

# FLOW



## Unlocking Value Through Digital Transformation

Issue 1, 2018

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**PETRONAS**

## **Ideas for a better life**

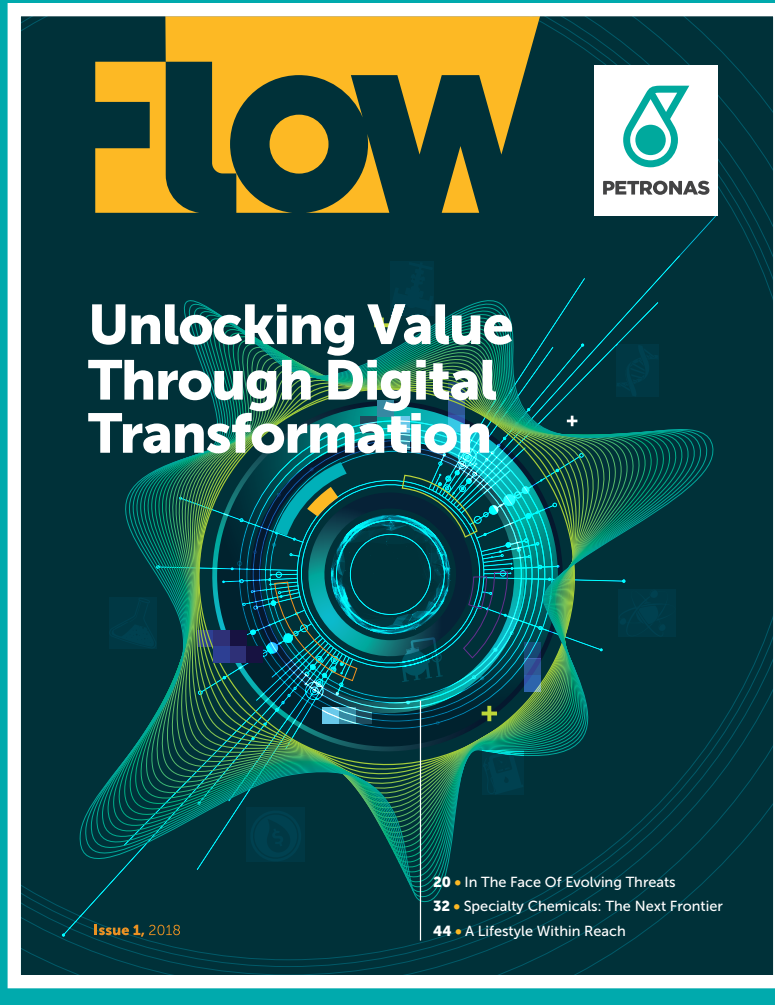
Natural Gas, an abundant energy resource in Malaysia carries with it a huge potential for the creation of a cleaner future.

**#SwitchtoGas**

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## ON THE COVER

The advent of new technologies has truly transformed the way we do things across our businesses— marking the dawn of Digitalisation. We will see more values being unlocked, setting the course for the future where a cleaner, more sustainable world awaits.

## GREETINGS

With this first edition of Flow in 2018, we are reaffirming our foot in the future and solidifying our forays into the world of tomorrow.

Time waits for no man, they say, and in the Oil, Gas & Energy industry, this couldn't be more true. For the past few years, we at PETRONAS have been encouraging our employees to embrace change in an effort to ensure that we move in tandem with the ever evolving world. There were things we had to unlearn and relearn in embracing fresh ways and ideas.

Aptly, in the cover story, we delve into the realm of Digitalisation and look at how, by understanding and analysing the science behind data, we are able to surface that additional value in our business and operations. As the industry shifts landscape, we are left with no choice but to always be on the lookout for new ways to add more value to the natural resources entrusted to us.

However, no change is without its threats and challenges.

While 20 years have seen a lot of changes to the sector's security landscape, new forms of more impactful threats like terrorism, cyberattacks, piracy and hijacking of vessels, militancy and community protests have been making waves in this industry. These threats are discussed and elaborated in this issue.

As we step further into the future, we take a peek at the world of petrochemicals. In

propelling Malaysia's economic growth and competitiveness, the Pengerang Integrated Complex (PIC) in Johor's larger Pengerang Integrated Petroleum Complex (PIPC) is set to position Malaysia as the hub for petrochemicals in Asia within the next two decades. We talked to three experienced professionals from our petrochemicals business to learn more about this next frontier.

It's impossible to talk about our tomorrow without a mention of natural gas. As the national oil and gas company, our responsibility to manage and add value to the country's resources have given us the opportunity to understand the need for a more sustainable world. It's no longer a choice but rather a necessity to #SwitchToGas for us to achieve that goal together and leave a better world for future generations. To better understand how crucial clean air is, we sat down with Dr Helmy Haja Mydin, Consultant Respiratory Physician at the Twin Towers Medical Centre and Pantai Hospital Kuala Lumpur, and co-founder of Asthma Malaysia.

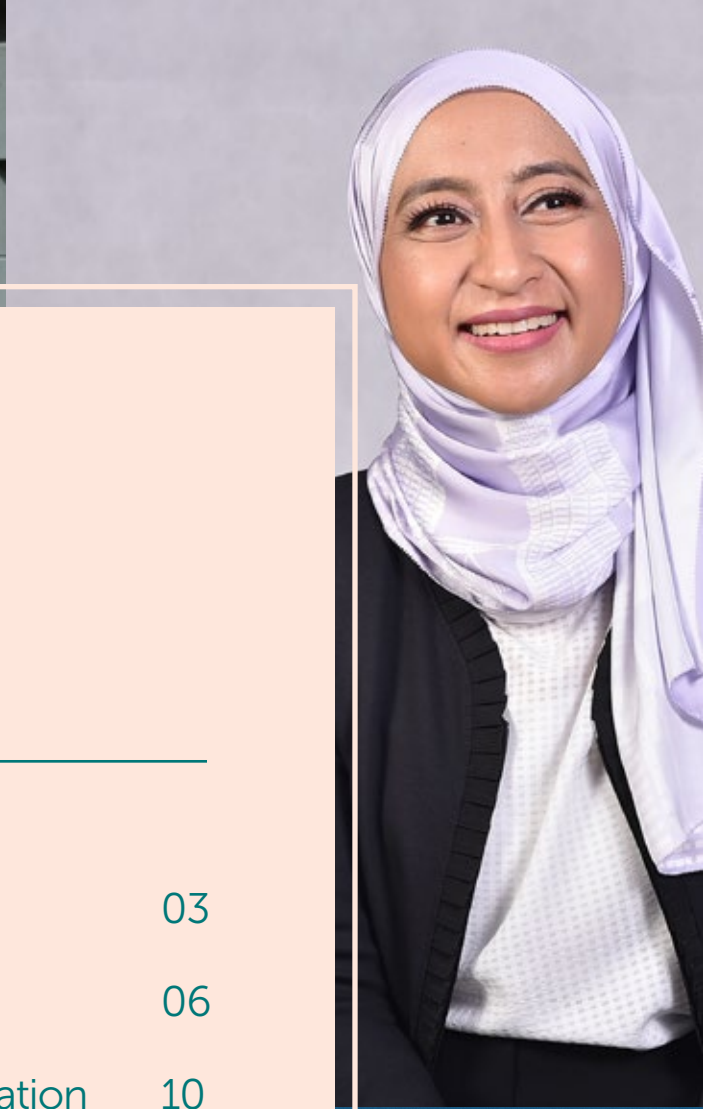
And who better to vouch for the importance of air quality than those who are physically active outdoors. We met with six of our employees who have made it a lifestyle to exercise out in the open air. Having breathed different air across the globe, they have the advantage of knowing what fresh and clean air feels like.

In this issue too, we rounded up our Corporate Social Responsibility (CSR) activities at the end of last year when Malaysia was struck with heavy downpours, causing floods in some areas in the country. It was a time when Malaysians' spirit of unity prevailed as volunteers from all across the nation lent a helping hand to lessen the hardship of the flood victims.

We look forward to sharing more stories with you in our coming issues. Until then, I hope you find this one enlightening and refreshing. Enjoy your read, and of course, I would love to hear from you. Do drop us an email at [flow@petronas.com](mailto:flow@petronas.com) for feedback and queries.

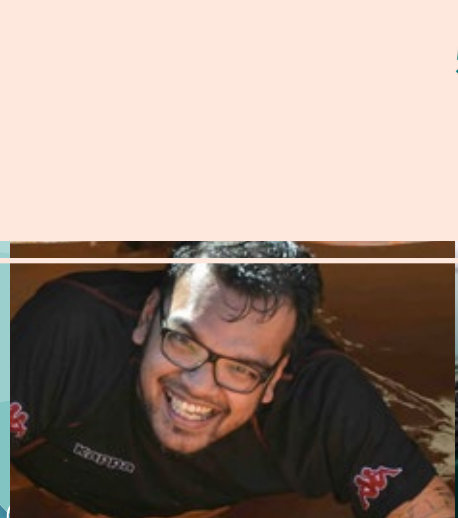
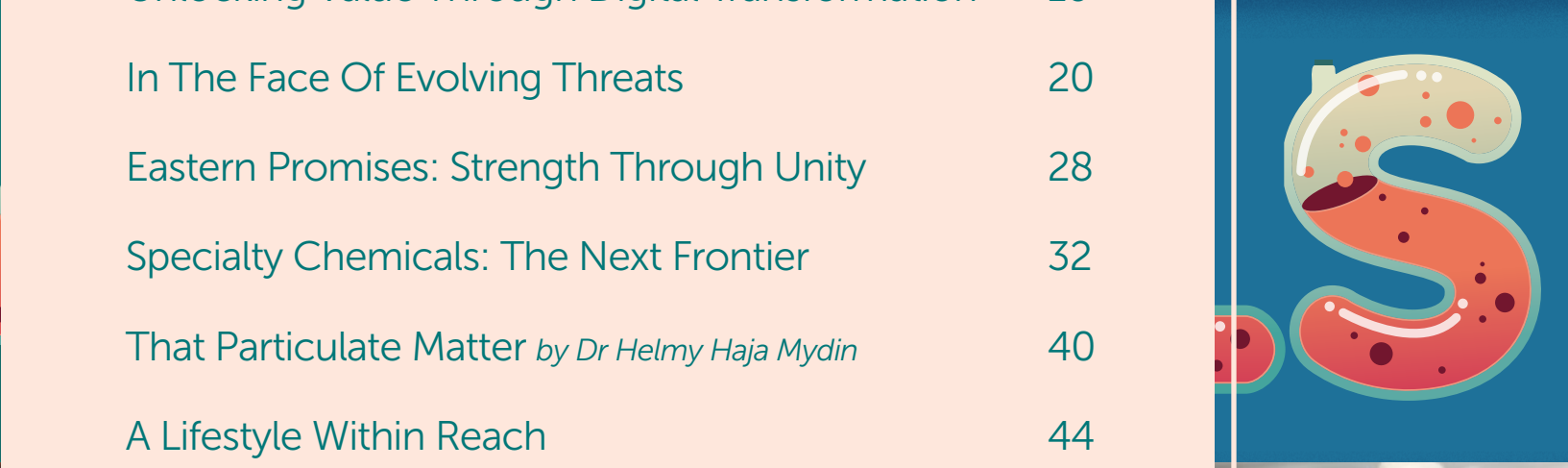
Editor-in-Chief  
**Zahariah (Liza) Abdul Rahman**





