaper also notes that the cost of imports – of both pharmaceutical raw materials and finished products – will rise following the recent downgrade of Egypt's credit rating. Nevertheless, in the longer term, Business Monitor still expect steady growth of both values and volumes, as the market's underlying characteristics – including growing population and gradually improving access to facilities – promote its development.

www.businessmonitor.com

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How to Sustainably Increase the Competitiveness of European Sites

Global Perspective — Future concepts of a competitive chemical industry landscape — including European and in particular German chemical industry parks — require a holistic analysis and assessment of local investment and operating conditions in an international context.

Christoph Behrendt, Project Manager, Scopein

Dr. Mikhail Meilikhov, Senior Consultant, Scopein

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Based on benchmarking results of chemical sites worldwide, six major fields of action have been defined to sustainably increase the competitiveness and attractiveness of chemical production investment and operating conditions at European chemical industry parks.

Figure 1 shows the benchmarking results on an aggregated regional level per site-success-factor with corresponding regional specifics and characteristics.

Actions to Increase Competitiveness

The outlined fields of action address the most decisive factors and areas for a continuous successful local chemical production. Figure 2 shows the fields of action and the respective recommendations.

1. Energy Costs and Availability

Chemical parks in Europe exhibit significant competitive disadvantages in terms of energy costs compared with production sites in the Middle East and other regions in proximity to low-priced energy sources.

For instance, German producers are primarily charged by legal obligations within "Energiewende," a project established by the German government to develop renewable energy sources and completely deactivate nuclear power plants. In order to diminish the migration of complete value chains from Germany to other countries, caused by future investment decisions, it is important to maintain the established exemption clauses for energy-intensive production companies.

On the other side, successful management of the "Energiewende" in Germany can provide major advantages, such as lower production costs and innovation for the chemical industry, as well as represent a unique successful role model for other industrial countries.

2. Demography and Availability of Qualified Personnel

European chemical industry parks offer optimal conditions when it comes to the availability of qualified labor. Only at American chemical sites can chemical production companies equally benefit from high education and skill standards.

In comparison, labor costs at chemical production sites in Asia are substantially lower. However, the availability of skilled chemical employees is in most cases strongly limited, in Asia as well as in the Middle East.

Nevertheless, the demographic development and the inherent risks for a critical pool of skilled labor in Europe have to be addressed by focused actions of governments, labor unions and chemical companies themselves. The aging population and the linked scarcity of needed personnel with special qualifications require chemical companies to pursue internal demographic analyses of their own employees' age and qualification structures. This helps to prevent shortages and information losses through targeted development and education measures for their own employees in-house. In addition, the education of specialists in dual studies offers attractive options to companies to optimally position themselves in a labor market expected to run short in the future.

3. Availability and Cost Levels of Raw Materials

The analysis of the availability and costs of raw materials at different European chemical parks shows an efficient interconnection of the single chemical parks by pipeline networks. This guarantees the required permanent supply of raw materials.

However, the current development of raw material prices (especially for petrochemicals) increases the pressure on European chemical production sites. The exploration of shale gas fields in the U.S. already shows initial effects on investment decisions of chemical enterprises that are aiming to establish additional production capacities in American production sites. Therefore, for European chemical parks it is important to secure the raw material supply to prevent a permanent competitive disadvantage.

4. Chemical Industry Park Strategy

The model "Chemical Industry Park" with its comprehensive and integrated offerings of site services and infrastructure is a predominant guarantee for the high competitiveness of chemical production at the European and especially German chemical sites. Nevertheless, clearly defined chemical industry park strategies and positioning with continuous site development initiatives cannot be found at all European and German chemical sites and offer room for improvement.

5. Innovation Power and Cutting-Edge Value Chains

Over the last decades the close network of universities, research centers and industrial research laboratories has secured the high innovation standards in Europe. Promotion and development of cutting-edge technologies (power-to-gas, utilization of CO2 in synthesis, etc.) are directly interconnected with the preservation of competitiveness of the whole region on the global market.

Actually, there is a trend for integration of different value chains on the same production site. This integration process allows realizing further existing synergies. In the future, the emerging "cutting-edge value chains" will be the main reason for competitive production in Europe compared with other regions, such as the Middle East or Asia, since the quality and know-how of the chemical products are the most influencing factors of customers' buying decision.

6. Investment Incentives and Taxes

The tax burden in combination with the minimal investment incentives compared to the incentives at Asian or Arabian chemical sites leads to a substantial disadvantage for upcoming new capacity investments at European and especially German sites. New plant investments have to prove economic viability with twice-as-large tax burdens without any further tax relief offered.

Recommendations per Field of Action

1. Energy Costs and Availability

The search for answers regarding the high energy costs at European production sites sets Germany in focus of the observation, where the management and the success of the "Energiewende" by the national government can generate the right impulses for the future.

The success of this ambitious project will provide significant competitive advantages for Germany and for Europe. The independence from fossil energy sources realized by the establishment and development of renewable energy sources will generate innovation edge compared with other regions. However, permanent readjusting during the critical phase of the realization of ambitious targets set by the German government is highly important and can only be achieved by precise and transparent management. In particular, the demand for mid-term planning security of energy-intensive companies should be addressed by a constructive discussion between representatives of both sides, i.e., the government and the companies.

2. Demography and Availability of Qualified Personnel

The link between educational facilities and the producing companies in Europe, for example in the chemical,

automobile and heavy metal industry sectors, guarantees a high, industry-oriented qualification degree of employees in the future. This strength has to be further leveraged on a national and pan-European level. However, especially small and medium-sized companies (SMEs) have to be proactively supported when facing the demographic development and the linked risks of shortage of qualified personnel.

Here, the labor unions play a key role. On the one side, they have to sensitize the companies. On the other side, they could effectively support the companies during the execution of company-related demographic analyses and the elaboration of company-specific concepts for personnel development and information transfer.

Furthermore, Europe has to benefit more from being an attractive target for qualified labor immigration. The shortage of qualified personnel in certain regions could be proactively approached by immigration policies and measures.

3. Availability and Cost Levels of Raw Materials

In Europe, many national initiatives aim to improve raw material supply. Those are primarily focused on the very regional improvement of the financial conditions of the supply process and the establishment of competitive prices. Chemical parks install national networks to develop the existing pipelines for better access to feedstock resources. Those activities happen without a unified controlling mechanism on the European level.

The urgent issues of the security of feedstock supply should be addressed by a concerted Europewide approach that eliminates the existing drawbacks compared with other regions, especially the U.S. and the Middle East. One of the most important and urgent issues is the decrease of the already existing handicap in promotion of cutting-edge technologies for long-term feedstock security, for example the "fracking" technology for the exploration of shale gas fields.

4. Chemical Industry Park Strategy

The positioning and further specialization of fragmented value chains of particular chemical parks in a regionally developed network should further be improved. The company-overlapping integration of value chains in a chemical park as well as in a regional production cluster requires an extensive management of different standpoints by various stakeholders among the companies and political representatives.

Especially German chemical parks provide critical input in the form of regional activities such as ChemCologne, CeChemNet, ChemDelta Bavaria and ChemSite for the preservation of competitiveness of Europe-wide chemical production. Additional activities are organized and managed by the professional association of chemical parks within the German association of the chemical industry (VCI). These activities should be applied for the generation of appropriate role models for further European production sites as well as for particular regions. Established role models will contribute and secure an efficient grouping of interests and manage coordinated activities in order to increase the competitiveness of chemical production in Europe.

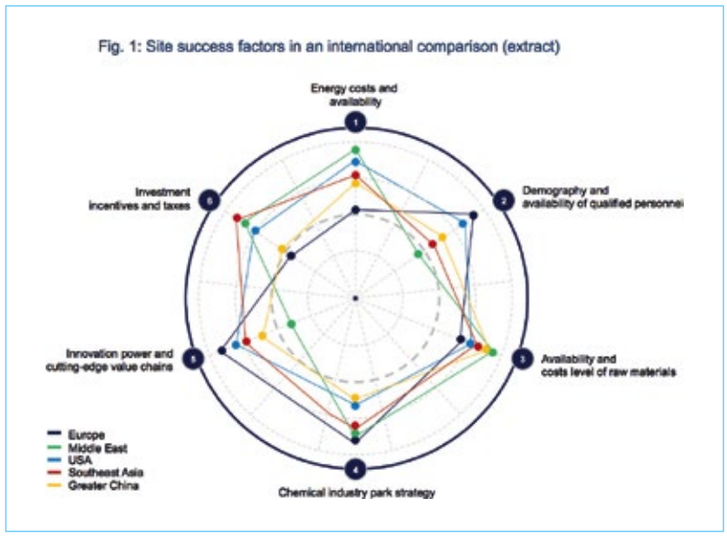

Fig. 1: Site success factors in an international comparison (extract)

5. Innovation Power and Cutting-Edge Value Chains

The analysis of the European research landscape shows that many collaboration projects involving industry and academic facilities fail because of the high discrepancy of the expectations expressed by each stakeholder. This gap can be bridged only by an open dialogue of both sides. Political representatives can take over the facilitator role. The main goal is to establish a prolific base for collaborative activities by trustful interaction and impartiality that would lead to a formation of strong partnerships. Such an environment can substantially increase the innovation power of an entire region.

