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# Singapore Chemicals 2018

**PRE-RELEASE  
EDITION**



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## Dear Reader,

Welcome to GBR's 2018 Singapore Chemicals pre-release edition! As international field journalists, we have the privilege of talking to the brightest minds in the global chemicals arena. This year marks the fourth time GBR is researching the island state's integrated chemicals ecosystem, and this preliminary study includes insights from the government, key associations, MNCs and local SMEs.

Our final research will be released as the Singapore Chemicals 2018 Industry Explorations guide at a number of key global events and launched in August at APIC in Kuala Lumpur. Given the most pressing issues of today, from the need for sustainable nutrition and wellness, to lower emission vehicles, all eyes are on the chemical industry. Manufacturers are finding themselves in a position of having to adapt to increasingly sophisticated consumer demands or surrendering market share.

There has hardly been a more enthralling time to conduct this analysis – 2018 marks Singapore's Year of Climate Action, a testament to the island state's commitment to the Paris agreement and pledge for sustainability. Home to over one hundred chemical manufacturers, and one of the world's top 10 exporters of chemicals, Singapore is an undisputed powerhouse in the industry. Having to tread carefully in an uncertain global politico-economic climate, it continues to invest in its strengths – talent, research and development capabilities, and technological advancements. Leveraging government support and strong solution partners, the chemicals industry is increasingly adopting advanced manufacturing practices. Asia's exponential growth, shifting regulatory framework and growing consumer desires all pose a coveted opportunity for Singapore.

Read by local and global audiences alike, the following study aims to tell the story of the chemicals sector today, whilst also demonstrating the value of diversity and that true progress is only achieved through collaboration. On this note, GBR would like to thank the Economic Development Board (EDB), Singapore Chemicals Industry Council (SCIC), Enterprise Singapore, Association of Process Industry (ASPRI) and each and every interviewee who have made this research possible. We hope you enjoy the read as you learn about Asia Pacific's growing potential and Singapore's role as a linchpin in its evolution.

**Irina Negoita**  
Project Director  
Global Business Reports



Irina Negoita



Julian Issa



Emma Johannes

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## Singapore Chemicals 2018 Pre-Release

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# A Unique Ecosystem

*Singapore's Chemicals Sector is Undergoing a Transformation*

Singapore continues to redefine itself 53 years on since independence. From the city-state's humble beginnings, it emerged as one of the four Asian tigers before consolidating its position as a global logistics and business hub. Now, finely poised between the East and West, it is leveraging on dynamic shifts affecting the Asia-Pacific (APAC) region. Exponential population growth and changes in consumption behavior in China, India and the Association of Southeast Asian Nations (ASEAN) are increasing demand for a range of chemicals. Subsequently, Singapore is seeing growing demand for high value-added derivatives including lubricants, dyes, synthetic rubbers and coatings. Moreover, Singapore's strategic location, well-defined regulatory landscape, and advantageous business conditions have primed the country to capitalize on regional growth. It is increasingly being seen as

the ideal regional HQ location, a global destination for research and development (R&D), and as the Asia-Pacific logistics and



*Henri Nejade,  
President and CEO Asia,  
Brenntag*

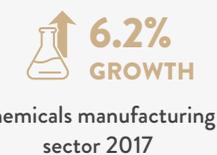
manufacturing hub. "Although Singapore is a small market in terms of chemicals consumption, it is a good regional hub where we can easily serve the surrounding countries," said Henri Nejade, president and CEO Asia, Brenntag.

Jurong Island remains Singapore's centerpiece for refining, petrochemical, and specialty chemical activity. Its integrated design and strong logistical capabilities have made it home to most of the major chemicals manufacturers. The chemicals sector has seen sustained growth of 6.2% in 2017 with petrochemicals growing by 23% and specialties by 6.2% in Q4 2017. However, the industry has not been without its share of challenges: "the evolving regulatory landscape, organizational restructuring to a leaner workforce and demands for higher productivity are still prevailing challenges faced by the industry," said Terence Koh, executive director of the Singapore Chemical Industry Council (SCIC). Recently ranked 2<sup>nd</sup> as a driver of production in the World Economic Forum's 2018 Readiness for the Future of Production Report, Singapore's



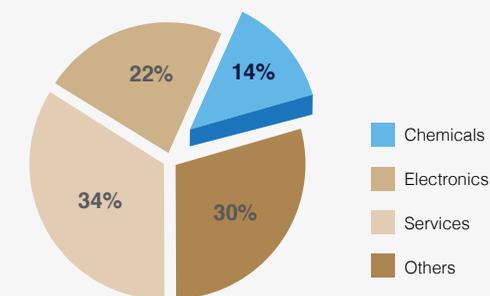
Photo courtesy of ExxonMobil

## INDUSTRY AT A GLANCE



from 2016 to 2020 through the Research, Innovation and Enterprise (RIE) plan

### FIXED ASSET INVESTMENTS BY INDUSTRY CLUSTER



Source: Ministry of Trade and Industry (MTI)

## Terence Koh

Executive Director,  
Singapore Chemical  
Industry Council (SCIC)



### What initiatives are the Singapore Chemical Industry Council (SCIC) currently prioritizing?

Industry productivity and sustainability continue to be key focus areas. SCIC is exploring ways to help the industry address and support sustainability needs in areas of energy efficiency, conservation of water resources, waste management and the reduction of environmental emissions. The Productivity Council comprising of the Singapore Economic Development Board (EDB), Association of Process Industry (ASPRI) and SCIC, has recently embarked on the trial certification process, aiming to improve the productivity levels of the Process Industry.

### Can you tell us more about Singapore's first national standard for Liquefied Natural Gas (LNG) bunkering that was recently launched by the SDO@SCIC?

To maintain Singapore's position as a premier bunkering hub, it is important to remain competitive and to keep abreast of new growth and developments regionally and internationally. To achieve this, the shipping industry is constantly looking for solutions to meet more stringent regulatory requirements. Singapore has also taken measures to provide cleaner and alternative sources of fuel, such as LNG. In April 2017, the SDO@ SCIC together with the Maritime and the Port Authority of Singapore (MPA) and SPRING Singapore jointly launched the first Singapore Technical Reference (TR) 56 for Liquefied Natural Gas (LNG) Bunkering. The Technical Reference (TR) 56 for LNG Bunkering was developed to help the maritime industry in Singapore pave the way towards a low sulfur requirement in bunker fuel following the announcement by the International Maritime Organization (IMO) to cap the sulfur content of marine fuel at 0.5% from 2020.

### What regulatory changes have been implemented to address safety in the industry?

With the enactment of the Workplace Safety and Health (Major Hazard Installations) regulations in September 2016, SCIC has been building capacity and Safety Case knowledge to prepare companies to implement Safety Case regime regulation. To date, more than 300 practitioners from 70 companies have been trained. We have also launched the Safety Case E-Forum that allows the Major Hazard Installations community to exchange information.



government has underlined productivity as one of its priorities. Key to the Singapore Economic Development Board (EDB)'s plan has been the implementation of Industry 4.0 technologies, driven by the Energy and Chemicals Industry Transformation Map (ITM). Sustainability is another key priority for the government, with 2018 being named as Singapore's Year of Climate Action. The government is seeking to raise the level of national consciousness and encourage efforts towards ensuring a sustainable Singapore. This has been coordinated with the passing of legislation on the carbon tax, which will come into effect in 2019, and will be initially set at S\$5/t of CO<sub>2</sub>. Singapore has shown its ability in the past to adapt to market volatility by creating robustness, optionality and optimization. Moving forward, digitalization and technological advancement will be pivotal to improve productivity and increase sustainability.