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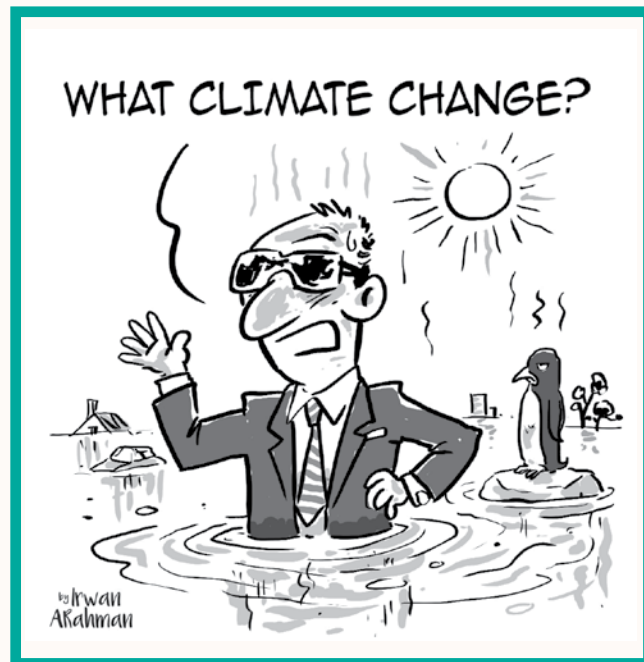




# Managing Climate Change Why Not Gas?

By **TK Tamby**

Climate change - no matter how you spin it, the stark image of melting ice sheets tells you that it's real. And the oil and gas (O&G) industry often finds itself stuck between the need to fulfill voracious energy demand and not destroying the environment in the process.



Despite its faults, can the O&G sector provide a remedy to reduce the amount of greenhouse gasses (GHG) spewed into the atmosphere? Though renewables are hailed as the panacea for all that ails the environment, there is a ready solution with a largely untapped potential of reducing GHG emissions. This solution is natural gas.

Granted, it is still a fossil fuel - however, it is low carbon. When natural gas burns, it produces 50 per cent less carbon dioxide (CO<sub>2</sub>) than coal and 30 per cent less than oil.

Though an obvious choice, there is considerable resistance especially from parties peddling other options for fuel. The number one argument against natural gas is that it consists purely of methane – a GHG 21 times more potent than CO<sub>2</sub>.







However, methane is a fuel that burns completely, emitting significantly less CO<sub>2</sub> - the primary GHG as well as Sulfur Dioxide and Nitrogen Oxide- the precursor of acid rain. Additionally, natural gas produces no smog-creating ash and particulate matter, which affect health and visibility.

The global methane emission is roughly split between anthropogenic and natural sources. Anthropogenic methane sources include agriculture, energy production, landfills and waste water. According to the US Environmental Protection Agency, agriculture accounts for more than 50 per cent of total anthropogenic emission followed by O&G supply chain, which accounts for around 20 per cent of emission - mostly, fugitive emission from leaks along the value chain.

Natural emissions of methane are attributable to amongst others, wetland, natural seeps, animals and vegetation decay.

Over the years, there has been tremendous effort by oil majors to cut methane emissions. In the case of PETRONAS, as part of its Carbon Commitment, the Group has imposed a mandatory requirement of no continuous venting and flaring of methane in the design of new facilities.

For inherited or legacy assets designed more than 20 years ago, methane is monetised in facilities with gas evacuation infrastructure. As for fugitive emissions, PETRONAS has put in place a Leak Detection and Repair Programme.

There has been increased investments in research aimed at improving the industry's ability to detect methane leaks, improve emissions reporting and enhance efforts to reduce emissions. Late last year, the Canadian government announced an investment of C\$5.3 million for seven projects aimed at tackling methane emissions in the oil and gas sector.

PETRONAS has pumped RM275 million into carbon reduction measures since 2013, which has contributed to an 8 million-tonne reduction of CO<sub>2</sub> equivalent emission.

The push to reduce GHG emission is not only motivated by the need to meet multiple environmental goals, but also to curb revenue loss. According to a 2015 article by Forbes, global oil and gas industries allow as much as 3.6 trillion cubic feet of natural gas to escape, representing at least USD30 billion in revenue loss.

Resistance on the basis of methane leak should not stop us from unlocking

the immense potential of natural gas. Apart from electricity, it can be used as a fuel for any mode of transportation. Natural gas vehicles (NGVs) are not zero-emission but their environmental, economic and availability advantages make them a realistic alternative to vehicles running on fossil fuels.

The reduction of pollution would be a much welcome change for cities shrouded in thick smog. The city of Lanzhou in China, once described as a city you can't see from satellite due to dense smog, managed to improve its air quality after switching from coal to gas.

At present, natural gas is the most viable solution to reduce our carbon footprint and improve air quality. Whilst renewables are in the spotlight, its viability calls for time, large investments as well as political and social will. Furthermore, the intermittency of renewables in generating energy when the wind blows and the sun shines requires a reliable and compatible partner, like natural gas.



# Unlocking Value Through Digital Transformation

A radical rethink of how organisations leverage digital to fundamentally change ways of working.

By Jacqueline Pereira



Digital is enabling and disrupting the way we work. The impact of the digital revolution for organisations depends on digital transformation. It propels the creation of differentiated business models based on unique digital assets, where organisations are able to leverage the power of data to optimise production and deliver new value. This allows them to increase operational effectiveness, make the right strategic decisions and reinvent their business models.

New opportunities arise with digital, resulting in novel value propositions to draw insights from data. In offering solutions around integration and new services to capture this emerging value, we should view data as an asset, leveraged to generate value and drive precision in decision-making.

Data is giving rise to a new economy as

the fuel of the future, a May 2017 article in *The Economist* reported. The same article reveals that data is to this century what oil was to the previous one.

"Data is the most valuable resource in this digital age, the driving force behind growth and change," emphasised Wan Shamilah Saidi, PETRONAS' Chief Digital Officer in her talk, *The Power of Data*, as part of the Brown Bag Series for PETRONAS staff in 2017.

## So When Did Data Become So Definitive?

Digital information is unlike any previous resource. Currently 2.7 zettabytes of data exist in the digital universe, 90 per cent of it created in the last two years, driven by exponential technological advances. It is predicted that by 2025, 180 zettabytes (21 zeros

behind 180) of data will exist.

Such data flows have not only created new businesses like Grab, WeChat and AirBnB, but relentlessly propel all businesses to transform. Big Data, Internet of Things (IoT), Analytics, Artificial Intelligence (AI) and High-Performance Computing (HPC) are no longer buzzwords capturing the imagination, but are today's reality.

PETRONAS' Activity Outlook 2018-2020 states clearly that to heighten the industry's resilience, sustainable competitiveness must prevail. Industry 4.0's next level will further open up market players to intense global competition. "To thrive in this challenging environment, technology is key for us to unlock value and deliver sustainable solutions for our industry," says Mazuin Ismail, PETRONAS' Senior





## Being Bold

Appointed less than a year ago and backed by a lean team, Wan Shamilah is responsible for driving PETRONAS' digital transformation. For her, digital is not about technology or software, but rather a new way of working for over 51,000 PETRONAS staff all around the globe. She also foresees agile and innovative digital leaders using data to deliver new increased value, translating into higher productivity and reduced costs.

Vice President of Project Delivery and Technology.

"To put it simply, digital is the innovative way information is combined with technology to raise human and machine performance," Wan Shamilah affirms, viewing the expected change not just as digital, but as business transformation too.

For PETRONAS, the aim is to be a data-driven organisation, adopting new ways of working, to deliver new value.

"Ultimately, we want digital to be entrenched in the way we work, intuitively using the tools just as we do in our personal lives."

To be agile in adapting, we must consider digital as the accelerator, anchored in business outcomes.

"You must always be obsessed with solving pain points. Then everything else will come together."

"Just like oil, data is being extracted, assembled, refined and used to generate economic activity," the maths geek with an accounting background assured her audience in a sharing session, The Power of Data in the Digital Era.

Guided by business priorities, the digital team works closely with businesses to accelerate and enable realisation of business goals.

## + Encouraging Disruption



In elevating digital fluency, Wan Shamilah expects successful pilot programmes to spread the word in their digitalisation drive. "Our approach is not about convincing staff, but rather immersing them in new ways of working through digital projects," she states. Another practice she promotes is 'Fail Fast, Fail Small,' encouraging the digital teams to be creative and innovative in coming up with business solutions, working in sprints of weeks. The aim is to develop solutions that can be scaled Groupwide.

This empowers staff because it encourages understanding lessons learnt, thus diminishing the fear of failure that can paralyse projects from truly succeeding. "What matters is: did we learn from it? How then do we pivot?" She finds this journey liberating, benefitting both talent and potential.

Deciding to run digital operations in a flat, lean environment was a calculated move. Digital is about bringing together multifunctional disciplines without a limiting reporting structure. The

proposed new way of working, however, requires shared purpose and passion, without being disabled by hierarchy. While her core team is small, she has an extended team, aptly named Digital Squad made up of digital leads in the key business units. The Digital Squad works hand-in-hand with businesses on prioritised business pain points.

**"By collapsing boundaries, we work smarter, collaborate better and naturally unleash creativity."**

She strongly believes that no hierarchy exists in creativity, although their digital pilots are very regimented, with stage-gate processes. "How can we leverage what the data is telling us?" In a contained environment, with very clear purpose and scope, pilots allow digital teams to creatively think problems through.

In addressing growing unease about machines replacing humans, and the economic and social consequences, she affirms that part of digital transformation is the opportunity for the organisation and its staff to establish new skills and refresh existing ones. "We need to adapt organisationally to combine wisdom and challenges to benefit the wider industry."

With digital entrenched in day-to-day work, she foresees the organisation moving at a pace to push boundaries.

Another practice she promotes is 'Fail Fast, Fail Small,' encouraging the digital teams to be creative and innovative...







# Deciphering Data

With wisdom, data becomes the solution.