Additionally, the setup of innovative networks on existing production sites for an effective integration of different companies should be funded by governmental programs instead of solely concentrating on intensive promotion of research institutes that are focusing on "pure" basic research in self-elected research fields.

6. Investment Incentives and Taxes

As a response to the optimal tax conditions, in particular at Asian chemical sites, European and German political bodies have to consider aligned pan-European, national as well as locally focused investment incentives beyond tax advantages.

Concerted actions as part of a long-term and comprehensive industrial policy for the respective regions and chemical sites have to support the settlement of new chemical production capacities beyond sole maintenance investments, through dedicated governmental support programs and optimal regulative conditions. Creative support measures and tax incentives in the field of training and further education represent alternatives to pure financial incentives to chemical companies in the course of a well-balanced industrial policy.

Criteria (extract) \ Regions		EU	USA	SEA	ME	China
C1	Political, legal and financial stability	●	●	◑ - ●	◕	◑
	Approval procedures	◕	◕	◑ - ●	◕	◑
	Taxes	◔	◔	◔ - ●	◕ - ●	◔
	Investment incentives	○ - ◕	◑	●	◑	◔
C3	Regional market size and growth level	◕	◕	◑	◔	●
C3	Raw materials availability	◕	◕	◕	◑	◑ - ◕
	Raw material s cost level	◑	◑	◕	●	◑ - ◕
	Electrical energy cost level	◔ - ◑	●	◔ - ◕	●	◑ - ◕
	Natural Gas cost level	◔ - ◕	●	◔ - ◑	●	◔ - ◕
C4	IP protection	●	●	◑ - ◕	◕	◔
C5	ESH regulations	◕	◕	◑	◕	◕
C6	Availability of qualified personnel	●	●	◔	○	○ - ◑
	Labor cost level	◔	◔	◕	◑	●
C7	Site strategy, position and IR management	◑ - ◕	◑	◔ - ●	◕	◔ - ◕
C8	Mass flow and infrastructure integration	●	◕	◔ - ◕	○ - ◔	◔
	Value chain coverage	◑ - ●	◑ - ●	◑ - ◕	○ - ◑	◑
C9	Site infrastructure	●	◑	◔ - ●	◕	◔ - ◕
	Logistical connectivity	◑ - ●	●	◕ - ●	◑ - ●	◔ - ◕
C10	Investment cost level	◑	◑	◑ - ◕	○	●
C11	Site service provision	●	●	◔ - ◕	◕	◑
C12	Project handling	●	●	◑ - ●	◑	◔ - ◕
C13	Reputation	◑	◕	◔ - ◑	●	◑
	Attractiveness for employees	●	●	◑ - ●	○ - ◑	◔ - ◕

Evaluation scale: ● very good (World-Class) ◕ good ◑ satisfactory ◔ sufficient ○ deficient

Fig. 2: – Selected fields of action to increase competitiveness

Conclusion and Outlook

Comparing competitiveness of worldwide chemical industry parks leads to different fields of action for European chemical sites for focused and sustainable development. This addresses not only the parks themselves but

Continues **Page 11** ▶

Competitiveness of Swiss Industry at Risk?

The Swiss federal government's "Energy Strategy 2050" could jeopardize the competitiveness of Switzerland's exporting industry, according to Scienceindustries, the Swiss Business Association for the Chemical, Pharmaceutical and Biotech Industries. Even though the final energy consumption targets remain ambitious, the Federal Council has now recognized the complexity involved in a reconstruction of the Swiss energy system in the Dispatch relating to «Energy Strategy 2050» published in September 2013. Scienceindustries welcomes these implementation measures, which are more realistic in comparison to the consultative proposal. However, Scienceindustries believes that the massive increase in the cost-covering feed-in compensation system surcharge endangers the competitiveness of Swiss industry. Only a few energy-intensive businesses are to be relieved of the requirement to pay the surcharge, at the cost of the rest of the Swiss economy. Most of industry will not be exempted from it. At a time when the Swiss Franc is strong, each additional increase in the price of electricity puts the Swiss export industry under further unnecessary pressure, Scienceindustries said.

◀ Continued **Page 10**

also the basic regulative conditions for chemical investments and production in the region. The variety of fields of action is the result of the large number of site success factors that are evaluated by the chemical companies during their investment decision process.

The major challenge — besides the interpretation of the benchmarking results, the conclusion of the major fields of action and the formulation of recommendations — is the implementation of actionable measures. The implementation requires a concerted initiative by the chemical companies, the political representatives and the various interest groups, such as the labor unions and the employers' association. Furthermore, it needs a European perspective that extends beyond the single corporation and national perspective in order to secure and strengthen the mid- to long-term competitiveness of European chemical production in an international competition.

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The Lacq Gas Basin, a Model Industrial Reconversion

France — With the support of the French government and local communities, three enterprises — Total, Sobegi and Arkema — have invested more than €154 million in Lacq Cluster Chimie 2030, a project to transform the Lacq platform into a center of manufacturing excellence. In November 2013, French Prime Minister Jean-Marc Ayrault inaugurated a new gas treatment unit for the project. The new facility is the cornerstone of the industrial redeployment of the Lacq site located in southwestern France in response to the depletion of the natural gas field.


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The Lacq Gas Field was discovered in 1951 and reached peak production in 1970 with a capacity of 33 million cubic meters per day, meeting one-third of French demand. In a few short years, the surrounding Béarn farmland became the "Lacq Basin," an industrial hub that generated thousands of jobs. For six decades, new industries, such as fine chemicals, bioenergy and carbon fiber, emerged and grew in Lacq, creating permanent jobs. Today, the basin counts around 8,000 jobs — as many as in its heyday in the 1970s — even though only 3% of its reserves remain.

The model industrial reconversion project will sustain economic activity and protect employment in the Lacq Basin. The new gas treatment unit will produce at low flow the gas remaining in the Lacq field for another 30 years, supporting local industry for the long term. The project is designed to supply manufacturers on the platform with cost-competitive power, steam and sulfur feedstock daily.

In addition, it consolidates the competitiveness of the Lacq platform and makes it even more attractive to new investors, such as Japan's Toray. The worldwide leader in carbon fiber manufacturing is undertaking a major capital project on the site. In addition, Total Développement Régional, whose role is to encourage projects to create, acquire and grow start-ups in Total's host regions in France, also works to draw new businesses to the platform.

http://developpement-regional.total.com

Chemicals and Plastics in North Rhine-Westphalia

As Germany's leading chemical location, North Rhine-Westphalia can look back on a long tradition. With its dense transport network and renowned research landscape, the state offers ideal conditions for investments and innovations in the chemical and plastics sectors.

In North Rhine-Westphalia the chemical industry is one of the largest and highest-selling employers: Over 400 chemical companies employ over 90,000 people, who most recently generated sales of 48.5 billion euros. Of the 20 highest-selling German chemical corporations, six are based in Europe's No. 1 chemical region: North Rhine-Westphalia.

Today's global concerns in the chemical industry such as Bayer and Henkel already started producing on the Rhine and Ruhr about 150 years ago. The state's chemical industry is now characterized by a mixture of global players and small and medium-sized enterprises (SMEs). Besides the old-established traditional firms, globally operating corporations such as Altana, BASF (Cognis), DuPont, Evonik Industries and Lanxess profit from evolved infrastructures and sophisticated logistics that North Rhine-Westphalia has to offer as a chemical location. Situated in the heart of Europe, the state provides fast connections to destinations all over the world and guarantees, for example, the supply of raw materials via extensive pipeline networks. In addition, the regional initiatives ChemSite in the Ruhr Metropolis and ChemCologne in the Rhineland support investors in their search for suitable locations and partners. The choice is large: With twelve chemical parks such as Chempark Leverkusen or Chemiepark Marl, North Rhine-Westphalia is also Germany's No. 1 region in this respect. Around 50 percent of all employees in the North Rhine-Westphalian chemical industry work at chemical parks.

The key production areas of the chemical industry in the state are not only conventional chemical products such as pesticides or detergents, but also polymer materials and environment-friendly materials made from carbon dioxide. The large companies concentrate mainly on the production of chemical precursors, while the SMEs concern themselves with the manufacture of end products.

Around 70 percent of the substances manufactured in the chemical industry go into industrial further processing. This demonstrates the strong influence of the chemical industry on technical progress in other sectors: It sets a whole chain of innovations in motion. Research and development play a correspondingly important role in the chemical industry — and enjoy ideal conditions in North Rhine-Westphalia. New resource-conserving, environment-friendly materials are developed in over 100 study courses, numerous renowned institutes such as the Jülich Research Center and company research facilities. This knowledge from research and practice is bundled in the statewide cluster Chemie.NRW. The tight networking of chemical companies with research institutes, universities and user industries strengthens the innovative capability of the industry.