**JURONG ISLAND PREPARES FOR INDUSTRY 4.0**

The Fourth Industrial Revolution is triggering structural changes in value chains across the globe as well as in Singapore's manufacturing industry, which grew by 10% in 2017 (Ministry of Trade and Industry). The government has prioritized funding for Advanced Manufacturing and Engineering (AME) and by 2020,

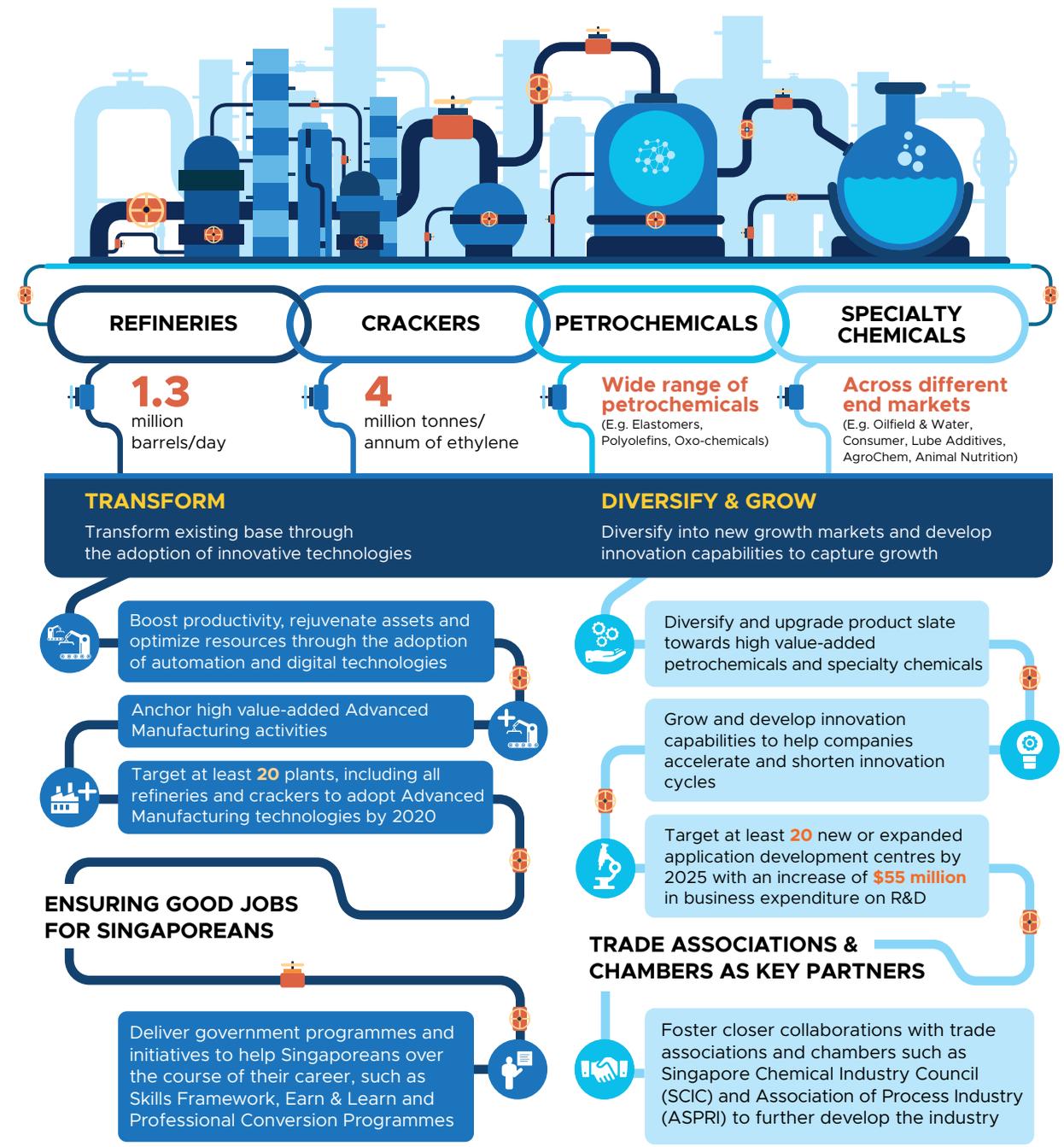
*"The government plays an integral role in connecting technology providers, like Yokogawa, to our end users. They proactively engage with companies and provide support to transform their operations and boost productivity, to generate growth. These initiatives enhance Singapore's position as a global center for business and innovation. With more technology companies developing their R&D centers in Singapore, technology providers like Yokogawa have the best possible environment to focus on real industry challenges whilst customers are provided with the latest technologies."*

**-Joseph Lee Ching Hua,  
Head of Co-Innovation  
Centre & General Manager  
- Singapore Development  
Centre,  
Yokogawa Engineering**



**ENERGY & CHEMICALS INDUSTRY TRANSFORMATION MAP**

**Building a Globally Competitive Energy & Chemicals Hub**



Singapore Economic Development Board | www.edb.gov.sg

Singapore plans to have 20 energy and chemical plants adopt advanced manufacturing technologies. A key component to the government's strategy will be the Energy and Chemicals Industry Transformation Map (ITM), which aims for a manufacturing value added (MVA) of S\$12.7 billion as well as 1,400 new jobs by 2025. The ITM's two-pronged strategy focuses on transforming Singapore's existing base of chemicals manufacturing through the adoption of innovative solutions and, in doing so, grow into new markets.

Success in technological advancement and digitalization will be underpinned by the industry's readiness to adopt such dramatic changes, given its conservative nature with certain manufacturers yet to embrace Industry 3.0 level technology. As Industry 4.0 gathers momentum, companies are grappling with its concept and the value it could bring. Consequently, the EDB has partnered with TUV SUD to develop the Singapore Smart Industry Readiness Index which serves as a diagnostic tool that companies - across all industries and sizes - can use to better understand Industry 4.0 concepts, evaluate the state of their facilities and architect a transformation roadmap.

The vast majority of Jurong Island's producers are already in the process of adopting advanced manufacturing solutions. A success story has been Chevron Oronite, which, at their Jurong

Island plant, has piloted Industrial Internet-of-Things (IIOT) solutions into their manufacturing processes. With the use of a tracker system to boost worker safety and efficiency, the company has started saving 30,000 man hours a year. Chevron Oronite is expected to expand its pilot scheme to include energy efficiency improvements and predictive maintenance solutions. It is just one of a number of companies embracing the benefits of digitalization. Due to this, solution providers are seeing growing opportunities in the industry. Yokogawa Engineering Asia, understanding that the process industry is set to undergo tectonic shifts, has been driving value creation through its Artificial Intelligence (AI) business concept - Synaptic Business Automation. "The government plays an integral role in connecting technology providers, like Yokogawa, to our end users. They proactively engage with companies and provide support to transform their operations and boost productivity, to generate growth. These initiatives enhance Singapore's position as a global center for business and innovation. With more technology companies developing their R&D centers in Singapore, technology providers like Yokogawa have the best possible environment to focus on real industry challenges whilst customers are provided with the latest technologies," said Joseph Lee Ching Hua, head of co-innovation centre & general manager of Singapore development centre, at Yokogawa Engineering.



Photo courtesy of Croda

### A CENTER OF INTELLIGENCE AND EXCELLENCE

The city-state is cementing its status as a global hub for R&D with its highly-skilled talent pool and top research institutions. Singapore, through its Research, Innovation and Enterprise (RIE) 2020 plan, is pumping S\$19 billion into R&D to drive economic growth through value creation, increase the adoption of technology and translate research into solutions. Moreover, the Energy and Chemicals ITM is targeting the construction and/or expansion of 20 new application development centers by 2025, with US\$55 million added in business expenditure on R&D (Ministry of Trade and Industry).

Aware of new innovation and digitalization centers have opened in Singapore in the past year. McKinsey & Company, in partnership with the Advanced Remanufacturing and Technology Centre (ARTC) has launched a digital capability center (DCC) as a key hub for Southeast Asian companies. Siemens launched its first fully integrated digitalization hub in MacPherson and Linde Gas has recently set out a S\$30 million initiative to develop an Asia Pacific Digitalization Hub - the first such center outside of Germany. Mitsui Chemicals has been working closely with the Agency of Science, Technology and Research (A\*STAR) to develop advanced materials, as well as chemical and biotechnological processes that improve sustainability and productivity.