Explaining his trainee data scientist's understanding of the discipline, Chief Data Scientist Dr Rajamani Sambasivam or Dr Samba as he is mostly known said, "The insights from data science are going to improve the knowledge or expertise in every area of the organisation," referring to how the subject has helped improve his own mechanical engineering knowledge.

That is the crux of data science. As an enabler, it takes what you already know and leverages information gained to the next level with specific digital tools.

## Defining Data

From as far back as 1962, data analysis has been debated. According to Forbes' A Very Short History of Data Science, data scientists came into vogue when the mature discipline of statistics was combined with a newer discovery – computer science.

Dr Samba classifies data science into four general areas:

- classic model: statistics and probability, that are still relevant
- machine learning: including algorithms like clustering, decision-tree, random forest, artificial neural networks and deep learning algorithms
- optimisation and system simulation: propagating what-if analysis
- big data analytics: working with text, data, videos, images and audio; examples include seismic and geographical data

Until about a decade ago, a few corporate giants controlled algorithms. Their democratisation has now made these open-source tools readily available.

**Classic model:** statistics and probability, that are still relevant

**Big data analytics:** working with text, data, videos, images and audio; examples include seismic and geographical data

**Machine learning:** including algorithms like clustering, decision-tree, random forest, artificial neural networks and deep learning algorithms

**Optimisation and system simulation:** propagating what-if analysis

As when Facebook identifies the person you are with in a photograph, big data analytics is already at work in the background.

For Dr Samba, a mechanical engineer with a PhD in fluid mechanics who has been practicing data science for 15 years, data science is like watching movies in 3D. Unlike the more limited 2D experience, data science offers additional depth in understanding one's core expertise with the third dimension. "Whatever we can't see in our experience or expertise, that third angle is brought out through data science, adding more depth to the knowledge we have already gained."

## Building Capability

In leading PETRONAS' ambitious analytics practice, which aims to deliver value across the Group's entire value chain, data science capability-building is a key criterion. Data scientists are sourced internally, as well as externally, for more experienced personnel and fresh graduates. Other than continuous training and certification to develop this niche expertise, Dr Samba is involved in project delivery through several pilot projects.

Data scientists must be able to challenge conventional thinking. "Are you ready to explore, challenge how things are done?"

Can you think differently?" he asks potential candidates. They must not be averse to mathematics and have the skill to develop applications, programmes and algorithms. In decreasing levels of importance, he stresses, the arithmetical and coding angles can be taught. "But the personality of an exploring mindset is innate to an individual. That is the most important trait of a successful data scientist."

While people are curious about the subject, general apprehension still prevails. However, they have managed to attract internal staff with ten or more years' experience to consider pursuing data science. The team did so





"Nowadays, more and more, your competitors are not who you expect them to be".

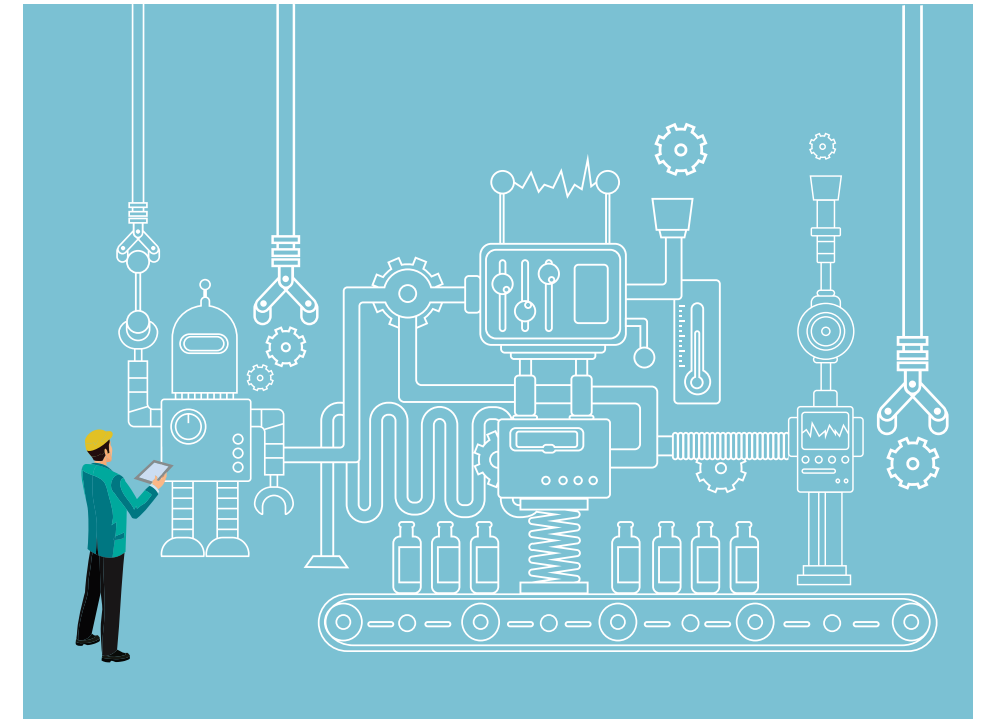
by communicating through SWITCH, a digital immersion programme which is aimed at evangelising digital fluency of all staff in PETRONAS.

The initial three-week training mainly focuses on introducing data science, mathematical principles and programming with small data-set projects. After that, candidates work in groups, solving independent data-set problems. Then they work on digital pilots with experts and business partners. Weekly knowledge-sharing sessions further enhance this hands-on application, demystify concepts, and encourage extra reading. Further practice ensures the required expertise, a little like learning to ride a bicycle. "The actual learning takes place in projects," Dr Samba asserts.

## Pushing Boundaries

The next decade, it is predicted, will witness ways to use all the data the industry has generated to automate simple decisions and guide harder ones. Ultimately, this will work towards reducing risk and resulting in finding and producing more oil and gas with less environmental impact.

Individuals have easily adapted on a global scale to digital or analytics, with apps such as Waze, Facebook and Google. However, in corporations, with deeply entrenched hereditary systems, migration to digital requires not only the process but also orientation, changed mentality and new ways of working. Observes Dr Samba, "Adopting digital will be very easy to an organisation born today!"



Current accelerated advances in technology allude to a future where humans and machines will coexist. This new dynamic will require humans to use judgement as they are posed with different options to choose from when completing tasks and activities in the workplace, and even in more general daily interactions.

"One thing is certain," stresses Dr Samba, "the world is changing, so people need to continuously learn, unlearn and relearn. This learning cycle is not going to stop."

It calls for continuous upskilling to adapt to the constantly changing environment. Similarly, he asserts that digital will continue to provide more job opportunities, as the scarcity of data scientists is already considerable.

He also feels that machines can never overtake human beings as humans have two fundamental needs. With their inherent thirst for knowledge and wisdom, humans always want to know why. The human mind is also better coped to sift through highly ambiguous, imprecise data as compared to machines. "For example, I will be able to, within a fraction of a second, pinpoint that one particular event of the past you are

referring to, with very little imprecise information given by you. Human mind can simply pluck that information very fast, because the mind's neuron connection is unique." The human brain is also furnished with the contextual information established by culture and environment, thus enabling us to process information based on cues from the world around us.

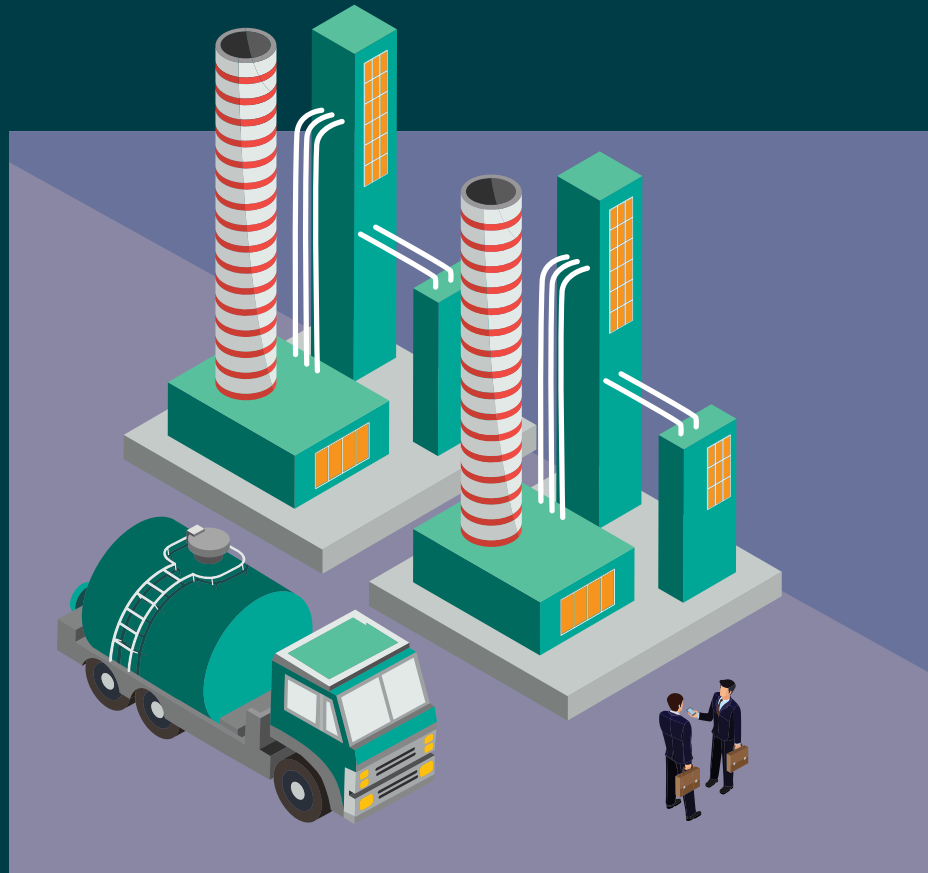
As humans, we do not get stuck at one place. We continuously innovate and change. This is what differentiates humans from machines.

Although artificial intelligence (AI) will serve certain purposes, it will not overtake human beings, he feels. To him, technology is neither beneficial nor damaging – how it is applied makes it good or bad.

External influences today precipitate disruptions. While individuals and organisations enjoy a certain stability in their current existences, they must never discount the possibility of adapting to forces beyond their control.

He cites how auto companies are threatened by software, rather than competitors from the same industry. The software for driver-less cars will cost more than its hardware. When disruption comes from a competitor, they may have a plan in place. But in digital, you do not know where it will come from. "Nowadays, more and more, your competitors are not who you expect them to be."





## Industry 4.0

In today's Industry 4.0 era, data-driven organisations need agile, able leaders who integrate innovation and add value to their products and services.