The chemical industry's reputation as an innovation engine is due in particular to its close ties to the plastics industry, as these two branches of industry go hand in hand in the field of plastics production. This is where the foundations for technological progress are laid: With its marked cross-sectional character the plastics industry in North Rhine-Westphalia is seen as an innovation driver in the fields materials and production processes, as well as for products in practically all spheres of life. Numerous institutes such as the Plastics Institute Lüdenscheid and the Fraunhofer Institute for Environmental, Safety, and Energy Technology Umsicht in Oberhausen form the basis of North Rhine-Westphalia's plastics expertise and work on sustainable high-performance materials. For example, the Fraunhofer Institute Umsicht has developed polymers which can repair themselves. Bayer MaterialScience operates a pilot plant for the extraction of plastic from CO_2, and at RWTH University lizard skin serves researchers as a model for extremely low-friction materials.

Whether it is petrochemicals, pharmaceutical or polymer materials — in the chemicals and plastics state North Rhine-Westphalia the industry enjoys optimal conditions for investments and innovations of all kinds.

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Risky Business

Nuances of Insurance in Emerging Markets

Country-Specific Challenges — The chemical industry in Asia and Latin America is growing fast. A large number of European corporations has established production sites in countries such as China and Brazil or is planning to do so. Others have made contracts with suppliers from these markets or entered joint ventures.

For risk managers this means new challenges, as country-specific risks such as natural hazards, a nontransparent legal system and cultural influences often don't get enough attention. Companies that remain unprepared may face severe losses from business interruptions.

According to a survey by the German Chemical Industry Association (VCI), global demand for chemical products is expected to increase by an annual 4.5% until 2030. This growth is largely based on ever-increasing demand from emerging markets, particularly in Latin America, China and Southeast Asia.

However, opening up new markets requires a precise strategy with a thorough risk-management program customized for each new site abroad. This program should include the selection of a safe location, the timing of the market entry and the type of enterprise. New plants, joint ventures and suppliers in countries such as China and Brazil are subject to very country-specific risks. Thus, both a successful entry and sustainable success are based on accurate risk knowledge and the corresponding risk mitigation through protective measures.

China Calls The Tune

One of the most rapidly growing markets is China. Since 2010, the Middle Kingdom has become the world's largest chemicals producer. Today there is a large number of collaborative projects between European and Chinese corporations. Some companies have moved entire business units to Chinaor decided to build new production sites. The main motive for such investments is the huge sales potential and the proximity to chemicals-hungry industrial consumers. Low production costs play a major role as well.

How To Ensure Resilience

From the perspective of a risk manager, China is a whole new set of challenges to production and supply chains. Nigel Todd, assistant vice president at commercial property insurer FM Global, points out that Chinese business partners are often reluctant to notice the value of protective measures. This problem is aggravated by the fact that in China, production sites and subsidiaries are often designed as joint ventures. Therefore, ownership issues are frequent and are complicated because the legal situation is sometimes ambiguous or vague.

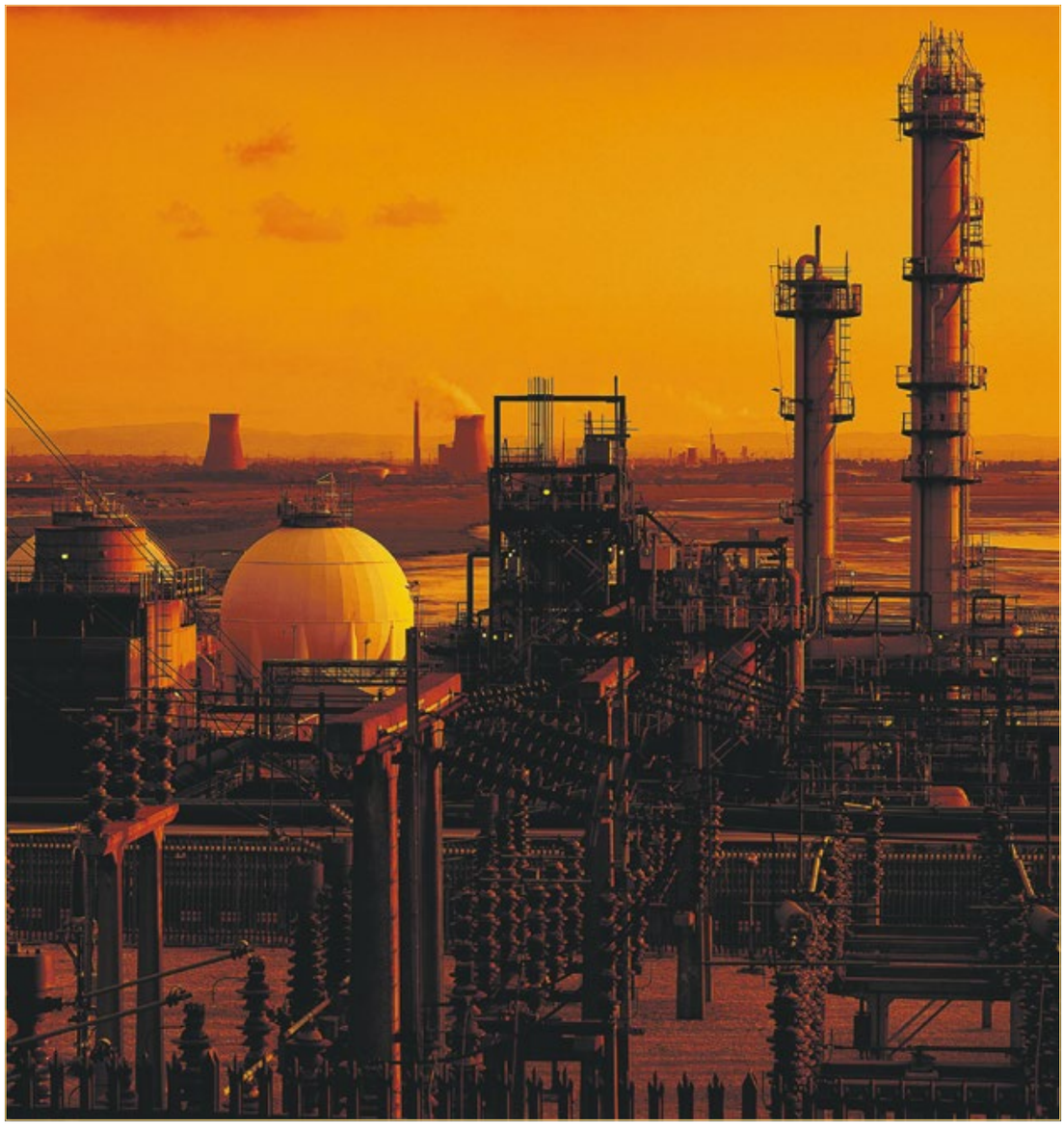
"This brings us to some crucial questions: Who has the technical and commercial lead in the building project? Who is to bring in the necessary technical expertise?" Todd said.

The difficulty for European corporations then is to keep control of a project and to enforce their own risk-management standards.

"It is therefore common practice to hire a local Chinese consulting firm familiar with the climatic and topographic conditions and experienced in dealing with the local authorities and with import regulations," said Ralf Kuperjans, senior account engineer at FM Global.

Flood And Wind

China has many flood-prone regions, and many areas are subject to strong



winds and heavy rainfall. As China is a country of large distances, many chemical companies have established most of their sites in the same industrial district. However, this also increases the risk exposure. In the event of a natural disaster, all sites will be affected at the same time and no fallback plant may be available.

"If companies have access to the necessary local knowledge, they will most likely fare better than their competitors," Kuperjans said. "It may help to know, for instance, that for spiritual reasons Chinese architects prefer fancy roof constructions, even for industrial facilities. While this special roof design is intended to keep the happiness in the building, this is risky business. The roofs provide a large contact surface for the wind, so they are frequently uplifted by gusts."

The Human Factor

But risks also arise from language barriers and a lack of knowledge about a country's culture. In many countries in Southeast Asia, European risk managers may find that their counterparts will show courtesy toward foreigners by refraining from asking questions about things they don't understand or will answer in the affirmative whatever the question. However, the agreed tasks may later not be performed despite the ostensible consent. Such misunderstandings may entail serious consequences, for example regarding fire protection or safety at work.

Nigel Todd therefore recommends linguistic and cultural translators who know the country, the people and their culture well.

Country-specific differences also become apparent when looking at technical requirements. Usually, local producers will offer alternatives to those technical devices a risk manager knows from Europe and sell them at the same price or for even less. Most of the time, however, the low price will come at the expense of quality, which may later lead to malfunctions or technical errors.

Brazil On The Rise

In Brazil, the chemical industry is gaining importance as well. The vast and resource-rich country with a fast-growing population is experiencing lasting growth. In 2013, the chemical industry contributes more than 10% of the gross domestic product of the manufacturing sector. Among the top chemicals producers in 2013, Brazil took fifth place, behind China, the United States, Japan and Germany. For European chemical companies, Brazil has thus become an important trading partner and place to relocate production. Risk managers should be aware that when entering this market a number of new risks demand consideration as well.

Security Firms to Protect Sites

When going to Brazil, European companies may also be confronted with higher levels of theft and violence against their property. For this reason, Ralf Kuperjans recommends hiring security firms. It's important as well to make a wise decision when selecting the location for a new site. FM Global's risk engineers can offer advice not only regarding safety and security but also with natural hazards exposure in mind. Businesses should also focus on creating and maintaining secure supply chains. If only one of the local suppliers has to stop production, it often becomes necessary to procure materials from abroad if no alternative supplier is at hand who can compensate the demand in time. In Brazil, a company will then face high import duties.