Academic excellence remains a cornerstone of Singapore's foundation. Former Prime-Minister, Lee Kuan Yew, often remarked that his strategy was "to develop Singapore's only available natural resource: its people." Singapore is constantly reinventing itself in a time of dynamic change and uncertainty. From a tiny swamp with no natural resources, to a leading regional economy, there is no doubt that Singapore will keep forging ahead.



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## Marc Deschamps

Regional Managing Director,  
Jebesen & Jessen Ingredients



on issues such as the circular economy, sustainability and compliance.

### Can you give an example of how Jebesen & Jessen Ingredients is adapting to changing consumer trends?

As communicating with consumers happens more online nowadays, going digital is a core part of our strategy. Jebesen & Jessen Ingredients is working jointly with other member companies in the Jebesen & Jessen group on a B2B platform, as well as B2C, so as to reach the consumer quicker. We are also creating our own brands in areas which were previously not accessible, as well as selling our suppliers' brands.

### Do you see Singapore remaining a prime location for Jebesen & Jessen Southeast Asia?

For Jebesen & Jessen Ingredients, Singapore is important due to its position as a supply chain and a business hub. While our Jebesen & Jessen Ingredients HQ is located in Bangkok, Singapore is also very relevant to us as many of our key principals have headquarters in Singapore. For example, Evonik's regional hub for Asia South is in Singapore and we have been their most important distributor in Southeast Asia for over 40 years. Singapore is also leading in the region in many aspects. It sets the standards for how to protect consumers, as well as leading

### What is Jebesen & Jessen Ingredients' vision for 2018 and beyond?

2018 will be a year of consolidation. We will however expand beyond our existing five locations in China into central China, upgrade our technologies further and offer a fuller range to our customers. Going forward, business is changing in that China will source more from the ASEAN and there will be more production in the region for the region. Southeast Asia's GDP will likely continue growing by 4% to 8% annually. •



Photo courtesy of Unilite

## Year of Climate Action

*Chemical Producers  
Rising to the Challenge*

On December 12th 2015, the Paris Agreement was adopted, pledging to reduce carbon emissions through adaptation and financing. With a predicted temperature increase of between 1.7°C to 4.4°C (A1B Scenario, SE Asia) and an expected sea level rise of one meter by 2100, Singapore will be severely impacted by the effects of global warming if little action is taken. Aware of the implications, the city-state is leading by example. It was ranked as the 8th most sustainable city in the world in 2017 (Arcadis Sustainable Cities Index), however, Singapore's government is motivated to keep increasing its efforts. 2018 has been announced as Singapore's Year of Climate Action with the intention of reaffirming its commitment to meeting targets under the Paris Agreement and consolidating policy changes announced in 2017. Moreover, Singapore's influence over the region is set to increase with the country assuming the chairmanship for ASEAN in 2018. The Lion City is set to lead discussions on climate action, highlighting the region's commitment to tackling global warming. "Climate change poses an existential challenge for Singapore. We must take action now, for the sake of our future generations. Although Singapore contributes only a small amount (0.11%) of carbon emissions worldwide, we will do our part as a responsible global citizen to fight climate change," said Masagos Zulkifli, Minister for the Environment and Water Resources. •

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CONSUMERS IN ASIA



DEVELOPING  
INNOVATIVE  
APPROACHES

SOLVING  
INDUSTRY  
CHALLENGES



JEBSEN & JESSEN  
INGREDIENTS

## Carbon Tax Set for 2019

*“The introduction of a carbon tax as part of a wider suite of mitigation measures is necessary to facilitate Singapore’s transition to a low-carbon economy and achieve our nation’s goals under the Paris Agreement. It will provide a uniform and economy-wide signal to incentivise emissions reductions and energy efficiency improvements and encourage investments in clean technology. Countries and investors around the world are moving forward on climate-smart investments. To maintain our competitive edge in the global economy, I encourage all businesses to embrace opportunities in low-carbon growth.”*

**-Masagos Zulkifli,  
Minister for the  
Environment  
and  
Water  
Resources**



 <p><b>S\$5 PER TONNE</b></p> <p>Intended tax rate for CO2 emissions from 2019-2023 (Budget 2018)</p>	 <p><b>S\$1 BILLION</b></p> <p>Expected tax revenue that will be channelled towards industry’s energy efficiency projects</p>
 <p><b>1 METER</b></p> <p>Mean sea levels potential rise by 2100 in Singapore</p>	 <p><b>+1.7°C to 4.4°C CHANGE</b></p> <p>IPCC AR4 Projections 2100 (A1B Scenario, SE Asia)</p>

The impending carbon tax has been on the mind of most manufacturers as well as companies that will be directly or indirectly affected by it. Some of Jurong Island’s producers have already demonstrated their efforts to reduce their carbon footprint. ExxonMobil’s cogeneration plant in Singapore, which opened in 2017, will have a 4% to 5% improvement in energy output, reducing carbon emissions by 265,000 tonnes per year. However, in an industry that is becoming ever more competitive, every cent counts. Industry leaders are concerned that even at the improved rate of S\$5/t of CO2, the carbon tax may deter potential manufacturers from investing on Jurong Island. Terence Koh, executive director at SCIC, has encouraged that the carbon tax regime be based on benchmarking, rather than a flat tax rate. “In the long term, benchmarking systems will motivate companies towards lowering carbon emissions while ensuring the competitiveness of their business operations in Singapore,” said Koh. •

### A Closer Look at the Carbon Tax

-  In March 2018, the Singaporean government passed the Carbon Pricing Act, which sets out the tax to be implemented in 2019.
-  Initially, the proposed carbon tax in Budget 2017 was set at S\$10/t to S\$20/t of CO2 but after reconsideration, it was reduced in Budget 2018 to S\$5/t of CO2.
-  Budget 2018, delivered by Finance Minister Heng Swee Keat, highlighted that the carbon tax will affect all facilities producing 25,000 tonnes or more of greenhouse gas (GHG) emissions per year.
-  The recent budget also proposes to reinvest all of the tax revenue – expected to be nearly S\$1 billion in first five years - plus an additional amount into worthwhile projects which deliver the necessary abatement in emissions.

## Industry Perspectives On The Impending Carbon Tax



*“There will be financial impacts due to the carbon tax, but the government’s most recent plan is much more reasonable than its first. Sustainability and future carbon taxes are going to impact every single jurisdiction as countries start to combat environmental concerns.”*

**-JooSang Kim,  
Managing Director and Regional Head of APAC, ARLANXEO**

*“We are well-positioned as we have a strong manufacturing program around waste and energy efficiency. With regards to sustainability, we prioritize recycling and the efficiency in which we produce products, which will help us manage the carbon tax. The carbon footprint of vinyl acetate-ethylene (VAE) emulsions is favorable to us.”*



**-Belur Krishnamurthy Sethuram,  
Managing Director, India, Japan and SEA-ANZ, Celanese**



*“Having spent a few years measuring our own carbon emissions, we are ready for the carbon tax. Reducing carbon emissions is an outcome that all industries will face and we have set ourselves a task of reducing our 2010 baseline measurements by 30% by 2025 and be carbon neutral by 2050. It is good to see a government putting forward legislation on this matter to help everyone move in the right direction.”*

**-Jeremy Rowe,  
Managing Director of Decorative Paints, South East and South Asia and Middle East, AkzoNobel Paints**

*“The carbon tax makes renewable energy more attractive, and DSM is convinced this change is inevitable. My perspective is that the government is trying to balance short-term competitiveness with a long-term objective.”*



**-Pieter Nuboer,  
Vice President, Animal Nutrition and Health, and President, Nutritional Products, DSM Nutritional Products, Asia Pacific**



*“The government is moving in the right direction by committing to the Paris Climate Change agreement. One of the challenges that the industry faces is that many companies are already using the best available technologies, so benchmarking could perhaps be more effective to incentivize companies to reduce carbon emissions and be competitive at the same time.”*

**-Kenneth Lim,  
Site Director, Neste Singapore**



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# A Search for Regulatory Cohesiveness

## Asia Pacific's Challenging Regulatory Framework

In Singapore as well as China, a strong and cohesive regulatory framework is being met with growing demands for sustainable products. It is what Rohit Aggarwal, president of global textile effects at Huntsman, called a 'perfect storm.' "This is where the consumer is becoming more aware of environmental sustainability and governments are prioritizing legislation. This represents an exciting time for the industry as focus shifts from pure cost to sustainability and creating value," said Aggarwal.