A 2015 McKinsey & Company Digital Report, Industry 4.0 - How to Navigate Digitisation of the Manufacturing Sector, defines Industry 4.0 as digitisation driven by four clusters of disruptive technologies:

- data, computational power and connectivity
- analytics and intelligence
- human-machine interaction comprising, for instance, touch interfaces and augmented reality
- digital-to-physical conversion, examples include advanced robotics and 3D printing

The report drew on significant primary market research, including a survey of 300 participants from the US, Germany and Japan. It revealed three dimensions for manufacturing companies and, by extension, other companies.

To capture the potential of Industry 4.0, companies must:

- drive the next wave of operational effectiveness
- adapt business models to capture shifting value pools
- build foundations for digital transformation

To leverage these multiple opportunities, companies need to embark on a digital transformation - a continuous, long-term effort to successfully navigate the changing industrial environment.



## Analytics in Action

To augment data science into a business model, it must be anchored on solving specific business pain points. For example, how might we predict when a machine is going to break down? How do we ensure retention and easy availability of corporate knowledge? How do we optimise chemical injections?

Data is critical in addressing business pain points such as these. In turn, data analytics allows for the identification of patterns in data and provides insights that can help organisations make informed decisions.

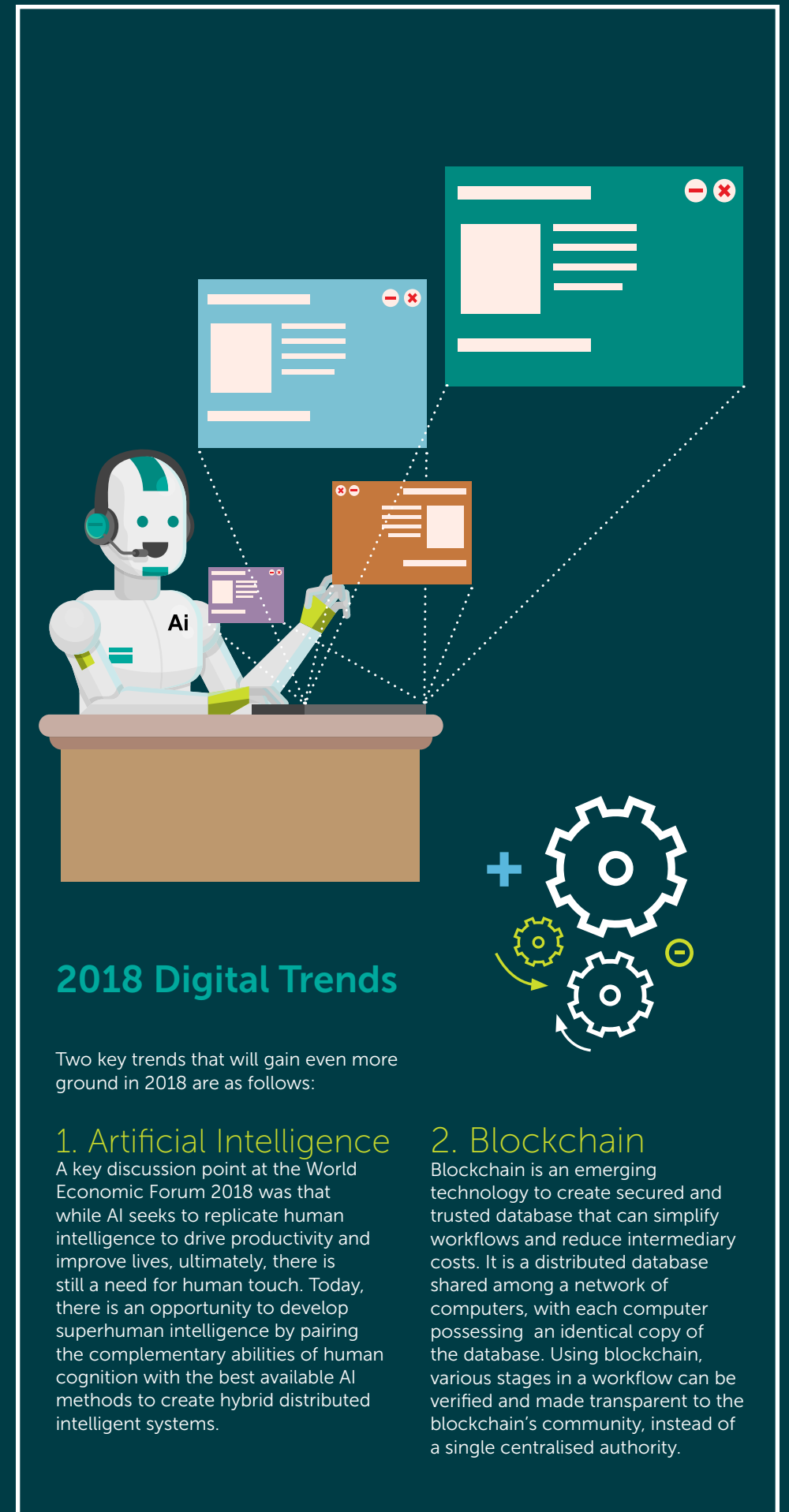
Broadly, there are four types of analytics:

- **Descriptive Analytics:** summarises historical data from multiple sources for quick identification of patterns for users to draw actionable insights
- **Predictive Analytics:** uses past

data to estimate the likelihood of future events and trends

- **Prescriptive Analytics:** applies algorithms to optimise a sequence of decisions for desired end result and advise on best course of action
- **Cognitive Analytics:** applies human-like intelligence to tasks, such as understanding the full context of what is being written or spoken

Depending on the business pain point, a suitable analytics model is then determined. These models are live and are continuously iterated and refined to address the pain point. To support this, an agile method of implementation is followed, resulting in a minimum viable product (MVP). With each MVP comes incremental, bite-sized progress, with continued lessons learnt to finally achieve a suitable end product.



## 2018 Digital Trends

Two key trends that will gain even more ground in 2018 are as follows:

### 1. Artificial Intelligence

A key discussion point at the World Economic Forum 2018 was that while AI seeks to replicate human intelligence to drive productivity and improve lives, ultimately, there is still a need for human touch. Today, there is an opportunity to develop superhuman intelligence by pairing the complementary abilities of human cognition with the best available AI methods to create hybrid distributed intelligent systems.

### 2. Blockchain

Blockchain is an emerging technology to create secured and trusted database that can simplify workflows and reduce intermediary costs. It is a distributed database shared among a network of computers, with each computer possessing an identical copy of the database. Using blockchain, various stages in a workflow can be verified and made transparent to the blockchain's community, instead of a single centralised authority.





# IN THE FACE OF EVOLVING THREATS

By **Brigitte Rozario**

**T**he security landscape in the oil and gas sector has changed over the past 20 years. Traditional asset protection concerns like theft, robbery and pilferage have taken a back seat to more impactful threats including terrorism; cyberattacks; piracy and hijacking of vessels; militancy and community protests.

"In some countries, terrorist and militant attacks are a direct threat to O&G industry operations," notes M A Kader M Kassim, Head of Security, Group Health, Safety, Security and Environment (GHSSE) at PETRONAS.

"Therefore, security measures should be able to withstand these threats in ensuring the safety and security of our people and sustainability of business operations," he adds.

Roy Manchip, Security Advisor, Group Health, Safety, Security and Environment (GHSSE), echoes the sentiment that these new threats affect all corporations competing in the global economy.

"It's an increasingly unstable and volatile world with a range of geopolitical, socio-economic and environmental conditions generating physical security threats to operations of corporations. We have the evolving threat from cyberspace – cyberattacks against websites, networks and SCADA (supervisory control and data acquisition) systems, and data theft. Then there are threats from militant and terrorist groups, civil war or military conflict between nations, which are real in certain countries and have a high impact. Recent examples include ongoing piracy and attacks by Niger Delta militant groups against the oil industry in Nigeria, the rise of ISIS in Iraq, and battles between militant groups in South Sudan which disrupted or closed down production for considerable periods of time," he explains.





Security drills are periodically held in the vicinity of the PETRONAS Twin Towers, as a precautionary measure.

#### Target of attacks

Industry consultant Deloitte LLP in a June 2017 report said that three out of four O&G companies encountered at least one cyberattack last year.

Meanwhile, global insurance company Aon, in its latest Terrorism & Political Violence map, reported that 2016 saw a 14.2 per cent increase in the number of terrorist attacks, with many focusing on the O&G industry.

The obvious reason why O&G is targeted is that it is worth an estimated 4.5-6.5 per cent of the global GDP (gross domestic product), hence its role in driving corporate and government revenues. A major security incident or attack on O&G production can cause supply chain disruption to the sector, which can have dire consequences for a company and country's revenues and economic growth.

Another factor that makes O&G more vulnerable than most businesses is the nature of the work. To find and bring on stream production from new fields, O&G companies have to explore blocks in areas of the world that are remote, exhibit hostile environments or have inherent security risks, putting personnel in the line of danger.

According to Manchip, while the O&G sector is vulnerable and has been for a number of years, "The inherent 'can do' engineering and project risk management approach has made oil

companies better equipped to deal with operational and security risks. Because of the money tied up with oil production, host governments, and the oil companies themselves, are prepared to invest more resources than some other sectors to secure their operations. Security is seen as a necessary and strategic investment."

According to market research firm Markets and Markets, the O&G security sector is estimated to grow from US\$26.3 billion in 2015 to US\$33.9 billion by 2020. The highest expenditure projections are for companies operating in the Middle East, Africa, Central Asia and South America, where physical and cybersecurity threats are escalating.

The report indicates that projected security spending in North America (the US and Canada) is also expected to rise as companies invest in improving the protection of their systems and infrastructure against a range of threats, including cyber and environmental activism.

#### Investing in security

Like its peers, PETRONAS too has been investing in security solutions.

Dzafri Sham Ahmad, VP of GHSSE, PETRONAS, explains that in 2015, arising from the evident changes in the global security landscape, the Group embarked on an initiative to assess the adequacy and preparedness of PETRONAS' security management system.



**Dzafri Sham Ahmad**  
VP of Group Health, Safety, Security and Environment (GHSSE), PETRONAS

He explains further that under Project Umbra, a benchmarking exercise was conducted to review the existing business model and identify gaps for improvement.

"One of the key findings from the study was the need for an updated and standardised security management system for the organisation," says Dzafri.

Subsequently, an enhanced security management framework, known as Security Management System (SeMS) was developed and launched, and is currently being implemented Group-wide. The management system enables a more systematic and standardised approach to handling security risks. It also includes the introduction of minimum security standards which are designed for Malaysian and overseas operations across PETRONAS Group.

Complementing PETRONAS' digitalisation agenda, an integrated online system has also been introduced to improve the management of contractors, visitors and personnel entering its facilities.

The system is intended to better manage contractors or visitors at PETRONAS' installations.