Support Your Local Fire Brigade

When it comes to infrastructure, additional investments are often necessary as well.

"In Brazil, large companies often support the local fire brigades to help them buy the necessary equipment," Kuperjans says. "This way, they ensure that the brigade is operational and capable of dealing with special emergency situations such as conflagrations at industrial sites."

When transferring risk in Brazil and China by taking out industrial insurance, it is important to know that a local insurance partner must be involved at all times. An international insurance company should always take the lead in co-insurance models to ensure that no financial shortfalls occur in the event of loss.

To avoid losses such as business interruptions, a country-specific risk management definitely pays off, particularly in emerging economies such as China and Brazil.

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Chemicals in the Middle East

The Drive Toward Downstream Expansion

Leveraging Feedstocks' Advantage — Behind the Arabian Gulf petrochemical and chemical industry lies three decades of exceptional growth: leveraging advantaged feedstocks, economies of scale, integration and world-leading process technology to build a vibrant, influential and highly profitable petrochemical industry that is the envy of many other regions.

Vir Lakshman, head of Chemicals and Pharmaceuticals, KPMG

Rita Duran, senior manager, Chemicals and Pharmaceuticals, KPMG

With almost 30% of the world's oil reserves and 23% of all natural gas reserves, the Gul Cooperation Council (GCC) states – made up of Saudi Arabia, Bahrain, the United Arab Emirates (UAE), Oman, Qatar and Kuwait – have benefitted from compelling cost economics and the export of low-cost petrochemical commodities to rapidly growing Asian markets.

Unlike other petrochemical producing regions, the GCC is not co-located on a major market. It is ideally situated close to either Europe or Asia but it is unique in its dependence on its supply chain. The infrastructure has been developed in a relatively short period of time during which petrochemical exports had built up dramatically.

From an embryonic beginning in 1981, the first exports of polyethylene were shipped from Qatar followed by Saudi Arabia and Bahrain in the 1980s.

The region has longstanding relationships with downstream producers in Europe, Japan and the U.S. Additionally, on the World Bank's Ease of Doing Business 2013 Index, all GCC states outrank the key emerging chemical producing countries of China, India and Brazil.

Over the decades, the GCC has developed talented petrochemical leaders. Many of these CEOs have astutely developed global positions through acquisitions and alliances, and have made the GCC a pivotal player in the global petrochemical sector.

The GCC petrochemicals production capacity reached 127.8 million tons in 2012. The petrochemical industry in the region is currently concentrated in Saudi Arabia. It is the leading petrochemical producer across the region and home to SABIC, a global top-10 chemical producer by revenue. Saudi Arabia accounted for about two-thirds of the region's production capacity with annual petrochemical output reaching 86.4 million tons in 2012.

The region is continuing its focus on developing its infrastructure, supply chain and logistics as capacity limits are being reached. A series of investments are underway throughout the region. Over the next decade, Saudi Arabia alone intends to invest more than $367 billion in developing its infrastructure including petrochemicals. After Saudi Arabia, Qatar has the next largest GCC petrochemical plans. It plans to finance more than $10 billion worth of petrochemical projects next year and up to $34 billion on projects in the five years thereafter.

The growth of the region's petrochemical industry has been on the back of significant cost-advantageous feedstock, compared with other regions such as the U.S. and Europe. As per ICIS, Middle East crackers enjoy about 46% cost advantage relative to U.S. ethane crackers.

Moving Downstream

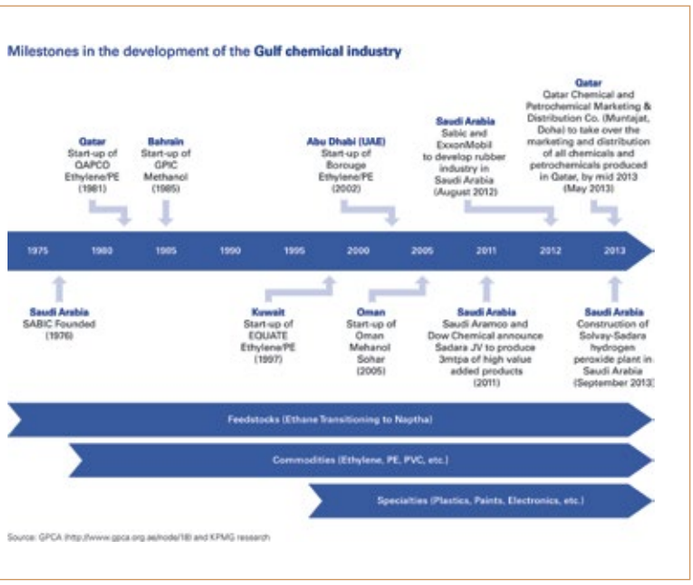
As per estimates by Gulf Petrochemical & Chemicals Association (GPCA), the annual petrochemical production capacity in the GCC region is set to reach 191.2 million tons by 2020 (growing by 50% from 2012). Saudi Arabia, followed by Qatar and UAE will drive the growth, expected to add 40.6, 10 and 8.3 million tons respectively of additional capacity by 2020.

Gulf producers will be competing more intensively to successfully capture downstream demand in the emerging markets. Gulf producers will continue to focus on Asian markets, particularly China and India — markets driven by high demand for middle class products.

The GCC petrochemical industry is expected to face several regional and global challenges in coming years.

On the global level, shale gas discoveries in North America are reinvigorating North American petrochemical producers. In 2017, when the U.S. capacity starts coming on stream, a lot of low cost product will be supplying Asia as well. Furthermore, the development of coal-based technologies such as methanol-to-olefins (MTO) in Asia may also fundamentally influence their import needs. These new sources of supply will affect price and profitability margins. GCC producers will face a strategic dilemma — stay in Asia, competing alongside the U.S., or switch their export focus to Europe.

In a post-stimulus world, geopolitical tensions are high with greater risk of protectionism and uncertain confidence. This volatility plagues the certainty sought by financial investors. Furthermore, attempts to rein in inflation in overly stimulated economies could lead to a hard landing in some of the largest chemical markets in the world.



Regional strengths in the global chemicals sector

Source: KPMG International, 2013

Declining Cost Advantage

On the local front, the biggest threat the industry is expected to face is that of declining cost advantage due to the switch from light to mixed/heavy feed, resulting from the gas shortage. As per a report by ICIS, this can lead to a 24% disadvantage to U.S. ethane crackers. The feedstock scarcity in the Middle East region has forced the regional chemical producers to switch their strategies to focus on downstream manufacturing projects. The region will continue to expand downstream with clusters playing an increasingly important role in the manufacturing of specialty chemicals. Conversion parks will consume and add value to locally produced petrochemicals. The downstream expansion is considered to be less cyclical and is expected to provide stable returns in the long run.

The industry also is expected to face a severe shortage of skilled labor, such as professional technologists, despite the area's growing population, a large part of which is younger than 25. According to GPCA, petrochemicals account for about 6% of the total workforce in the GCC region and the region's petrochemical companies will need to approach skills shortage and strive to focus on developing a young talent base.

Historically, the industry has been commodity-focused, therefore access to advanced technology and know-how remains a challenge. Producing downstream derivative products is heavily dependent upon developing or acquiring the requisite technology and know-how.

GCC producers pursuing the downstream strategy will need to identify and gain access to key technologies, or develop them locally.

Securing Downstream Technology

The GCC chemical industry can exercise one of several options to gain the essential technology it needs for development.

Joint ventures: Gulf producers can trade access to feedstocks for proprietary technology. An example of this is the rubber plant SABIC-Exxon Mobil joint venture announced in August 2012 for a combined investment of $3.4 billion. The JV is to develop a 400kt/y synthetic rubber manufacturing complex in Jubail, Saudi Arabia. The project is scheduled to be online by mid-2015 and is expected to deliver halobutyl rubber, ethylene propylene diene monomer (EPDM), carbon black, styrene butadiene rubber (SBR) and polybutadiene rubber.

Technology licensing: Advanced technology can be licensed from foreign competitors, such as the SABIC agreement with Asahi Kasei and Mitsubishi Chemical to produce 200,000 mtpa of acrylonitrile.

Buying and replicating: GCC companies could buy and replicate technology via acquisitions. The acquisition of European-based Borealis and Canadian based Nova Chemicals by Abu Dhabi investors is an example of this strategy. More recently, in October, Oman Oil Company announced it will acquire Oxea (Germany), one of the largest global manufacturers of Oxo chemicals, from the private equity firm Advent International. With this acquisition, Oman aims to become a vertically integrated global chemical leader in the downstream industry with Oxea bringing its technology and expertise to Oman. A large part of technology and IP rests with management, so particular care must be taken to retain key management teams. An advantage GCC producers may have over their competitors in other emerging chemical markets is their legacy of deal-making in Western markets and ability to move quickly in M&A auction processes.

Incentivize foreign investments: Special incentives (such as tax holidays and lower tax rates) could be offered by GCC states to foreign investors with leading edge technologies. These must be designed to compete with investment-attractive countries such as China.