Despite this, other countries in the ASEAN and APAC have been slow to adopt new regulations on sustainability, including Indonesia, Malaysia, and India, which are some of Singapore's top export destinations. Unlike in the EU, the ASEAN does not have a regulatory setup that creates uniformity across the region. This is problematic for Singapore's chemicals producers as they are likely to face competition from local producers that may be using cheaper, less environmentally friendly products. "What is happening in China and Singapore is very different from both Southeast Asia and India. In those regions, the change to volatile organic compounds (VOC) and low odor is not driven by regulation or the government but by marketing forces," said Belur Krishnamurthy Sethuram, managing director, India, Japan and SEA-ANZ, Celanese.

Singapore has shown in the past that it can be a force of change. A key example

of this has been Singapore's green building strategy, which aims at 80% of all buildings meeting green credentials by 2030. Jeremy Rowe, managing director of decorative paints, Southeast and South Asia and Middle East, AkzoNobel, highlighted that this initiative is a great example of how Singapore is able to instigate a regional shift. "Singapore is a leader in the region when it comes to developing regulations through its

*"In the ASEAN region, some countries have no clear regulation or guideline on separating the usage of pesticidal chemistries and formulations for non-agricultural uses. It conflicts with global regulations, thereby potentially affecting the development of robust scientific sustainable solutions in specific areas in industry."*

**-Vinod Agnihotri,  
Managing Director,  
ASEAN and Head of  
Material Production  
Products (MPP) –Asia  
Pacific,  
LANXESS**



# Kenneth Lim

Site Director,  
Neste Singapore



### Can you tell us about the decision to base one of your renewable diesel refineries in Singapore?

The investment decision to move to Singapore was made in 2007. Plant construction started in 2008 and commercial production began in November 2010. Singapore's excellent logistics infrastructure, close proximity to feedstock and strong support from both the Singapore government agencies and strategic partners were key reasons for basing our refinery here.

### Neste uses a wide range of waste products for its renewable diesel, including tallow. Can you tell us more about the feedstock being used?

We source our feedstock globally and our NEXTBTL technology enables us to use 100% of the feedstock from wastes, residue oils and fats. About 20% of Neste's feedstock currently comes from crude palm oil, which is sustainably produced and fully traceable to the oil palm plantations. All our palm oil suppliers are members of the RSPO (Roundtable of Sustainable Palm Oil) and they have committed themselves to 'No-Deforestation' guidelines in their third-party sourcing. But having said that, Neste's focus is still on expanding the use of wastes and residues further from the current 80%.

### What are your expectations for renewable diesels moving forward?

There is much speculation about falling diesel demand following commitments by countries to ban the use of diesel passenger cars in the near future. But the fact is that about 70% of fossil diesel demand is from heavy-duty road and sea transportation for which there is currently no cheaper or more efficient alternative. By 2040, we will see a significant increase in demand for diesel, driven by economic growth and increased trade activity. Currently, there is insufficient renewable diesel to meet the regulatory requirements in Europe and North America. With a global trend towards the use of more sustainable fuel, we expect the demand for sustainable diesel to grow substantially as well.

system of governance, measurement and incentives. This is why Singapore sets ambitious targets on green buildings for example. What is positive is that many countries in the region use Singapore as a reference point for building regulations, which increases regional standards," said Rowe.

Singapore, as well as China, is setting an example for the region. India and Vietnam are already showing further commitment to strengthening their regulatory framework, and with Singapore holding the ASEAN chairmanship this year, there is an increased possibility of a sustainable and more aligned ASEAN.



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## Paul Fong

Singapore and Malaysia  
Country Manager,  
Dow Chemical



air. A final example is a recently developed polyolefin-based coating to eliminate Bisphenol A (BPA) in the interior lining of tin cans. The CANVERA™ Technology won the 2017 Kirkpatrick Chemical Engineering Achievement Award and 2017 Edison Award for Innovation.

### Dow has set ambitious goals towards sustainability for 2025. Can you tell us about these initiatives?

We have set seven goals, which include *Advancing a Circular Economy, Safe Chemistry for a Sustainable Planet, and Delivering Breakthrough Innovations*. For example, in Malaysia we have partnered with the Malaysia Plastic Manufacturing Association to create a plastic recycling awareness campaign in schools. In addition, we believe that the alignment with governments on sustainability issues is key in helping us achieve our targets.

### What is your vision for Dow in Singapore over the next three to five years?

I would like to see Dow influence a greater adoption of technology and advanced solutions in the market. Moreover, we want to strengthen and build partnerships with educational institutions like the National University of Singapore (NUS) to foster entrepreneurship and application-based projects in STEM-related subjects.

### Can you tell us about some of the sustainable solutions Dow has recently developed?

Dow has been at the forefront of developing innovative and sustainable products, as demonstrated by the 754 patents we obtained in 2016. Some key examples include the ECOGROUND™ technology – one of 10 winners at the 2017 R&D 100 award. It is a waterborne acrylic binder for making rubberized running tracks, playgrounds and walkways that significantly mitigate exposure to materials with volatile organic compounds (VOC). We have just installed the first ECOGROUND™ running track, basketball court and playground in a school in Singapore - the first in Asia Pacific outside Greater China.

Another key solution is the FORMASHIELD™ formaldehyde-abatement technology – an industry-first binder technology for latex paint that helps remove harmful formaldehyde from indoor



Photo courtesy of Jebsen & Jessen

# Feeding Asia's Appetite

## Singapore's Manufacturers Meeting Regional Demands

One would be forgiven for missing the little red dot on a world map but Singapore has proven overtime that size does not matter. Its position as a top 10 exporter of chemicals, globally, is testament to this. This feat is made even more impressive when considering Japan, the 9th largest exporter of chemicals in the world, is 542 times larger.

The 32km<sup>2</sup> Jurong Island, an amalgamation of seven offshore isles, has been core to Singapore's emergence as a chemicals powerhouse. With the global chemicals market expected to have a compounded annual growth rate (CAGR) of 3.9% between 2015 and 2030 (Ernst and Young), Jurong Island is set to play even more of a significant role. Singapore's producers are well-positioned to benefit from APAC's rising demand for specialty chemicals from end-user industries such as construction, automotive and electronics.

Singapore's manufacturing sector saw a resurgence in 2017. The sector expanded by 10.1% in that year, accelerating from the 3.7% growth of 2016 according to Singapore's Ministry of Trade and Industry. Although chemicals output is expected to increase by 5% in Q1 2018 compared to Q4 2017, the general business outlook for the first half of 2018 is not as positive, with an expected decrease of 9%, compared to the second half of 2017 as noted by the EDB. However, this is heavily driven by a reduced level of production in the petrochemicals segments due to scheduled plant maintenance. Further downstream, specialty chemicals manufacturers can anticipate more output due to increased export orders from the region. The ASEAN

*"Singapore can and will develop more specialty chemicals on Jurong Island and in its many regional innovation centers, with a reach far beyond Singapore. Many manufacturing companies have gone to Malaysia but Singapore's role will continue to be most relevant to Asia as a thought and innovation leader of specialty ingredients and chemicals."*

-Marc Deschamps,  
Regional Managing Director,  
Jebsen & Jessen Ingredients



World-changing progress ideas come from a radical shifts in thinking. The power of chemistry can change our perspectives to create substance of significance from out of the void. At Mitsui Chemicals, we harness this power with assurance to bring you solutions in mobility, healthcare, and food & packaging.

**0→1**  
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*“In the Asia Pacific region, we are seeing a continued increase in demand for our products and we have the potential to expand our businesses and contribute to the region’s success. The Evolve™ is used mainly for packaging and is in line with the growing demands in Southeast Asia.”*



**-Masayuki Kinoshita,  
Managing Director and CEO,  
Mitsui Chemicals  
Asia Pacific**

economies are expected to remain firm in 2018 due to sustained improvements in domestic demand.