"As far as PETRONAS is concerned, we have a robust plan to manage emerging security threats. We have our own contingency and crisis management plans, and security Incident Action Plans (IAP) for responding to the assessed security risks. These plans are regularly tested to check our preparedness in the event of a security breach. We also maintain a close relationship with the authorities, especially the National Security Council, Police, Navy, and Malaysian Maritime Enforcement Agency as well as with host nation governments in our international operations," explains Kader.



**Roy Manchip**  
Security Advisor, Group Health, Safety, Security and Environment (GHSSE), PETRONAS

#### Risk management

Manchip, who has an extensive background in security risk management, observes that the energy and oil services companies tend to have a strong risk management culture.

"Security is one of a number of operational risks that O&G companies face and it has to be managed. This does not always mean that all oil companies get it right all of the time, but the fact that new supplies are brought on stream safely suggests that their security risk management is effective.

"This means that while there have been attacks, and unpredictable shocks in the past (e.g., the rise of ISIS in Iraq), the industry has to be able to absorb them, adapt and recover quickly, adjusting their operations to meet the changed threat or risk profile, while guaranteeing reliable supply," says Manchip.

He believes that O&G companies need to monitor and continually update their security risk registers, and have appropriate strategies and decision-making procedures in place to deal with security risks and crises, should they occur.

Kader concurs, saying, "Security risk, as part of project management, is one of the top priorities for PETRONAS. We always train our (GHSSE Security)



**// The industry is pretty robust and has been able to absorb the shocks - geopolitical, economic and security as well as new threats. //**

people to enhance their competency and capability. We also ensure that they are kept up to date on security matters affecting our operations as we believe in being prepared.

"We have put in place measures to deter, detect, deny and respond to security threats. We have our own response team who have been trained specially as first responders to any eventuality. The team is groomed to be physically fit and responsive, and is equipped with relevant training such as profiling of people so they can identify suspicious activity when patrolling.

"PETRONAS' security policy clearly says that we are committed to implementing an effective security management system Group-wide to identify and evaluate as well as manage security risks to our people, property, information and operations. We have a very strong policy and we live by it. Security is everyone's responsibility," says Kader.

#### **Safety first**

"Ultimately, and most importantly, we want everyone to go back home safely," he adds.

**M A Kader M Kassim**  
Head of Security, Group Health, Safety, Security and Environment (GHSSE), PETRONAS



## Combating Piracy



In light of rampant piracy incidents in 2008, Malaysian International Shipping Company (MISC) and the Royal Malaysian Navy established a strategic partnership which would be a significant milestone for the company and set a bold precedent for the shipping industry. It resulted in the conversion of MISC's Bunga Mas Lima (BM5), a 699 TEUs container ship, into an RMN Naval Auxiliary Vessel. It was the first Malaysian merchant vessel to be repurposed for security reasons. To date, MISC is the first and only shipping company to implement such a unique security arrangement to protect its ships, crew and cargo against piracy threats in the Gulf of Aden.

BM5 went to sea as a Naval Auxiliary Vessel on 1 June 2009. Its mission was to escort MISC ships sailing through the Gulf of Aden, which was notorious for piracy activities.

To support the operations for BM5 as a Naval Auxiliary Vessel, its crew underwent training to become Naval Reservists.

BM5 was enhanced with various facilities such as rigid-hulled inflatable boats (RHIB), to facilitate the transfer of RMN's Special Forces to MISC ships (prior to the commencement of an escort through the high-risk areas); light weapon mounts; improved communication apparatus; and medical facilities. The operations, code-named OP FAJAR, saw BM5 safely escorting over 415 Malaysian vessels plying the Gulf of Aden and its adjacent areas.

Subsequently, MISC handed over BM5 to RMN in 2016. The vessel joined RMN's current fleet to safeguard our Malaysian waters and strengthen the country's future maritime defence strategy.

## Militant Attacks Threaten Nigerian Oil Production and Revenues



After just 1½ years of ceasefire, the militants were at it again in Niger Delta. The January 2018 attacks did not come entirely as a surprise. Last November, there were already rumblings that the Niger Delta Avengers militant group was dissatisfied with progress made since the August 2016 ceasefire negotiations.

The talks came on the heels of the Avengers' attacks on oil pipelines, which caused international oil companies to evacuate expatriate staff and cut Nigeria's oil production by 30 per cent from 2.2 million barrels per day to around 1.4 million. It was the lowest the top African country had produced in 30 years, tipping the country into recession. The attacks in 2016 ended seven years of peace and stability after the militant group for the Movement of Emancipation of the Niger Delta signed a peace deal with the Nigerian Government in 2009, ending a three-year insurgency against government forces and the oil industry.

In January this year, the Avengers threatened to carry out attacks on deep sea oil facilities in the offshore oilfields of the Niger Delta. The group had targeted

the Bonga Platform and the Agbami, EA and Akpo fields. The militants also said they would target Nigerian oil company Britannia-U. Shell operates the Bonga and EA fields while Chevron operates Agbami. Akpo stakeholders include Total, China's CNOOC, Brazil's Petrobras and Nigeria's Sapetro.

The threat was designed to pressure Nigeria's President Muhammadu Buhari to address inadequate development, pollution and the uneven distribution of revenues from Niger Delta oil production over the past 30 years. The Avengers claim insufficient progress has been made since they agreed to a ceasefire in August 2016.

The country has been linked with allegations of corruption involving politicians and community leaders. There has also been uneasiness over oil industry jobs going to foreigners; many question why its citizens live in poverty while the country has some of the world's richest oil deposits.

The threats of attacks this year raised fears of a repeat of 2016 with waves of violence and another dalliance with a recession.



## Cyberattacks a Major Risk to the Oil and Gas Sector



The oil and gas sector is one of the top targets for hackers. In fact, it is the second industry most prone to cyberattacks according to a report released by consulting firm Deloitte LLP in June 2017. *The Protecting the Connected Barrels—Cybersecurity for Upstream Oil and Gas* report, based on research conducted by the Ponemon Institute, revealed that over 75 per cent of companies surveyed admitted to being hit by at least one cyberattack in 2016. Threat groups include state-sponsored actors, industrial espionage, terrorists, environmental and/or anti-industry activists, and "hacktivists".

Risks include loss of commercially-sensitive data and intellectual property; SCADA systems shutdown that could cripple production; loss of containment; and environmental issues. The challenge for companies is the tension between IT departments to secure the network and control access to data and operating systems, and field operators who need ready availability of access to data, logic and control systems for extraction and production.

The report's authors, Andrew Slaughter, Paul Zonneveld and Thomas Shattuck, stressed the significance of Deloitte's findings. "The culture needs to change, and that's happening but it takes time.

This report serves as a call to arms," they said.

The worst cyberattack reported on the oil industry occurred in 2012 when an introduced Shamoon malware wiped over 35,000 Saudi Aramco computers in hours, forcing operators to use typewriters and faxes to maintain operations until IT services were restored. The attack threatened, but fortunately did not stop, Saudi Aramco's oil production which makes up 10 per cent of the world's oil supply.

The same year, the networks of the Canadian branch of Telvent, a provider of IT-based remote administration and monitoring tools for the energy sector, were breached in an advanced persistent threat attack and infiltration of malware. The attackers, believed to be a Chinese hacking group, stole project files related to one of its core products, OASys SCADA.

In 2014, dozens of Norwegian O&G companies, including STATOIL, were victims of cyberattacks. The threat group and motives have not been identified.

Motives for these cyberattacks include cyberterrorism, industrial espionage, market manipulation and fraud, and operations disruption.

Successful cyberattacks can affect upstream exploration, drilling, oil collection and processing, gas compression, and production metering. In the midstream, processes disruption from cyberattacks can impact oil and gas processing, transportation and storage. While downstream cyber risks include threats to oil processing and regasification, refining, production of petrochemicals, oil and gas storage, and transportation to consumers.

According to the Industrial Control Systems Cyber Emergency Response Team (ICS-CERT), more than a third of the 2015 attacks on critical infrastructure was untraceable or had an unknown "infection vector". As such, the attacks could remain undetected for days, not only crippling computers and networks, but even reappearing as new forms over time.

The industry is expected to spend up to US\$1.87 billion on cybersecurity in 2018, in a sector that is expected to be worth US\$25.68 billion by 2020.

Although many oil companies are setting up industry forums, collaborating with others and working with governments to secure their operations, the solution doesn't just lie in new technology investments and cybersecurity fixes.

Beefing up cybersecurity is not just about throwing money at IT solutions. Companies need to identify risks and develop risk mitigation strategies. Staff, vendors, partners and contractors need to be trained and made aware of risks to close any security gaps. All of which needs to be done while allowing the Internet of Things to flourish, providing mobility and remote access to data and systems.

It is imperative that O&G companies remain vigilant and resilient while prioritising the safety and security of people and assets; maintaining reliable operations; and delivering new value streams.



## Nature for the Future

Within the 30,000 hectares of Imbak Canyon Conservation Area (ICCA), Sabah's untouched lowland dipterocarp forest is nature's treasure trove of 600 species of flora and fauna. It is also where the **Imbak Canyon Studies Centre (ICSC)** stands - a state-of-the-art research complex to preserve its natural resources.

PETRONAS collaborates with Yayasan Sabah to ensure this nature's marvel will thrive and greet our future generations with the same splendour.



# EASTERN PROMISES: STRENGTH THROUGH UNITY

by **Tengku Fairuz Khalisah Tuan Ibrahim**

With “Creating Value Through Collaboration” as its theme, the Asia Petrochemical Industry Conference (APIC) 2018 puts the spotlight on the imperative of collaboration and cooperation in paving the way for a prosperous and robust petrochemical industry.

## Rising optimism in the oil & gas industry

With 2017 deemed by many as the year of recovery, 2018 brings about a sense of optimism as the oil and gas industry continues its slow and steady recovery from the 2014 downturn. Global oil prices are rising gradually from around \$30 per barrel in early 2016 to around \$53 per barrel in 2017. There is also an increase in upstream and downstream activities which is a positive indicator of the health of the industry.

Robust global economic growth has led to a steady increase in oil and gas demand. In its latest report, International Energy Agency (IEA) forecasted that global oil demand will rise from 97.8 million barrels per day (bpd) to 104.7 million bpd from 2018 to 2023 with China and India contributing half of the increase in demand.

Non-OPEC countries are forecasted to dominate the global oil supply contributing 59.26 million bpd of crude oil this year, with the US contributing the largest supply growth amounting to 1.4 million bpd for 2018. Apart from the surging output from the US, rising

production from Canada, Brazil and Norway is expected to support and drive global demand, while the Middle East continues to remain as Asia's biggest supplier.