Developing new technology: This is the least feasible option as it takes time, which given the current rapidly changing market is simply not available.

So a new era has begun for the petrochemical producers in the region — strategic imperatives are changing, feedstocks are less accessible, refinery/petrochemical integration more essential and prevalent, added value more essential, decisions more complex and markets less certain.

But the region has enduring strengths that will secure its leadership role in the next decade — strong cash reserves, refinery/petrochemical integration, good infrastructure, feedstock advantages and proximity to both growth markets in Asia and established markets in Europe. Additionally, the region has long-standing relationships with downstream producers in Europe, Japan and the U.S. to bring the required technology to bear.

With the rapid expansion of its educated, urban youth, demographic pressures are increasingly making successful economic diversification and downstream expansion a necessity for the Gulf petrochemical industry. The challenge has been set.

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Bringing Innovation and Industrialization to Life

Bahrain is an Attractive Base for Accessing the GCC Market

Gateway to the Gulf - Bahrain had not been on the map of many investors from the chemical industry until December 2012 when German chemical giant BASF inaugurated a new plastics additives facility in the kingdom situated off the Saudi Arabian coast in the Arabian Gulf. But for international companies looking to access the trillion dollar market of the Gulf Cooperation Council (GCC) states the country is an attractive base to set up business.

In the Gulf countries, the state-owned oil and gas companies constitute the beginning of the value chain by extracting natural resources. The first wave of downstream development began with additional state-owned companies moving into refining, petrochemical industry, and other basic industries. Today, Gulf countries are making significant efforts to achieve sustainable, long-term industrialization on the basis of science, research and technology. The mission is to bring innovation and industrialization to life.

Bahrain was the first Gulf nation to discover oil – and later the first to diversify its economy away from oil. Although oil and gas reserves are being depleted, the oil sector still accounts for about a quarter of the country's GDP of about $27 billion. But besides the oil and gas industry, today, the finance sector contributes to approximately 25% of the nation's GDP. Other sectors are thriving too, including the downstream sector, business support services, manufacturing, and logistics to name but a few.

BASF's new plastics additives facility in Bahrain.

Foreign Investment Flow

Bahrain witnessed significant foreign investment flow throughout 2012 and into 2013, with 40 international businesses from North America, Europe and Asia as well as the Middle East region setting up their operations in the Kingdom. This was mainly due to the direct outreach activities carried out by the Bahrain Economic Development Board (EDB). The public agency is focusing on target economic sectors such as manufacturing, logistics and transport services as well as other sub-sectors, in which the Kingdom offers significant strengths.

The Kingdom's skilled bilingual local workforce and low cost of doing business mean that it is a natural home for firms looking to invest in the region. In fact, Bahrain is highly interesting as a production location, especially for European investors, as it is not only extremely favorable in terms of production costs, compared with Eastern Europe, but also has the relevant sales markets.

Access to a Trillion Dollar Market

The smallest of the six member states of the Gulf Cooperation Council (GCC) is one of the best places from which to access this rapidly growing market for a number of reasons. It was the eighth most economically free nation in the world, according to the Economic Freedom of the World: 2013 Annual Report published by the Fraser Institute.

EDB chief executive Kamal bin Ahmed said: "Bahrain's ranking in the top ten freest economies in the world for the second year running is

a testament to more than a decade of economic reforms that have been undertaken to improve prosperity in the Kingdom. The results of which have been strong economic growth, particularly in the non-oil economy, more jobs for Bahrainis and an open, attractive and supportive business environment from which companies can access the GCC market, worth in excess of $1.4 trillion."

Other recent reports have also highlighted Bahrain's economic strengths. Earlier this year, Bahrain was ranked first place in the Middle East and 12th place worldwide in the 2013 Wall Street Journal / Heritage Foundation Economic Freedom Index.

Office building at the Bahrain International Investment Park (BIIP).

Economic Vision 2030

Such a bright performance is bound to further expand, in fulfillment of Bahrain's ambitious Economic Vision 2030 of attaining a knowledge-based economy, enhanced innovation, productivity, competitiveness, human resource development, fairness and sustainability. Among the government's strategic initiatives is a drive to support private enterprise, in particular small and medium-sized businesses.

Bahrain's business fundamentals are strong and economic stability is secure. The Kingdom's business sector is already supported by the most productive national workforce in the GCC together with the Kingdom's strong infrastructure. The latter maximizes its strategic location as the gateway to the Gulf and has been boosted by new developments such as the Bahrain Logistics Zone (BLZ) and the adjacent Khalifa Bin Salman port.

Liberal Business Environment

Bahrain is a muslim country, business law, however, is based on western models. Thus, Bahrain provides a liberal business environment. Overseas investors benefit from 100% foreign ownership for most categories of business with no restrictions on repatriation of capital, profits or dividends.

This was a major reason for BASF to choose the Bahrain International Investment Park (BIIP), an industrial zone located near the country's biggest seaport for its new customer-specific antioxidant blends plant, which is based on proprietary technology. "It was important for BASF, which issues more than 1,000 patents every year worldwide, to select a location which offers strong protection for intellectual property", said Frank Fasdernes, business management director for BASF's plastic additives business for Eastern Europe, Africa and Western Asia. "Because we were able to have 100% ownership of the Bahrain project we have been able to assume greater control over the patented technology which runs the plant," he continued.

BASF employs more than 750 people in the region, and the new plant provides skilled employment for a number of Bahrainis. "It is always BASF's goal to provide employment for local citizens wherever we operate, and in Bahrain 70% of the plant workforce is local. In fact, good quality labor availability was another important factor in choosing Bahrain as an investment location," explained Harald Kroll, BASF's Dubai-based regional managing director.

Both BASF executives make the point that the engagement with the local authorities, from the industry and commerce ministry to the EDB and BIIP management, left a positive and lasting impression.

Well-Educated Workforce

The national agency that is in charge of developing the skills of Bahraini citizens is called Tamkeen. The initiative also tasked with supporting small and middle private sector enterprises (SMEs) is one of the cornerstones of Bahrain's national reform initiatives and the Bahrain Economic Vision 2030.

Khalid Al-Amin, board member of Tamkeen and of the Bahrain Chamber of Commerce and Industry explained that the government-launched initiative has made significant progress since its establishment in 2006 in providing high-quality staff for investors such as Kraft Foods, General Electric, the Indian polyester company JBF or BASF. Since international investors create jobs for local citizens, he "would like to see more multinationals investing in Bahrain."

International Investment Park

Bahrain, along with the rest of the Gulf, continues to rapidly expand. One of the major business / industrial projects in the country is the Bahrain International Investment Park (BIIP).

BIIP is a landmark development in Bahrain positioned as a location for high-quality foreign direct investment and export-orientated domestic projects. The 247 hectare business site is divided into 6 zones, each zone targeting a different sector such as services and knowledge-based activities, high-tech manufacturing and assembly or process industry.

The park offers unique incentives including 100% foreign ownership of companies; 0% tax with a ten-year guarantee; special Customs services; no recruitment restrictions and dedicated assistance with all corporate and human resource formalities. Quality facilities, offices and factory units are offered with long leases, and competitive land rentals in an environment that is professionally zoned, landscaped and managed.

BIIP is situated in a superb location with excellent connectivity and access to both the Bahrain International Airport and the new port. The park enjoys direct motorway access to Saudi Arabia via the 25 km Saudi-Bahrain King Fahd Causeway and will enjoy the same connectivity to Qatar via the Qatar-Bahrain Friendship Bridge after its completion.

Besides chemical manufacturing and formulation projects from a wide range of sectors have been approved for the park including food products, medical technology, household products, electronics devices, and packaging materials.

Moving Forward

Bahrain is committed to sustaining and strengthening its core business fundamentals: a highly skilled workforce, stable and transparent regulation, an open business environment and sustainable growth, offering a vibrant market and attractive base for accessing the wider GCC market.

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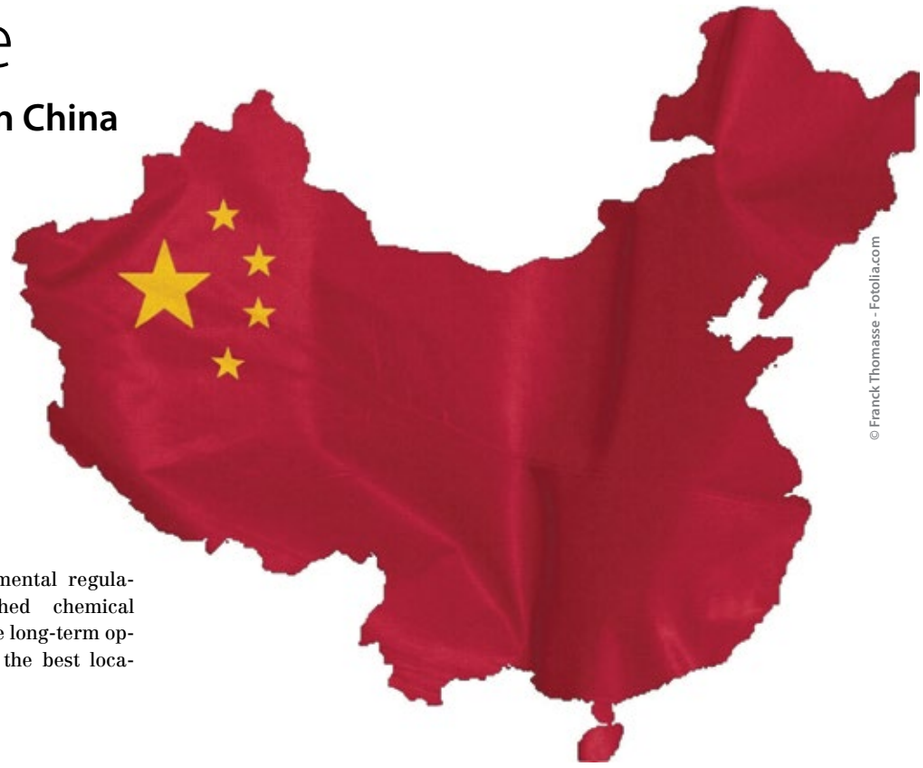
Spoiled for Choice

Chemical Parks and Site Selection in China

Local Know-how — Establishing local chemical production in China is essential for long-term success of multinational chemical companies, whether to improve access to the local market or to leverage lower labor and investment costs.