**PETROCHEMICALS**

Despite an expected slowdown in the first half of 2018, Jurong Island’s petrochemical producers appear to be well-positioned for future growth. Low crude oil prices and growing demand in a number of end-user industries including plastics, packaging and transportation in APAC are contributing to this. Mitsui Chemicals Group has continued increasing its footprint in Singapore opening its Prime Evolve plant in April 2017, the only Evolve plant outside of Japan which is producing Evolve™ branded MLLDPE. The Evolve plant has been highlighted as a key example in how companies are leveraging Singapore as a base to tap into the growing ASEAN middle class.

ExxonMobil has also had a busy year, completing the acquisition of Jurong Aromatics Corporation’s Jurong Island plant - one of the largest aromatic facilities in the world with an ethylene production capacity of 1.9 million tonnes each year. Furthermore, ExxonMobil completed its new grease and synthetic lubricants facilities in June 2017. The expansion of the Jurong lubricant plant increases the company’s capability of meeting the growing demand for grease and synthetic lubricants products in the region.

**PAINTS AND COATINGS**

The last decade has seen steady regional growth in the paints and coatings industry, with Asia now accounting for 50-55% of total production. The industry remains one of the most heavily regulated industries in the world, which has seen the increased production and adoption of low-solvent and solventless technologies. Singapore’s manufacturers are particularly benefiting from the increasing regional demand for these sustainable and innovative solutions. Celanese completed its vinyl acetate-ethylene (VAE) emulsion production facility in 2016 and is supplying to Southeast Asia, India, Japan and South Korea. “The new production facility will give Celanese a strong platform to grow the business across the region. [...] We have seen the increased adoption of the VAE emulsion across the region due to its good environmental profile with low volatile organic compounds (VOCs), low odor as well as requiring little to



Photo courtesy of Croda

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## Danny Foong

Business Manager,  
Arkema



### With respect to further expansion in the region, is Singapore seen as an ideal destination for a new production facility?

Singapore has always been identified as a candidate for a new facility but as a global company we need to follow the growth of our customers. We have a lot of interest in Singapore, not only in manufacturing but also in R&D with a lot of support from the EDB and research institutions like National University Singapore and Nanyang Technological University. We are aiming to build partnerships with both universities and are looking into the R&D ecosystem in Singapore to see how we can increase our growth.

### Can you tell us about the R&D work that is being carried out here in Singapore?

We have identified a number of mega trends which represent strong potential for us. These include new energies, portable water technology, electronic solutions and home efficiencies, which our adhesives sector is working on. Arkema has focused on innovative solutions from its inception. As a company that prides itself on innovation, we continue to listen to our customers and stakeholders to see what more we can do and what we can alter in our current product portfolio.

### What is your vision for Arkema both in Singapore and in ASEAN?

We will continue to deliver superior growth in Asia and to further balance our geographic split. Today, Asia contributes to 26% of our total sales. Singapore will act as a regional HQ to support the growth in the region. All our regional leaders are in Singapore and they are looking at assisting growth in the region. Furthermore, we are looking at further acquisitions in the region and want to continue our organic growth in advanced materials.

no coalescence,” said Belur Krishnamurthy Sethuram, managing director, India, Japan and SEA-ANZ, Celanese, Dow Chemical has also been prioritizing the adoption of new innovative and sustainable products, demonstrated by the 754 patents it obtained in 2016. Following the DowDupont merger, their Materials Science Division will focus on three market-leading segments – performance materials and coatings, industrial intermediates and infrastructure, and packaging and specialty plastics. Singapore will remain a key regional base for Dow as a regional business headquarters for a number of their divisions as well as a regional R&D center.

Singapore remains a key hub for AkzoNobel, home to its marine, protective and yachts coatings global HQ and the decorative paints regional HQ. AkzoNobel has been prioritizing growth in the region through organic and inorganic growth. Specifically, powder coating has emerged as a key sub-sector for the company. “Powder coating is an interesting sector that we, as the market leaders, will look to consolidate. It is one of the fastest growing sectors due to its logistical and applicatory benefits and its zero VOC content,” said Jeremy Rowe.

### MOBILITY

Demand for synthetic rubber has been rising globally, driven by the needs of the automotive industry. Tire production has seen an annual growth of 3% to 4%, with ASEAN growth at 5% to 6% and China at 7% to 8%. Although the industry suffered

*“There is not only a desire from the customer for new vehicles but also a desire from the government for improved fuel economy and emission controls. We are meeting the lubricants technology demand to enable this with the development of solutions for vehicles equipped turbo charged injectors and particulate filters.”*

-Sean Spencer,  
Vice President and Managing Director - Asia Pacific,  
Afton Chemical



*“The brands are focusing on fast retailing and the emphasis on speed, agility and inventory management will become ever more important. Cost and shorter lead times will drive the supply chain in the next few years. We can expect efficiency and enhancement in logistics and supply chain management to cope with the trends of speed and agility. Singapore will play an even greater role as a creator hub as well as a logistics base.”*

-Rohit Aggarwal,  
President of the Textiles Effects Division,  
Huntsman



from market volatility due to feedstock prices, the global synthetic rubber market is expected to grow by 5.16% from 2017-2021 annually. The market is seeing an increasing demand for synthetic rubber over natural rubber due to lower costs and wider varieties. ARLANXEO, which has butyl rubber and neodymium butadiene rubber (NDBR) production facilities in Singapore, was created in 2016 as a joint venture between Saudi Aramco and LANXESS. Given the former's access to the raw materials that make synthetic rubber, the company is in a strong position to capitalize on growing regional demand. The fuel additives and lubricants market is also seeing dynamic growth. As with the synthetic rubber industry, an increasing demand for passenger cars and commercial vehicles in APAC is contributing to this with China currently producing 20 million cars a year. A further contributor is the growing demand for additives that comply with China's new cleaner emission regulations. Afton Chemical has been expanding its operations in Singapore to meet regional demand with a second phase

expansion set to be completed later this year. This phase is specifically focused on developing dispersant technologies to meet China's growing demand.

### TEXTILE CHEMICALS

In recent years, the textiles industry has been heavily dominated by China following a manufacturing shift to the east due to advantageous low-cost labor. However, there is now a growing trend of manufacturers going back to the United States as labor arbitrage and cost structures have narrowed. Rohit Aggarwal highlighted that productivity in the region will be high on the agenda to maintain competitiveness. “The brands are focusing on fast retailing and the emphasis on speed, agility and inventory management will become ever more important. Cost and shorter lead times will drive the supply chain in the next few years. We can expect efficiency and enhancement in logistics and supply chain management to cope with the trends of speed and agility. Singapore will play an even greater role as a creator hub as well as a logistics base.” said Aggarwal.

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# By Land, Sea and Air

## Asia-Pacific's Logistics and Distribution Hub

Singapore's integrated and connected logistics system has long been the city-state's backbone in its transformation from a low-income country to one of the world's wealthiest. Despite being a small local market, the island nation has developed its infrastructure to serve every part of the international logistics chain. Its status is now mostly undisputed. The city-state has ranked as Asia's top logistics hub for 10 years and came 5th in the most recent Logistics Performance Index global rankings by the World Bank. Moreover, Singapore is the world's second busiest port in terms of total shipping tonnage as well as home to the top-rated international airport – Changi Airport – for six years straight (World Airport Awards). In 2017, Menon named Singapore as the leading maritime capital in the world, ranking highest in a number of categories including shipping, ports and logistics as well as attractiveness and competitiveness.