## Asia as the key driver of global petrochemical industry

Asia's robust economic growth supported by megatrends; rapid urbanisation, growing population and rising middle-class income will lead to higher demand of petrochemicals. This will increase the potential for continuous growth of the industry in the region.

One of the bright stars in Asia is China. Availability of coal resources and imported LPG from the US, and the development of integrated refinery and petrochemical complexes have made the availability of feedstock for the development of the petrochemical industry.

India is also expanding its petrochemical capacities and increasing its flexibility in petrochemical production. The government is planning to develop petrochemical complexes around India to meet the increasing demand for polymers and specialty chemicals across the diverse industrial segments. In 2017, India's Reliance Industries Limited (RIL) has successfully commissioned the world's largest ethane importing plant and has now begun to import ethane from the US for its crackers in Dahej and Hazira.



ROAD TO TOMORROW.  
A view of Pengerang Integrated Complex taken in March 2017.

## Growing capacity expansion in the US

The shale revolution brought about a robust petrochemical capacity expansion in the US. According to an analysis by Independent Chemical Information Service (ICIS) eight new ethane crackers are expected to commence production from 2017 to 2018, producing a total of 9.2 million tonnes/year of ethylene capacity.

The US polyethylene capacity is projected to rise by 6.5 million tonnes/year, accounting for about 42 per cent of global polyethylene capacity expansion up till 2020. The US polyethylene production will mostly be meant for export to key regions such as Latin America and Europe. The increased expansion has opened arbitrage opportunities to Asia, competing with the regional producers as well as producers from the Middle East.

## The need to collaborate for the sustainability of the industry

With intensifying competition from other regions, collaboration plays a prominent role in enhancing the robustness of the Asian petrochemical industry. Strong cooperation between manufacturer and consumer is needed to develop new markets for differentiated products. The focus on creating high-value specialty chemicals which are customised to cater for the niche market will help propel the industry further in positioning the Asian petrochemical producers as solution providers.

Akbar Md Thayoob, President, Malaysian Petrochemicals Association (MPA) said, “Today, Petrochemicals are regarded as the key engine of growth as we move into the future, shaped by the megatrends of urbanisation, ageing population, rising middle-income, energy efficiency, just to

name a few. Against this backdrop, there is a need for the petrochemicals fraternity to come together and collaborate to offer sustainable solutions demanded by these megatrends.”

## Malaysia's petrochemical industry landscape

Malaysia's petrochemical industry began in the early 1990s with the development of three major petrochemical facilities strategically located in Gebeng, Kertih and Pasir Gudang. Since then, Malaysia has been among the key petrochemical players in the region with a wide range of petrochemicals being produced and exported from the country such as olefins, aromatics, ethylene oxides and glycols, among many others. These world-scale plants have also contributed significantly to the production of the local plastic processing activities in the country by providing a steady supply of feedstock material for the plastic industry.





PETRONAS' largest downstream project, Pengerang Integrated Complex (PIC), is currently on track for overall start up by early 2019. This bold move by PETRONAS is expected to push the Malaysian Oil and Gas downstream sector into a new frontier of technology and economic development. During the construction period, PIC employed up to 60,000 workers and created spin-off from economic activities to its surrounding areas. Its proximity to the world's busiest shipping lane and international trading hub makes it the most strategic regional downstream hub.

The Malaysian government's support in providing a conducive ecosystem has also helped the petrochemical industry to thrive in the country. This includes the development of infrastructure and offering of incentives to attract foreign companies to invest in Malaysia and boost local manufacturing sector activities.

### APIC 2018: Creating Value Through Collaboration

Against the backdrop of these opportunities, APIC 2018 will gather key business players, leading market analysts and industry experts in Kuala Lumpur from 20 to 21 August to provide insights and critical analysis from across the chemical value chain to enhance the growth of the industry.

Notable speakers for the event includes Dave Witte, Senior Vice President, Division Head – Energy & Chemicals, IHS Markit, Clive Gibson, Vice President, Asia, Energy & Chemicals Advisory, Nexant, Dr Charles Fryer, Chairman, Tecnon OrbiChem and Datuk Sazali Hamzah, Managing Director and Chief Executive Officer, PETRONAS Chemicals Group Berhad.

For more information about APIC 2018, visit [www.apic2018.org.my](http://www.apic2018.org.my).



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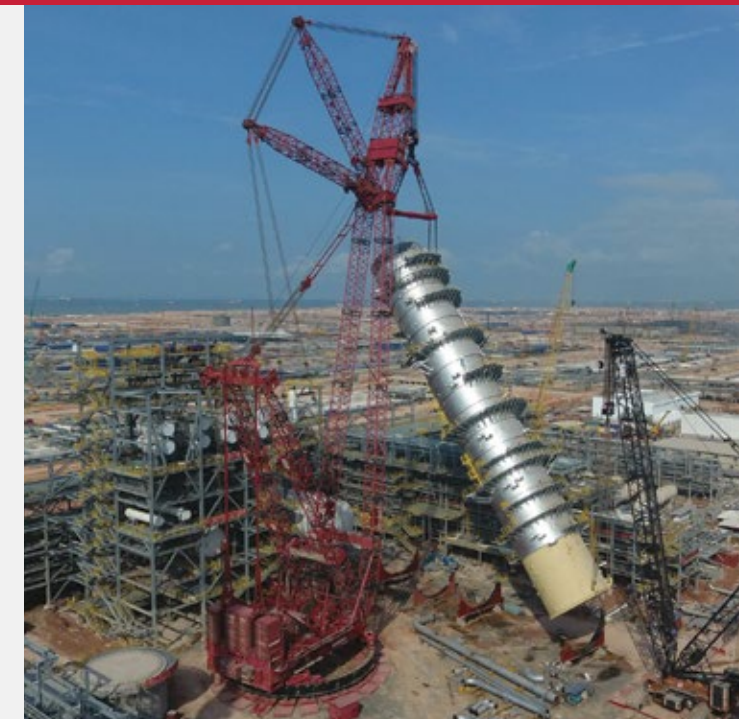
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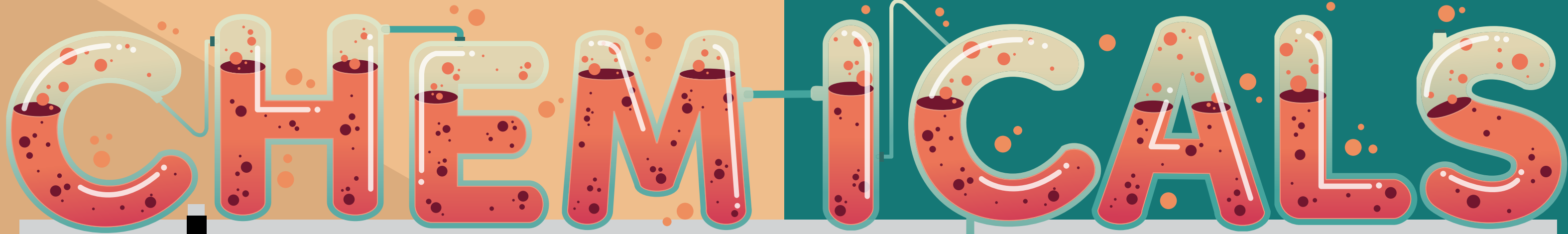


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# SPECIALTY



## THE NEXT FRONTIER

by **Sreerema Banoo**

PETRONAS, through PETRONAS Chemicals Group Bhd, is upping its game in the chemicals sector thanks to a two-pronged strategy for growth. A major ace up its sleeve is the Pengerang Integrated Complex (PIC) that houses the Refinery and Petrochemical Integrated Development (RAPID) project in Pengerang, Johor.

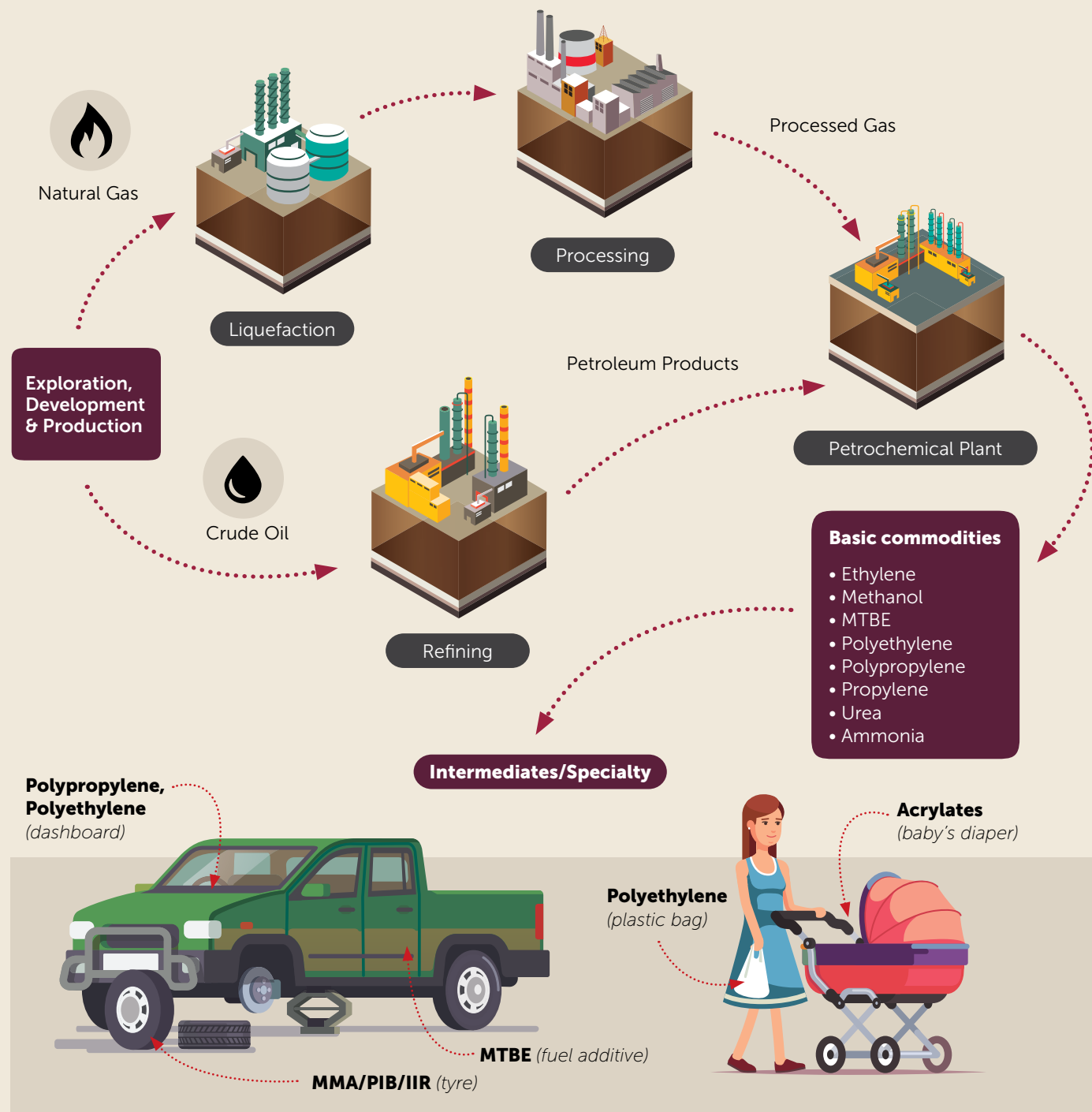
**W**hat makes a shampoo so moisturising that it leaves your hair silky soft, or a toothpaste taste so minty fresh, or your shirt wrinkle-free? The answer to that lies in the realm of specialty chemicals. These are performance-enhancing properties and solutions - the "secret ingredients" - that go into additives, plastics, coatings, fertilisers, fragrances, and flavours of

products that we use and come into contact with every day.