Kai Pflug, Management Consulting – Chemicals



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Therefore choosing the right production location is an important issue for chemical companies, independent of whether they already have local investments. Increasingly, stricter enforcement of environmental regulation leaves established chemical parks as the only viable long-term option. But how to find the best location?

Table 1: Top 20 Chinese chemical parks as ranked by CPCIF

Rank	Name	Province	Foreign companies (examples)	Domestic companies (examples)
1	Shanghai Chemical Economic and Technological Development Zone	Shanghai	BASF, Bayer, Huntsman, Lucite	GPCC, Shanghai Chlor-Alkali Chemical, Sinopec, Shanghai Huayi, Tianyuan
2	Nanjing Chemical Industry Park	Jiangsu	BASF, BP, Celanese, DSM, Ineos, Oxea	ChemChina, Nanjing Jinqi Chemical Group, Sinopec
3	Ningbo Petrochemical Economic & Technological Development Zone	Zhejiang	AkzoNobel, Lanxess, LG, Mitsubishi	Ningbo Heyuan Chemical, Sinochem
4	Huizhou Dayawan Economic and Technological Development Zone	Guang-dong	BASF, Clariant, Shell	Chung Shun Chemical, CNOOC, Zhongchuang Chemical
5	Jiangsu High-tech Fluorine Chemical Industrial Park	Jiangsu	Arkema, Daikin, DuPont, Solvay	3F, Huada Chem, Huayi Chemicals
6	Quangang Petrochemical Industrial Park	Fujian	ExxonMobile, SaudiAramco	Fujian Petrochemical, Meizhou Bay Chlor-Alkali Industry, Fuqing Jiangyin, Sinochem
7	Yangzhou Chemical Industry Park	Jiangsu	Dairen Chemical, Praxair	Oxiranchem, Yangzhou Chemical
8	Changshou Economic and Technological Development Area	Jiangsu	BASF, BP, Evonik, Mitsubishi, Sinopec	CNPC, Sinopec
9	Jiangsu Yangtze River International Chemical Industrial Park (Zhangjiagang)	Jiangsu	Ashai, DIC, DOW, DowCorning, DuPont, PPG, Sumitomo, Wacker	Feixiang Chemicals, Glory Chemical Industry, Zhangjiagang Yangtze River Petrochemical
10	Taixing Economic Development Zone	Jiangsu	AkzoNobel, SP Chemicals	FuAn Chemical, Taixing Chemical
11	Maoming High-Tech Industrial Development Zone	Guang-dong	BASF	Sinopec
12	Yushen Industrial Area	Shaanxi	Dow (in planning)	Shenhua
13	Yangpu Economic Development Zone	Hainan		Sinopec
14	China New Chemical Material (Jiaxing) Park	Zhejiang		DICP, Jiahua Energy Chemical
15	Jilin Chemical Industry Circular Economy Pilot Park	Jilin	Evonik	CNPC, Jilin Chemical Group
16	China Chemical Industry (Qinzhou) Park	Guangxi		Capital Success Chemical, Petrochina
17	Liaoyang Aromatic Hydrocarbon and Chemical Fiber Base	Liaoning	Evonik	Petrochina
18	Tianjin Nangang Industrial Zone	Tianjin	Air Liquide, Dow, Rosneft, SABIC, Shell	CNOOC, Datang, Petrochina, Sinochem, Sinopec
19	Dongying Port Economic Development Zone	Shandong		Zhenghe Petrochemical
20	Cangzhou Coastal-port Economic and Technological Development Zone	Hebei		Cangzhou Dahua

Fortunately, the search has already become substantially easier in the last 10 years as more professionally managed chemical sites have opened. According to the China Petroleum and Chemical Industry Federation (CPCIF), by the end of 2012 there were 141 major chemical industry parks. Of these, 29 are on the state level and 112 are at the provincial level. More than 9,000 enterprises with annual sales of more than RMB 20 million (approximately €2.5 million) are within these parks.

The CPCIF has recently published a ranking of the top 20 chemical parks in China. The criteria include economic competitiveness, infrastructure, environmental protection, safety and public recognition. Tab. 1 shows this ranking along with examples of foreign and domestic companies active at the individual parks.

As the list shows, eastern China around Shanghai (i.e., Shanghai, Jiangsu, Zhejiang) is by far the region with the most highly developed chemical parks, and the region with the majority of foreign chemical companies. In fact, if anything, the CPCIF ranking probably understates the situation — some smaller chemical parks in eastern China are probably more highly developed than some of the parks in the lower ranks of the list, which have been favored for political reasons.

Particularly in the lower-ranked parks, some of the typical issues of Chinese chemical parks are still prevalent. These include a lack of unified macroscopic planning, limited security measures regarding access to the parks and inadequate emergency response systems. This leaves some room for improvement, possibly in cooperation with Western site service providers such as Infraserv, Infracor or Currenta.

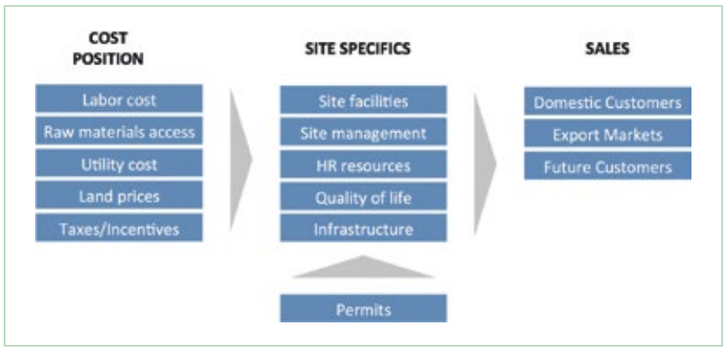

Fig. 1: Criteria for selection of suitable chemical production site in China

While the park ranking provides a good starting point for a chemical company looking for a suitable production site, it is necessary to also take individual company needs into account and integrate them into a project-specific criteria list. For example, some chemical sites need to be established in a way that guarantees good access to raw materials, such as BASF's selection of the somewhat remote Korla in Xinjiang for its production of butanediol and polytetrahydrofuran.

Another obvious factor is the presence of a major customer on site. Evonik chose Jilin as a production site for hydrogen peroxide mainly because 90% of the production is delivered to Jishen Chemical Industry as a raw material for propylene oxide production.

Criteria outside of the core chemical industry can also have a major influence on site selection. Particularly for companies with a strong focus on R&D and the desire to combine the R&D and the production site, the cultural infrastructure is highly relevant. Few highly trained Chinese scientists will be willing to move to a site in Guangxi province, which has led to most of the R&D centers of multinational chemical companies being established in the Shanghai area. Similarly, the attractiveness of a site for expat workers depends on the existence of an appropriate infrastructure for them and their families (e.g., international schools).

Fig. 1 shows how these different criteria can be grouped into those mainly concerning input factors/costs, those concerning the sales of the products and those more narrowly affected by the conditions at a specific site.

Not all of these criteria may be relevant for every company, and sometimes additional criteria need to be added. It is also important to decide on weightings for the different criteria, as the site eventually selected will most likely be a compromise between different factors pointing in different directions. For example, Shanghai as a site has several advantages regarding facilities and market proximity but certainly is not a low-cost production site.

In addition, negotiations should initially be started with several sites — not only to improve the negotiation position but also as some chemical parks particularly in the Shanghai area are getting more and more choosy and may not accept processes that are deemed to be dangerous, polluting or low-value.

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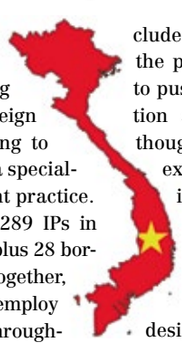
Vietnam Attracts High Investment



Vietnam's industrial parks (IP) and economic zones (EZ) have been attracting considerable sums in foreign direct investment, according to Dezan Shira & Associates, a specialist foreign direct investment practice.

Vietnam currently has 289 IPs in addition to 15 coastal EZs, plus 28 border economic zones. Together, these zones have helped employ over two million people throughout the country. The Vietnamese government divides the country into three key economic zones (KEZs) for which economic development plans were launched in 2004 with a vision to 2020.