*“Yang Kee’s integrated logistics hub at Tuas South Link was conceptualized and built in line with the nation’s Industry Transformation Map for the logistics sector to continue securing Singapore’s position as a globally leading logistics hub that is underpinned by operational excellence, innovation and a strong Singaporean core. Strategically located two minutes from the future Tuas Mega Port, it will be a six-story ramp up warehouse with a total floor area of 66,000 sqm, and ideal for Regional Distribution Centre (RDC) operations.”*

**-Jason Goh,  
CEO Asia,  
Yang Kee Logistics**



Nevertheless, Singapore is showing no signs of slowing down. The Tuas mega port, which began construction in 2016, is set to have a capacity of 65 million twenty-foot equivalent units (TEU) - more than the combined 50 million TEU capacity of the current city terminals. Not only will it be the largest container terminal globally but also the single largest fully-automated terminal. This is all in line with the government's industry transformation programme, which aims to cement Singapore's future as an innovative and forward-thinking logistics hub. A separate road map for logistics is set to add US\$8.3 billion in value to the sector and create 2,000 jobs by 2020 (Ministry for Trade and Industry). “We are excited for the development of the new port, which will further underline Singapore's connectivity to the world and its strategic regional dominance in the field of chemicals,” said Lieven Vander Elstraeten, CEO, Bertschi Singapore.

Yang Kee, the largest home-grown logistics provider, is set to benefit from the construction of the mega port. With two facilities currently operating in Singapore at Jurong Pier and Tuas South, the company is set to open a third logistics facility later this year.

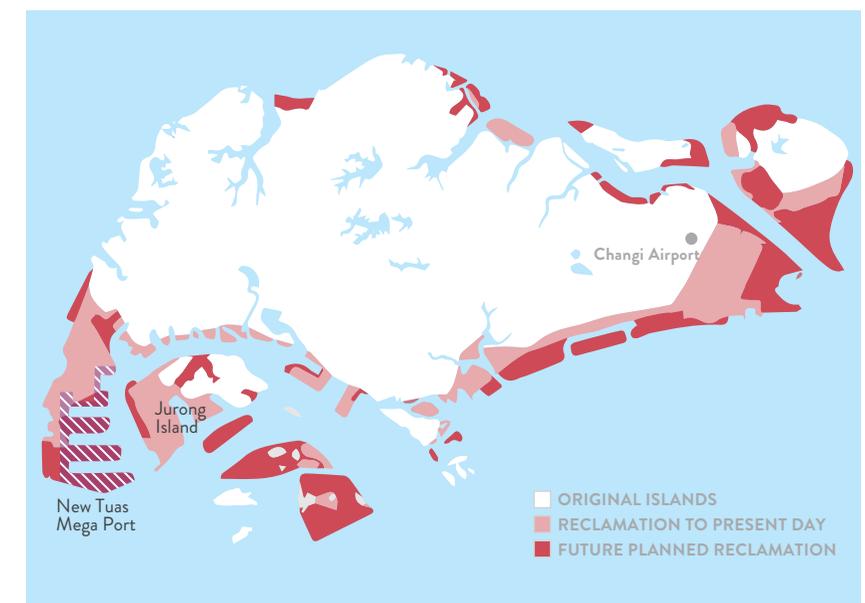
*“For regional and global supply chains, Tuas mega port will be a dream come true. Not only is the location brilliant, but also from a logistics, environmental and safety perspective, the future port will be driving growth and best practice standards across Asia for years to come.”*

**-Goetz Von  
Dresky,  
Managing  
Director,  
Out of the Box  
Logistics**



“Yang Kee’s integrated logistics hub at Tuas South Link was conceptualized and built in line with the nation’s Industry Transformation Map for the logistics sector to continue securing Singapore’s position as a globally leading logistics hub that is underpinned by operational excellence, innovation and a strong Singaporean core. Strategically located two minutes from the future Tuas Mega Port, it will be a six-story ramp up warehouse with a total floor area of 66,000 sqm, and ideal for Regional Distribution Centre (RDC) operations” said Jason Goh, CEO Asia, Yang Kee Logistics. With Singapore continuing to strengthen its integrative network as well as leveraging on regional growth, the city-state’s logistics firms are strengthening their hands. Bertschi Singapore has doubled its storage

## TUAS MEGA PORT LAND RECLAMATION TO DATE



 <p><b>CAPACITY OF 65 MILLION 20-FOOT EQUIVALENT UNITS</b></p>	 <p><b>TOTAL OF 222 CAISSONS TO FORM WHARF OUTLINE</b></p>
 <p><b>PHASE 1 CONSTRUCTION BEGAN APRIL 2017</b></p>	 <p><b>4TH PHASE SET FOR COMPLETION BY 2040</b></p>

Source: Maritime and Port Authority of Singapore



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Photo courtesy of Bertschi

capacity with a second warehouse completed on Jurong Island in January 2018: the infrastructure has been built to accommodate dangerous goods storage. Following a downturn in ISO tanks due to overcapacity, both Bertschi and Sutttons Group have recently begun expanding their ISO tank capacity to meet growing regional and global demands. Bertschi increased their fleet by 3,000 in 2017, purposely making the investment when steel prices were low. “Last year we made an investment of 800 ISO tanks and we have just placed an order for an additional 1000 ISO tanks. There is an ongoing program to expand and upgrade our global fleet,” said Jochen Krapp, regional director of Southeast Asia, Sutttons Group.

Distributors are also poised to benefit from increasing regional demand, utilizing Singapore as a base to serve the region. Nicholas Lim, managing director at Unilite, has seen his MNC customers

become more upbeat as demand has slowly increased. “Improvements in the economy have been led by regional and global demand. Local demand is not reflecting this confidence as of yet, although 2018 will see an overall improvement,” said Lim.

Henri Nejade, CEO and president of Asia at Brenntag, is seeing rapid growth across Asia-Pacific. This growth is not only increasing Brenntag’s activity in the region but adding to its service offerings. “There is a real demand in the food and beverage space driven by changes in consumption behavior. Upward trends include the pharmaceutical, personal care, coatings, lubricants and blending industries: these are spaces in which we provide services to our customers and our suppliers. There is added regulatory demand from our customers and suppliers. One place where we see a good opportunity is supporting SMEs, as we can offer safety and technical services,” said Nejade.

*“We have always focused on ways to simplify and streamline processes, making our customers’ supply chains seamless. We integrated a transportation management system to help our customers manage their businesses with maximum productivity and efficiency. We have also provided complete end-to-end visibility to our customers for over a decade with our BDP Smart® technology.”*

**-Gary Chan,  
Managing Director  
APAC,  
BDP  
International**



# Where East Meets West

## A Trading Epicentre for the Long Haul

Trade has been a hot topic for 2018 and not always for the right reasons. An isolationist agenda by the Trump administration with the implementation of levies on steel and aluminium imports has set alarm bells ringing across the globe. Although a hostile rhetoric has been building, a global trade war that could negatively affect global GDP by 1% to 3% remains unlikely. Geopolitics aside, a number of key dynamic shifts

are affecting the petrochemical and chemical trading landscape, most prominently the relatively low crude oil prices, the continued effects of the shale gas revolution in the United States as well as China’s new wave of ethane cracker projects. Singapore is expected to play an even greater role in the current trading environment, due to its location along major trading routes where East

converges with West, its business acumen and its cultural and linguistic connections. Gina Fyffe, executive director at Integra, highlighted that the seismic changes happening in both China and the United States are adding further significance to Singapore. China’s market is becoming more diverse and complicated due to new producers and domestic traders entering the market. “I believe any company working in China needs to develop an

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## Satvinder Singh

Assistant Chief  
Executive Officer,  
Enterprise Singapore



**Enterprise Singapore is responsible for growing the wholesale trade sector of Singapore. What is your assessment of the current trading environment in Singapore?**

Last year, the Singapore economy grew by 3.5% and trade has also grown effectively. The biggest driving force is regional growth from the major economies that sit within the Asian time zone. When looking at projected growth for 2030, trends suggest that the top economies in the world will be China, the United States, India, Japan and Indonesia. Singapore sits in the middle of four out of five of these economies, providing us a unique ability to be a critical part of their trade flows with one another and the rest of the world. We are the biggest trading hub in Asia, but we have the potential to become one of the biggest trading hubs in the world. Our pro-business environment encourages innovation for trade, and we have the right infrastructure to support this, be it through our R&D centers or talent pool. Singapore has become a magnet for solution providers who are producing new digital trade services in areas including reducing frictional costs in trade transactions and enhancing decision making through data analytics.