Whether it's the toothbrush, soaps or shampoos that you use, your choice of breakfast, the clothes that you put on, or the cars that you drive, specialty chemicals are ever-present in our daily lives. They are the formulations that make modern, urban life easier, more comfortable, and appealing.

Reports suggest that the worldwide specialty chemicals market will hit US\$530 billion by 2022, growing at a CAGR (compound annual growth rate) of 6.3 per cent from 2015 to 2022. Rising population, rapid industrialisation and urbanisation, and increasing demand from automotive, construction and consumer goods industries are some of the factors driving this growth.





Cognisant of the growth opportunities and trends that are changing the world we live in, Petrolim Nasional Bhd (PETRONAS) is widening its footprint in this arena. And it is doing this through its petrochemical arm, PETRONAS Chemicals Group Bhd (PCG).

Listed on Bursa Malaysia in 2010, PCG is involved primarily in manufacturing, marketing and selling a diversified range of chemical products such as olefins,

polymers, fertilisers, methanol, and other basic chemicals and derivative products. The specialty chemicals segment is the next frontier of its business strategy.

"We have a two-pronged strategy to realise our vision to be the preferred chemical company, and that is to continue sustaining our strength in basic petrochemicals, and selectively diversifying into specialty chemicals and solutions," says PCG Head of Strategic

Planning & Ventures, Akbar Md Thayoob.

This strategy, he says, increases PCG's volume-play advantage as a competitive regional player and at the same time harnesses value-play from higher-margin products. The latter is where specialty chemicals come in. These products, he adds, also insulate the group against market cyclicality and volatility - ensuring sustainability in the longer term.

## FUTURE-PROOFING THE BUSINESS

The push towards specialty chemicals, Akbar says, was born of an internal project that sought to develop a strategy to future-proof PCG's business. Dubbed Project Titanium – so named for the metal's versatility and ubiquitous applications, it commenced in September 2017 with a series of in-house brainstorming sessions, labs and workshops.

"It was from here that we came up with the blueprint to grow our specialty chemicals segment," he says.

Growth will be driven through three levers – organic growth i.e. extension of the value chain from PIC's petrochemicals and existing complexes, mergers and acquisitions (M&A), and by creating optionality for growth via corporate venture capital and internal research and development.

In recent past, PCG's CEO Datuk Sazali Hamzah has spoken about the group's interest in looking at M&A as part of its growth strategy. In an interview with CEO Magazine, Sazali said that PCG is "evaluating some of the latest technology applications beyond 2020 via partnerships and/or possible mergers and acquisitions".

"We have the mandate to pursue M&As," reiterates Akbar, adding that technological strength, market access and management capability of its prospective partners or investments are key criteria.

"We're also looking at placing small bets through corporate venture capital on start-ups or companies that are working on breakthrough technologies or solutions that fit into chemical segments based on megatrends," he adds.

**Akbar Md Thayoob**  
Head of Strategic Planning & Ventures, PETRONAS Chemicals Group Berhad.



The group is also looking at its existing portfolio of basic petrochemical products and the options to extend the value chain. "Instead of selling raw materials, we turn them into derivatives and some we can turn into specialty chemicals. It's a step-by-step approach. The idea is to extend as far down the value chain as possible and create better value," says Akbar.

Through its joint venture company, BASF PETRONAS Chemicals Sdn Bhd, the group has already added specialty chemicals into its portfolio with the commissioning of new plants in Gebeng, Kuantan.

These products include aroma ingredients, which are sold to the flavour and fragrance industry, 2-Ethylhexanoic Acid (2-EHAcid), which are used in esters for film plasticisers and synthetic lubricants, and Highly Reactive Polyisobutene (HR-PIB) used in manufacturing high performance fuel and lubricant additives.

"We have a two-pronged strategy to realise our vision to be the preferred chemical company, and that is to continue sustaining our strength in basic petrochemicals, and selectively diversifying into specialty chemicals and solutions." – Akbar Md Thayoob

## CUSTOMISED SOLUTIONS



**Ir Yaacob Salim**  
Deputy Project Director,  
PETRONAS Refinery and  
Petrochemical Corporation  
(PRPC) Sdn Bhd.

PCG's clientele include large plastic manufacturers, paint manufacturers, fast-moving consumer goods manufacturers, and large plantations, to name a few. Approximately 29 per cent of its market are in Malaysia, with a further 41 per cent in the Southeast Asia region, 16 per cent in China and 14 per cent from other countries around the world.

"We have over 1,000 active customers globally, and more than 80 per cent of our business comes from customers who have been with us for over 10 years," says Akbar.

Its approach, he adds, is to study megatrends, and understand customers' pain points to find solutions. "We have a few solutions that we've co-created with our customers, and customised to suit their requirements. For example, a few years ago we developed a special solar panel cutting fluid with a customer, which reduced waste and improved the performance of the solar panel. We have also developed an insulation for pipe coating that offers UV protection, and we've also developed polymers that make it easier for the customer to mould their products," he says.

In Japan, the group with its strong urea base, is also moving into specialty

urea for boutique farming. "Not all the nutrients can be found in the soil, so if you want tomatoes that are redder and juicier, this is where specialty chemicals come in. And this is where the future of specialty chemicals lies – more niche and customised solutions," he adds.

Despite the opportunities, the industry is not without challenges. Besides the low price of crude oil, there is stiff competition from the US, China and the Middle East. Akbar says the shale gas revolution will continue to rewrite the global supply and demand balance.

"The Middle East players are also diversifying into specialty chemicals in a big way and turning specialties into commodities in the process," he says, pointing to several solvents and surfactants as examples.

Navigating through these challenges, Akbar highlights the importance of pursuing PCG's two-pronged strategy. Remaining competitive and maintaining its market leadership in the region's chemical industry means focusing on Health, Safety and Environment (HSE), and its core capabilities, namely operational excellence, commercial excellence, and striving to continuously offer innovative solutions and products to its customers.

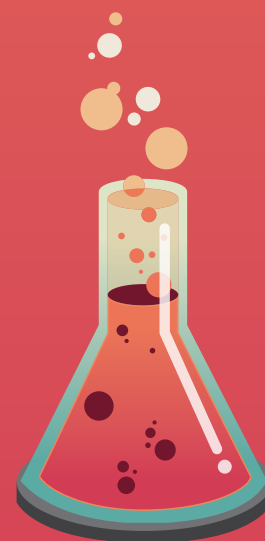
## RAPID PATH TO GROWTH

The charting of PCG's path to growth would not be complete without looking at the impact of the Pengerang Integrated Complex (PIC) and the Refinery and Petrochemical Integrated Development (RAPID) project.

Here, PCG's isononanol plant has already entered the construction phase and is expected to come on-stream by the second half of 2019. Isononanol is a building block for chemicals used in the plasticiser industry for automotive, cable and construction sectors. "We'll be using the latest process technology – putting us at the forefront in terms of product quality and efficiency, as well as being environmental friendly," says Akbar.

The experiences and lessons learnt from its operations at the Integrated Petrochemical Complex in Kertih have been valuable. "We looked at how the different plants were managed, how they co-existed and ensured that the synergistic values of the different installations were tapped. We also

"The market is there and the opportunities are there. The question now is how can we tie ourselves to the technology. No technology, no specialty chemicals."  
- Datuk Nur Iskandar A Samad



**Datuk Nur Iskandar A Samad**  
Project Director for  
Petrochemicals, PETRONAS  
Refinery and Petrochemical  
Corporation (PRPC) Sdn Bhd.

looked at how HSE was managed, how we dealt with the local community. We have a good dictionary of lessons learnt from Kertih which is being added to Pengerang," says Akbar.

He expects that by 2020, its petrochemical projects in Pengerang will further propel PCG's total capacity to 14.6 million tonnes per annum - a substantial growth of 35 per cent since the group's listing.

"This will then provide a good foundation for us to move towards derivatives and specialty chemicals."

"And that's the advantage of PIC. It is a fully integrated complex with ample space to develop an ecosystem beginning from the most basic of building blocks all the way down to end products like specialty chemicals. It has all the infrastructure and facilities in one place," says Akbar.

PETRONAS Refinery and Petrochemical Corporation (PRPC) Sdn Bhd Project Director for Petrochemicals Datuk Nur Iskandar A Samad, says when the facilities, refinery and the cracker were built, the goal was to optimise the molecules or basic petrochemical products produced.

"The key driver to producing petrochemicals is the feedstock, which comes from the cracker. The feedstock for the cracker comes from the refinery and the feedstock for that comes from crude oil. At RAPID, the refinery has been designed for a wide range of crude, including cheaper crude," he says. This flexibility and the cracker's production capacity allow for the competitive production of differentiated and specialty chemicals.

"We are world-class in terms of capacity - 350,000 tonnes per year of linear low polyethylene, 400,000 tonnes a year of high density polyethylene and 900,000 tonnes a year of polypropylene. These give us competitiveness in terms of unit production cost," says PRPC Deputy Project Director Ir Yaacob Salim.

PIC's location is another advantage for the downstream business. "We are smack in the middle of a high-growth region that is ASEAN and China," says Nur Iskandar. He adds that the Pengerang Deep Water Terminal and PIC's proximity to shipping lanes ensure accessibility to these markets. Yaacob adds that the location also reduces the cost of logistics and freight for the feedstock.