The KEZs are the economic engines of Vietnam. The Northern KEZ covers eight provinces and municipalities including the country's capital Hanoi. The Central Key Economic Zone covers four provinces and Da Nang City. The Southern KEZ includes Ho Chi Minh City. Specifically, the plan aims for the Southern KEZ to push ahead in oil and gas exploration and electricity generation. Although Vietnam began its oil and gas exploration only a few years ago, it has now become the third largest oil producer in Southeast Asia.

The South, a major contributor of national GDP, has been designated as the leader in the industrialization and modernization of the whole country. Between January and September 2013, Ho Chi Minh City's industrial parks and zones welcomed total FDI of US-$341.4 million, a year-on-year increase of 114%, according to HEPZA, the city's management authority of industrial parks and export processing zones.

www.hepza.gov.vn

Malaysia Fosters Industrial Parks

China and Malaysia have established two joint industrial parks. These government-to-government initiatives are meant o further boost bilateral trade and investment. The Malaysia-China Kuantan Industrial Park (MCKIP), to be built on 1,500 acres, is located in the less developed Malaysia Eastern Corridor, in the state of Pahang.

This industrial park is the twin project of the 13,600-acre Qinzhou Industrial Park (QIP) being built in Guangxi Province of China. Investors taking up industrial land in Qinzhou are expected to be offered attractive land prices, tax incentives and financial support.

Similarly, Kuantan is also expected to offer investment incentives such as 5+5+5-year pioneer tax-free status and generous capital allowances. MCKIP is estimated to cost US$806 million to develop. It hopes to secure total investments of US-$24 billion by 2020. Its key business areas include oil, E&E products and car component manufacturing.

Also in the state of Pahang, the Gebeng Industrial Estate houses a world-class chemical and petrochemical industrial zone. With four development phases totaling 8,600 hectares of land, it is strategically located only 5 km from the Kuantan Port.

With excellent infrastructure and facilities, Gebeng Industrial Estate is rapidly expanding to become the leading chemical and petrochemical hub of the region.

www.investinpahang.gov.my

Doing Business the Indian Way

Multinationals Must Adapt to Local Practices and Show Commitment to Succeed

The Next Level — Over the past 20 years, multinational companies have made considerable inroads into the Indian market, but many have failed to realize their potential. For multinationals, the key to reaching the next level will be learning to do business the Indian way, rather than simply imposing global business models and practices on the local market.

Many multinationals in India are stuck in a profitability trap characterized by a lack of commitment to build country-specific operations and management systems. When expatriate company heads are brought in, their efforts often fall victim to short rotation cycles that inhibit the execution of long-term strategy. One important differentiator is the ability to demonstrate a commitment to India through the economy's inevitable cycles and volatility. Policy makers and local entrepreneurs have long memories, and "state visits" by global CEOs and chairmen are not sufficient if a company doesn't follow through on its commitments.

Empowering The Indian Organization

Empowering local management is also critical for attracting and retaining talented staff. Many multinationals are moving toward the creation of a strong Indian business unit and, in the process, moving away from functions or global products as the primary axis of governance. These companies are investing in top talent: The head of the Indian unit is experienced and knowledgeable about the market and has a direct line of communication with the global company's CEO. This direct connection to global management — combined with the ability to make decisions on capital spending, products, and pricing — holds a local leader more accountable and facilitates the execution of strategy.

Local empowerment should extend beyond the country head to lower levels of management, which can help drive innovation and entrepreneurialism on the ground and decrease times to market for new products. But structure is not enough. Multinationals need the right people — especially in middle management. Given the vast array of opportunities available in India and its relative shortage of management talent, multinationals have had to revise their models significantly. With continuing professionalization of Indian companies, the country's managers have less incentive to work for a branch of the multinationals, which must look beyond short-term tactical measures to attract high-quality people.

Innovating For India

Multinationals are learning that many different Indias exist within the subcontinent. The big differences — the haves and have-nots, languages, literacy, and geography (including the urban–rural divide) — make it difficult for a global brand to satisfy all of the country's consumers. Multinationals also face the challenge of low-cost local competitors.

This aspect of competition in India means that innovation is occurring not only through localized products and services but also in business models and processes. To strike a balance between global brands and local positioning, multinationals can introduce sub-brands or models with features suited to Indian needs. They could also work with local suppliers to reduce costs. Although many of these ideas are not new, multinationals have been slow to implement them in India. The key is that customization has to be a game-changing strategy rather than an incremental one: multinationals must aim to cut costs by 60-80%, with just a 30% reduction in features.

Choosing the Right Entry Strategy

One of the first and most important issues for a multinational considering doing business in India is ownership structure. Multinationals that enter the country on a stand-alone basis generally fare better than those that use Indian partners to create joint ventures. Most global companies that opted for them have exited the Indian market, while some have purchased the stakes of their partners or established majority shareholdings.Multinationals that choose joint ventures as their entry vehicle into India think that a local partner can better navigate the market's complexities and manage regulatory issues. There is some truth to that idea, but in practice, joint ventures often tend to emphasize short-term performance over long-term goals, long-term commitment, and an alignment between the interests of the global and local partner. Without management control and a clear path to ownership, global companies may have no alternative but to exit the market. Joint ventures can be beneficial in some cases, but they are not essential if a multinational regards India as a priority market. When joint ventures are necessary, multinationals should ensure that they have real management control and a clear path to ownership should that become necessary.

Strategic Partnerships

Partnerships with Indian companies need not be limited to joint ventures but can also include strategic alliances with local players. For example, a global pharmaceutical company established itself as a stand-alone entity but developed strategic alliances with a local manufacturer in licensing and supplies for the generic and off-patent segments. This helped the multinational to enter India's fast-growing market for low-cost, easily accessible branded generics and off-patent medicines.

Winning in India requires an intense and concerted effort. The multinationals need top leaders willing to make a commitment to the Indian operation. They must adapt to the Indian consumer's demand for innovative, low-cost delivery systems and high value for money products, as well as identify and implement an appropriate ownership model. Finally, senior executives of these companies should not neglect the management of influential local stakeholders, such as regulators and activists.

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A Game Changer

New Digital Pathology System for Cancer Diagnoses Set up in Ontario

Technological Transformation — In this digital era, it comes as a shock to discover that critical diagnoses of life-threatening diseases such as cancer still depend on what a pathologist sees on a glass slide under the lens of a microscope. This process, which also involves paper files, has not evolved very much in more than a century, but soon it will change radically.

Dr. Terrie Romano, Consul, Economic Affairs Ontario

Luigi Gentile, executive director, GE's Pathology Centre of Excellence, GE Healthcare Canada

Top 5 Reasons to Invest in Ontario

1. Among the most generous R&D tax incentives
Our R&D tax incentives are some of the most generous among industrialized countries. When tax credits are factored in, a $100 R&D expenditure can be reduced to an after-tax cost of about $57 for large companies to as low as $39 if you're a small business. And nonrefundable tax credits can be carried back three years or forward 20 years.

2. Lower business costs
Canada offers a lower business-cost environment for life sciences companies than the U.S., Germany, Italy, Australia or Japan, according to KPMG's Competitive Alternatives 2012. Ontario's marginal effective tax rate (provincial and federal combined) on new capital investment dropped from 33.7% in 2009 to 18.7% in 2010 and will continue to fall to 16.3% by 2013.

3. A research powerhouse
With seven of the top 10 Canadian research hospitals, Ontario is the fourth-largest biomedical research center in North America.

4. Faster time-to-market
Ontario has launched a number of programs to accelerate the successful adoption of life science discoveries. Some examples: Excellence in Clinical Innovation and Technology Evaluation (EXCITE) is a groundbreaking premarket evaluation process for medical technologies that can streamline their adoption by health systems. Clinical Trials Ontario is an independent nonprofit organization that is coordinating the development of a streamlined approach to conducting multicenter clinical trials in Ontario while ensuring the highest ethical standards for patient safety.

5. Critical mass of companies and talent
Ontario has a broad and innovative life sciences sector that includes some 1,100 firms. We have six medical schools including the University of Toronto, one of the largest in North America. Our 44 universities and colleges produce more than 30,000 graduates a year in mathematics, engineering and sciences.

www.investinontario.com

All figures are in Canadian dollars unless otherwise noted.

"Pathologists make the definitive diagnosis in the continuum of cancer care," said GE Healthcare's Luigi Gentile at GE's Pathology Innovation Centre of Excellence (PICOE) at the MaRS facility in Toronto. "It's a pivotal step, but the process involves an analog, glass-and-paper system when all around it the health-care environment is going digital."

While digital imaging has been used by pathologists since the 1980s, slow scanner speeds, huge file sizes and overburdened IT networks within hospitals meant that viewing, sharing and storing the images was costly and slow. It also made consulting with a geographically distant specialist difficult.

At the same time, medical researchers were making breakthroughs in the identification of many different types of cancers, the recognition of genetic predispositions and the evaluation of the effectiveness of different treatments. The problem was this ever-increasing wealth of specialized digital knowledge was not easily accessible by the pathologists making the diagnoses.