**What are the current factors growing the chemicals industry in Singapore?**

We will be primarily influenced by demand, which is driven by global demographics. We are fortunate to be sitting in a region that is seeing exponential population growth. A lot of investment will go into the urbanization of societies, and the growing middle class in Asian societies will drive further demand. A marketplace like Singapore will benefit from that growth.

**Can you tell us about Singapore's growing capabilities as an LNG trading hub?**

Enterprise Singapore has been actively building the LNG trading community and there has been a significant increase in the number of players in the LNG trading cluster in Singapore. The LNG cluster in Singapore was nascent a decade ago, but there are now more than 45 companies with LNG trading or business development presence. With SLNG's fourth storage tank due to be completed by the first half of 2018, we are looking forward to the additional storage capacity which will not only cater to our domestic needs but also increase the scope for more LNG physical trading activities. •

*"I believe any company working in China needs to develop an expertise to survive. China is a vibrant, exciting market and our understanding of it is greatly benefited by being based in Singapore. Singapore is finely balanced between East and West and can play a key role in bridging and understanding the relationships between the United States and Northeast Asia as well as the Middle East and North East Asia. China is still challenging in some aspects and recently we have noticed a growing number of traders setting up camp in Singapore."*

-Gina Fyffe,  
Executive Director,  
Integra



expertise to survive. China is a vibrant, exciting market and our understanding of it is greatly benefited by being based in Singapore. [...] Singapore is finely balanced between East and West and can play a key role in bridging and understanding the relationships between the United States and Northeast Asia as well as the Middle East and North-East Asia. China is still challenging in some aspects and recently we have noticed a growing number of traders setting up camp in Singapore," said Fyffe.

### DEVELOPING A WORLD-CLASS LIQUEFIED NATURAL GAS (LNG) TRADING ECOSYSTEM

Singapore previously relied on LNG imports via pipelines from Malaysia and Indonesia to serve the country's energy needs. However, since 2013, Singapore's LNG capabilities have boomed. Singapore's LNG terminal has recently completed a third phase of expansion to its regasification facilities, bringing overall capacity to 11 million tonnes - enough to meet the city-state's total gas demand. For an island nation with no natural resources, this further strengthens Singapore's security over energy. Furthermore, Singapore is emerging as a probable LNG trading hub. There are now 45 LNG companies in Singapore and, with the increasing commoditization of LNG, increasing numbers are arriving in Singapore for greater optimization. Singapore continues to nurture an environment fit for LNG trading. According to a survey of senior industry leaders by Deloitte, 80% identified Singapore as the most likely destination for Asia's next LNG trading hub. With its ever-growing LNG infrastructure, regulatory framework and strong talent pool, Singapore appears well placed to add another string to its bow. •

## Behind the Scenes

### Service and Solution Providers

#### ENGINEERING AND CONSTRUCTION

Singapore's engineering and construction services are yet to reach anywhere near the growth levels that preceded the 2014 downturn. The sector shrank by 8.4% in 2017, a reversal of the 1.9% growth in 2016 (MTI) and it is set to remain lacklustre in 2018 as a lack of demand, particularly from the private sector, continues to weigh on construction activities. Consequentially, construction companies are diversifying their capabilities in other sectors as well as identifying opportunities across the ASEAN region in key growth markets including Vietnam, Myanmar, Indonesia and Malaysia. Following the downturn in the energy sector, HSL Constructor began focusing more on the water industry and have benefited from a number of public contracts, including the Changi Water Reclamation Plant Phase 2 and the Tuas Desalination Plant 3 (opening July 2018), both for the Public Utilities Board (PUB). Regional assignments for HSL have included power projects in Malaysia, as well as projects in Indonesia and Myanmar.

Returning to the pre-2014 heyday, which was driven by large EPC projects across the chemicals industry, remains unlikely for now but the key process industry players as well as the Productivity Council, comprising of the EDB, ASPRI and SCIC, will continue seeking out opportunities to keep the industry competitive.

#### MANPOWER CONSTRAINTS A PERSISTENT BURDEN

Heavily linked to the process industry, the lack of manpower continues to be an issue in Singapore. Although Industry 4.0 technologies, especially advanced-robotics-enabled procurement, will reduce the need for manpower in parts of the value chain, other areas, where high-skilled labor is required but underrepresented, is a cause of concern. Bertschi's Vander Elstraeten still highlights the manpower shortage and its lack of

*"As a service provider, it is difficult for us to execute projects productively and competitively, which is of course the only desirable way. High energy and land costs, competition from the region and the carbon tax are all pressing concerns. Another contributing factor is overregulation especially on foreign labor. For Singapore to stay at the forefront, it needs to be very selective on the type of manufacturing that is brought here. I believe the EDB knows what they are doing and continues to make the right investments, with a focus on specialty chemicals producers."*

-Charles Quek,  
CEO,  
HSL Constructor



quality as his biggest challenge. "We hope the government will put in place smart actions and makes the necessary changes to the existing foreign quota system to address the extreme shortage of manpower as it is slowing down our growth and further development on Jurong Island," said Vander Elstraeten. Jon Proctor, regional director for Asia at Brunel, highlighted that the Ministry of Manpower has made it increasingly difficult to obtain foreign worker permits as they prioritize a Singaporean workforce. Despite this, Proctor sees this as an opportunity rather than a challenge: "Singapore has depended on foreign

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## Wayne Yap

Executive Director,  
Association of  
Process Industry (ASPRI)



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### Can you update us on the ASPRI-Westlite Dormitory-Papan and other initiatives ASPRI has been focusing on?

ASPRI-Westlite Dormitory – Papan, in collaboration with Centurion, is the first dormitory in Singapore that embodies a Live, Learn and Play concept. This workers accommodation, which was soft-launched in May 2016, achieved almost full occupancy in less than one year and plays a vital role in increasing productivity and upskilling the workers of the process construction and maintenance (PCM) industry. Located in close proximity to Jurong Island, home to more than 100 global energy and chemical companies, the workers accommodation helps reduce workers' travelling time and fatigue.

In Q3 2016, our training division, ASPRI-Institute of Process Industry (ASPRI-IPI), commenced operations at ASPRI Integrated Training Centre (AITC). Early results have been promising. In 2017, ASPRI-IPI conducted 125,000 training hours for 8,600 trainees (of which 3,300 are residents), a four-fold increase from pre-AITC levels.

### How is the business environment for SMEs in Singapore at present and how has it changed over the last few years?

Rising business costs is still the main agenda for most Singapore businesses and we observed an overly competitive environment for PCM companies. A barometer of this is that ASPRI's corporate memberships have not gone down but in fact increased slightly. This is consistent with a highly fragmented industry resulting from a price sensitive structure. With sustained depressed crude prices, the cost of feedstock has been reduced but asset owners are taking a more conservative outlook and postponing maintenance activities.

### Where would you like to see the industry and ASPRI in the coming years?

The launch of Singapore's Energy and Chemicals Industry Transformation Map (ITM) in October 2017 marks a renewed commitment to position this sector for the future. The ITM details Singapore's plan to transform its existing base of chemicals manufacturing through the adoption of innovative Advanced Manufacturing technologies to improve productivity and safety, rejuvenate asset and overcome resource constraints.

labor for many years, particularly in heavy industries. However, it has become increasingly difficult to bring in blue-collar workers into Singapore, especially in high volume. We are having to educate our clients with respect to this situation. However, these restrictions have also allowed us to leverage more local talent and we now understand the local manpower market very well," said Proctor.

Although parts of construction and operation in the chemicals industry will always remain manpower intensive, workforces are becoming leaner as automated working conditions start to increase. Singapore's ITMs and Smart Index are fast-tracking digitalization and automated processes and this will reduce manpower needs across the industry. However, this has left some workers pondering what their future working prospects will look like. Arnaud Despierre, partner at Spencer Stuart, emphasized that the government has historically shown its ability to anticipate such fundamental changes. "Government policies are very thoughtful when coming to reskilling the impacted workforce, as well as helping individuals whose jobs are at risk," said Despierre.