Removal of a Bottleneck

That digital-analog bottleneck was finally removed through a clinical trial by a multidisciplinary team at PICOE collaborating with medical and IT specialists at the University Health Network, a leading center for research and advanced patient care.

In spring 2013, both Health Canada and regulators in the European Union approved the GE Omnyx integrated digital pathology system (IDP).

"It's a game changer," said PICOE's Gentile. "It makes it much easier and faster to connect different types of specialist expertise and develop the best medical solution for that individual patient."

At the core of the Omnyx IDP system is an enterprisewide IT network architecture. For the first time, pathologists can access, analyze and share diagnostic images with colleagues and specialists — no matter where they are physically. This means that the diagnostic needs of patients in remote locations can be better served by the expertise of specialized pathologists in larger medical centers.

Key to achieving regulatory approval for the IDP system was a beta test of the system at Toronto's University Health Network and the Timmins and District Hospital (TDH), a regional health-care center in a mining community 700 km north of Toronto.

Collaborative Innovation

"The question was could we manage TDH's entire pathology workload remotely from Toronto? And the answer was yes," reported PICOE's Gentile. "The test period involved more than 3,000 patients and over 20,000 slides. We were able to focus the expertise of 27 different specialized pathologists

The MaRS facility in Toronto.

to help diagnose the medical issues of patients in Timmins. Our success is a credit to the quality of science and the collaborative nature of medical innovation both here and in Timmins."

PICOE was established in 2011 as a result of a US-$17.2 million partnership between GE Healthcare and clinical leaders in Toronto, with financial support from the Ontario government. PICOE's mandate is to stay on the leading edge of GE's corporatewide "healthymagination" drive to find innovative solutions to global healthcare needs.

"Innovation is about understanding critical challenges around the world and drawing on the best expertise needed to create the solution," said Peter Robinson, vice president and general manager, GE Healthcare Canada. "PICOE is not about throwing technology at a problem. This is about changing the basic business model to consistently drive better results in patient care and health-care services."

GE Healthcare's groundbreaking IDP system is now available across Canada and Europe. Interest is building quickly.

"We've been very fortunate to work with a very innovative team here," Gentile said. "The expertise of these medical researchers has made it possible for us to have a global impact on improving patient care."

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Turning Sarnia Green

Hybrid Chemistry Center Sprouts from Petroleum-Based Cluster

Renewing Possibility — What is green chemistry? Simply put, it is chemicals made from renewable resources. It is not a new concept. In 1941, Henry Ford unveiled a "field-grown" plastic car. Ford came up with the idea in the Depression, and then World War II enhanced the need for plant-based plastics. However, the end of World War II opened access to oil supplies globally and created the dawn of the petrochemical age.

Murray McLaughlin, Bioindustrial Innovation Centre

For the next 60 years, the petrochemical industry drove significant global growth and an expanded chemistry industry. But cost, health, environmental and security concerns, along with managing the use of oil, are creating a shift to sustainable technologies and products. Transformation and development of a hybrid chemistry industry is setting the standards for the 21st century.

This puts Canada in a unique position to become a global chemistry leader. We have the resources to create a sustainable hybrid chemistry industry. The resources are agriculture, forestry and waste materials. The knowledge is within Canada's universities and industries or in other areas of the globe that need our natural resources.

Green Cluster

In Sarnia, Ontario, a true cluster is growing in the area of green and sustainable chemistry, based on fostering partnerships and developing synergies from having all the right individuals come together within industry, colleges, universities and local governments — to support the hybrid chemistry cluster.

Nothing happens without a plan, though. Sarnia's plan came together over a 10-year time frame. It was designed to work with and build off of the petroleum-based cluster that needed to be maintained.

As the plan came together a number of things were implemented. The Sarnia-Lambton Research Park was established in partnership with Western University; the Bioindustrial Innovation Centre (BIC) was granted Centres of Excellence for Communication and Research (CECR) funding; and Bioindustrial Innovation Canada (BIC) played an investment and facilitating role in establishing bioindustrial companies.

As we look back from 2013, the progress is visible thanks to the efforts of many people in the community. BIC and the Sustainable Chemistry Alliance (SCA) have 14 investments between them; the pilot facility has three tenants doing pilot and demonstration-scale development (Woodland Biofuels, GreenCore Composites and KmX Technologies). New businesses, such as Methes, S4C02 and

BioAmber, are also getting established.

There are two industrial parks focused on attracting green and sustainable businesses to Sarnia. These parks are managed by Lanxess and TransAlta, and they both are very interested in new startups with a sustainable focus.

BioAmber is the first full-scale plant for bio-based chemicals in Canada, and it is building at the Lanxess Industrial Park in Sarnia, Ontario. Why Sarnia? Because BioAmber found a community that wanted to work with it to ensure success.

Sarnia-Lambton is becoming a site location for the bio-based chemical industry and green energy (solar) industry. Others in the region are Suncor Ethanol, Enbridge (solar energy) and Greenfield Ethanol.

Green Jobs and Local Investment

Sarnia-Lambton is known for playing to its strengths and is characterized as a leader in green energy jobs. That's not a bad reputation to have — and one that proves a region can be recast, moving from tough economic times to a future filled with opportunity. As the eastern Canadian hub for refined petroleum and petrochemical products, Sarnia-Lambton has a promising future thanks to the ongoing work of the local community and some key organizations that have been driving a vision to transform the region into a leading center for chemistry, clean energy, bio-industry, and more importantly, growth. In addition, the area boasts one of the world's strongest clusters of education for the chemical industry.

Not surprisingly, a consequence of these efforts is that there is significant local investment in the community. According to George Mallay, general manager of the Sarnia-Lambton Economic Partnership (SLEP), the evolution of Sarnia-Lambton became important with the onset of globalization and the harsh reality facing the once-vibrant petrochemical industry, because of aging technologies and aggressive worldwide competition: "What we needed was to redefine Sarnia-Lambton, drawing on its inherent benefits. We lived through difficult times, but we learned from it and are looking forward. There is no going back."

What Mallay and other SLEP partners recognize is the rich opportunity in Sarnia-Lambton with its significant infrastructure — pipelines; feedstock; storage caverns; power, gas and steam supplies; transportation and distribution arteries, including rail systems, shipping channels and a deep-sea port. In addition, there is brainpower, the hum of human energy, and dedication to addressing the needs of the future by developing unique, sustainable, alternate energy supplies, agri-food technologies and bio-based chemicals. This makes Sarnia a true hybrid cluster.

Bridging The Gap

In conjunction with the work of SLEP, the BIC/SCA — whose efforts have helped bridge the gap between biochemistry and synthetic chemistry — has been a significant change agent. With headquarters at the Sarnia-Lambton Campus of the Western University Research Park, its proximity means Bioindustrial Innovation Canada is uniquely positioned for collaboration. It is touted as the leading bioindustrial accelerator with a shared pilot plant facility that opened in 2010, focused on sustainable feedstock as an alternative to petrochemicals — things like soybeans, corn, switchgrass and algae that will create greener products. I am excited about the emerging bio-cluster in Sarnia-Lambton and the business connectivity collaboration provides. There is tremendous expertise in this region, and by leveraging ideas, forming strategic partnerships and working together, there is no doubt we'll continue to distinguish ourselves as a vibrant center for bio-industry.

We recognize how important the shift was from a purely petrochemical industry to that of a hybrid chemical industry — a combination of green chemistry (bio-based) and petrochemicals. Because of this shift, consumers will have a choice of cleaner products. The shift is a true positive for Sarnia-Lambton and one that just made sense: The facilities to make this change happen are already in Sarnia, but the benefit is that our community, the county, the city and the petrochemical industry are all highly supportive of this initiative. They see the benefits of having Sarnia leverage these strengths and build the bio-based and hybrid chemical industry.

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Wave of New Investments in US Manufacturing

The American Chemistry Council (ACC) appreciates the stream of new investments in chemical manufacturing that have been announced recently. According to the association, these announcements are further evidence that abundant and affordable supplies of natural gas have made the United States the most attractive place in the world to invest in chemical manufacturing," said ACC President Cal Dooley after Odebrecht, parent company of Braskem America, reported its intention to build a multi-billion dollar ethylene cracker in the Mid-Ohio Valley of West Virginia. "Odebrecht's significant investment will be a game-changer for economic growth in West Virginia, not only for chemical companies, but for the region's manufacturing sector as a whole", added Dooley.

Odebrecht is one of a growing list of companies that have announced plans to expand U.S. chemistry production or explore new investments in major manufacturing facilities. As of November 2013, 135 chemical projects worth nearly US-$90 billion in proposed capital investment have been announced, with 54% coming from companies based overseas.

Access to vast new supplies of American natural gas from shale deposits is one of the most exciting domestic energy developments in decades, particularly for the business of chemistry. ACC, however, concedes that energy policies must protect the environment while enabling access to natural gas.

Growth in domestic natural gas production reduces prices and creates a more stable supply. It is estimated that U.S. shale deposits contain 100 years of natural gas supply. This shale gas is a "game changer" that is rejuvenating America's chemistry industry – and can strengthen U.S. manufacturing, boost exports, and create hundreds of thousands of new jobs.

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