## For a Rainy Day

Singapore Targets Water Self-Sufficiency

The late Lee Kuan Yew made water his main priority with a vision to capture every drop of rain that fell on the island. "Every other policy has to bend at the knees for our water survival," were the words of Singapore's founding father. Water demand in Singapore currently stands at 430 million gallons a day, with non-domestic consumption accounting for 55% of total demand (PUB). By 2060, Singapore's total water demand could almost double. In 2015, the Water Resources Institute (WRI) ranked

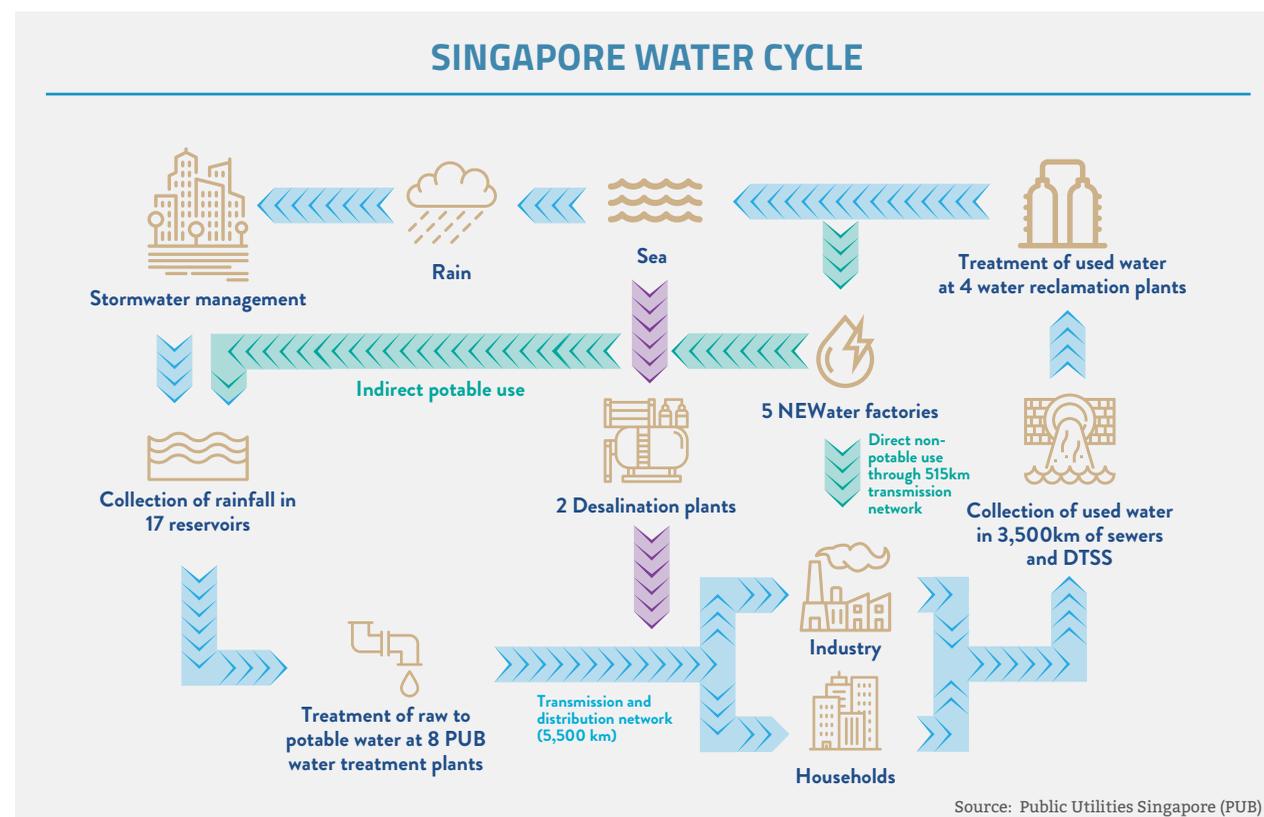
Singapore as one of the most water-stressed countries in the world. Moreover, the WRI highlighted that Singapore is set to be one of eight countries globally that will be most vulnerable to disruptions in water supply. Through a multi-pronged strategy, Singapore is increasing its drive towards water self-sufficiency. One of the key steps has been the construction of the NEWater plants, which recycle used water into ultra-clean, high-grade reclaimed water. Singapore currently has five NEWater

### WATER DEMAND-SUPPLY BY 2030



Source: Public Utilities Singapore (PUB)

## SINGAPORE WATER CYCLE



Source: Public Utilities Singapore (PUB)

*“Singapore is one of the leading countries in water technology globally and also has positive intentions to promote the water industry. As a small water scarce nation that currently imports over half of its water from a neighboring country, Singapore is strongly motivated to move its water industry forward.”*

## Adil Dhalla

Managing Director, START Centre,  
Nanyang Technological University  
NTUitive  
and COO,  
NEWRI



### How is Singapore leveraging its R&D to develop sustainable water solutions?

Singapore has been extremely successful in its R&D efforts in the fields of water and environmental technology, with a robust ecosystem involving strong support from government agencies, world-class research at our universities, and a vibrant industrial ecosystem. With RIE2020, we have an increased national focus on translating some of our academic inventions to products and processes. I contribute by carrying out techno-commercial analyses to identify the most promising inventions at NEWRI, one of the world’s leading environment and water research centers, for scale-up and then work with our partners in the industry, leveraging enablers like the START Centre to bring these to scaled-up versions, ready for demonstration at pilot scale.

### How do you foresee Singapore addressing challenges surrounding water management?

Singapore has taken the challenge of our water resources, and through innovation and commitment, developed itself into a Global Hydrohub. We are able to develop and attract the world’s greatest minds in relevant fields of R&D and have a wealth of inventions from these efforts. The government’s visionary technology roadmap, RIE2020, gives us a pathway to extend this leadership to full-scale products, processes and innovations. This is done through leveraging our academic and research leadership, our increasing focus on engineering and translation, and of equal importance, our close partnerships with key industrial partners and local SMEs.

into a strength. Now a global hydrohub, Singapore is leveraging all of its capabilities, from its leading research institutions to its multiple industries, to develop the most innovative and sustainable solutions that will lead to water optimization and secure Singapore’s water future.



-Dr. Jerry Liu,  
Chief Technology Officer,  
CITIC Envirotech

plants providing 40% of the island nation’s water needs. Singapore is also harnessing reverse osmosis technology to produce desalinated water from seawater. A third desalination plant was recently completed in Tuas and construction of a fourth plant in Marina East began in earnest last year. The fourth plant is set to produce 30 million gallons of fresh drinking water per day with completion scheduled for early 2020. By 2060, the NEWater and desalination plants are set to meet 85% of Singapore’s water demand.

With non-domestic consumption of water set to account for 70% of overall intake by 2060, manufacturers are increasingly looking at ways to improve water-usage efficiency through their operations and solutions. Huntsman, which operates in an industry that heavily relies on water consumption, has been prioritizing water savings in its innovation pipeline. Its award winning proprietary dye, AVITERA, is set to cut water usage by 50%. LANXESS’ LewaPlus software suite is also directly improving the process of water purification. The solutions are increasing recovery rates in the reverse osmosis process of water purification to 98%; considerably higher than the traditional 75% to 85%.

Singapore has come a long way since the polluted waterways of the 1970s. The city-state’s lack of clean water would for many countries be seen as a strong disadvantage. However, Singapore overtime has shown that a country’s weakness can be developed

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### POLLUTION PREVENTION

Our goal is to reduce or even eliminate waste materials and emissions at our plants by improving processes and procedures and the use of strict operational controls.

### PROCESS SAFETY

We strive to prevent accidents and hazardous situations by ensuring that our facilities are designed, built, operated and maintained according to sound practices, and reviewed periodically for conformance.

### PRODUCTS STEWARDSHIP

We make health, safety and environmental protection a priority in the development of new products and processes so that the chemicals we produce can be manufactured, transported, used and disposed safely.



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