“The future of specialty chemicals lies in more niche and customised solutions.” – Akbar Md Thayoob



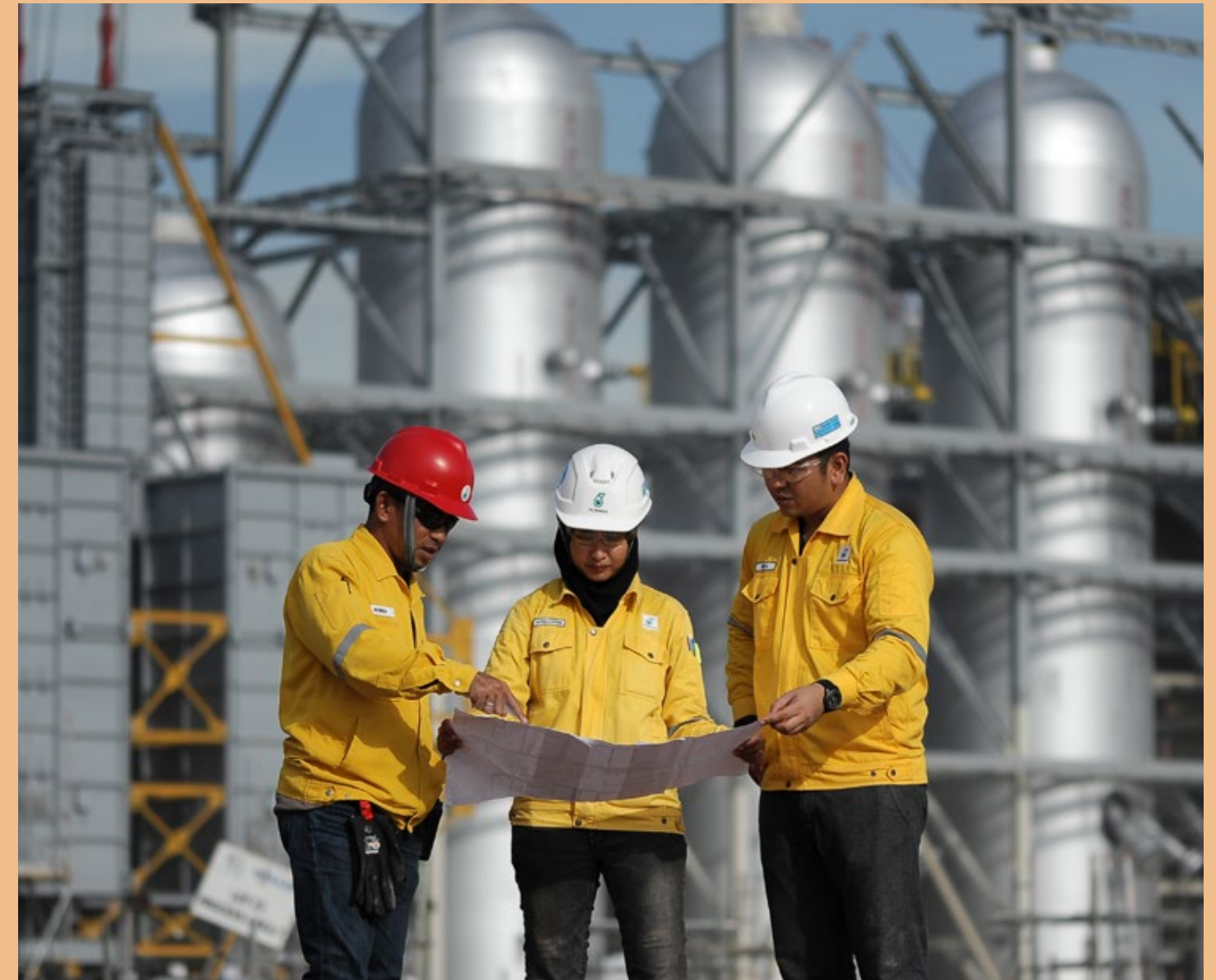
## BEING HUNTERS, NOT JUST FARMERS

The more cost-competitive these petrochemical products are, the greater the competitive edge for PCG's specialty products. “We need to be a cost leader, find ways to improve efficiency so that we can compete with the other players,” says Akbar

Technology is also crucial, says Nur Iskandar. “That’s the key driver of success,” he opines. “The market is there and the opportunities are there. The question now is how we can tie ourselves to the technology. No technology, no specialty chemicals,” he says succinctly, reinforcing PCG's blueprint to growth via M&As.

“We are actively pursuing M&As,” reiterates Akbar. And he feels that there is no better time to be in the industry than the present. “It’s an exciting time. Gone is the old mindset of developing a large plant and getting a few big customers. That’s the volume play where you sell by the tonnage via large vessels and trucks.”

“Today, we are talking about value play, where we sell by the kilogrammes, in pails or drums. It means that we’re not just farmers, but we need to be hunters as well,” he adds.



## HUB FOR PETROCHEMICALS

The statistics at the Pengerang Integrated Complex (PIC) and its central component, the Refinery and Petrochemical Integrated Development (RAPID) project is staggering – from its size, scale, materials used and state-of-the-art facilities.

The facilities at PIC include the Pengerang Deep Water Terminal 2 (PDT2), Air Separation Unit (ASU), Pengerang Cogeneration Plant (PCP) and Pengerang Transmission Line, Regasification Terminal 2 (RGT2), Raw Water Supply (PAMER), and Centralised Utilities and Facilities (UF). These ensure

that RAPID, a fully integrated petroleum refinery and petrochemical complex, is self-sufficient.

Covering an area of 6,239 acres, the US\$27 billion project in Johor is the national oil corporation's largest downstream investment in Malaysia. According to Nur Iskandar, as of April 2018, overall progress is at 90 per cent.

“Our target is to be up and running in the first quarter of 2019, beginning with the refinery and cracker, which will be the feedstock for the petrochemical projects,” he says, adding that the first

of these to come on-stream will be the polypropylene plant, also in the first quarter of 2019.

PIC forms part of Johor's larger Pengerang Integrated Petroleum Complex (PIPC) – to turn Johor into a regional hub for oil storage, fuel refining and petrochemical production, as well as imports and exports of liquefied natural gas. The development will help Malaysia capitalise on the growing need for energy and commodity petrochemical products in Asia in the next 20 years.



Air pollution is a silent killer. The presence of fine particulate matter in the air can lead to the development of new disease as well as exacerbated existing ones. Efforts to cut down the amount of fine particulate matter, such as increasing the use of gas, will yield better long-term benefits to our health.



# That Particulate Matter

by Dr Helmy Haja Mydin

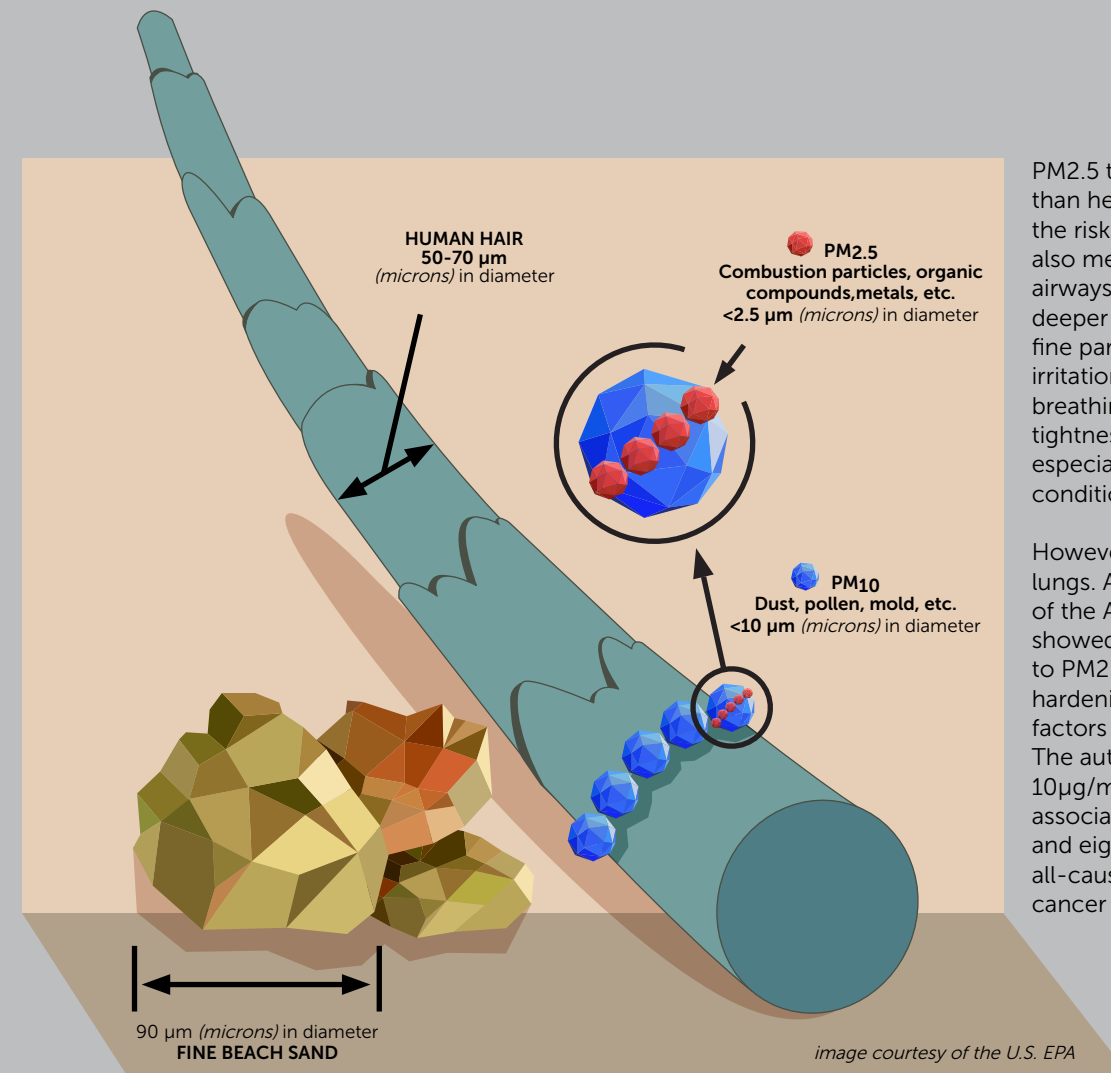
One of the first things we learn in Science is that the air we breathe keeps us alive. However, few are aware that the very same air can also be the source of death for many - 6.5 million annually worldwide to be more precise. This was the number of deaths associated with air pollution in 2012, the equivalent of 11.6 per cent of global deaths that same year.

Despite killing more people than all wars combined, air pollution does not get the headlines it deserves. This is partly due to its insidious nature but also the lack of awareness regarding its effect on our health and the economy. We often don't think about the importance of clean air on our lungs until it's too late.



An air pollutant by definition is 'any substance in the air that could, in high enough concentrations, harm humans, animals, vegetation or material'. These include ozone, nitrogen dioxide, and sulphur dioxide.

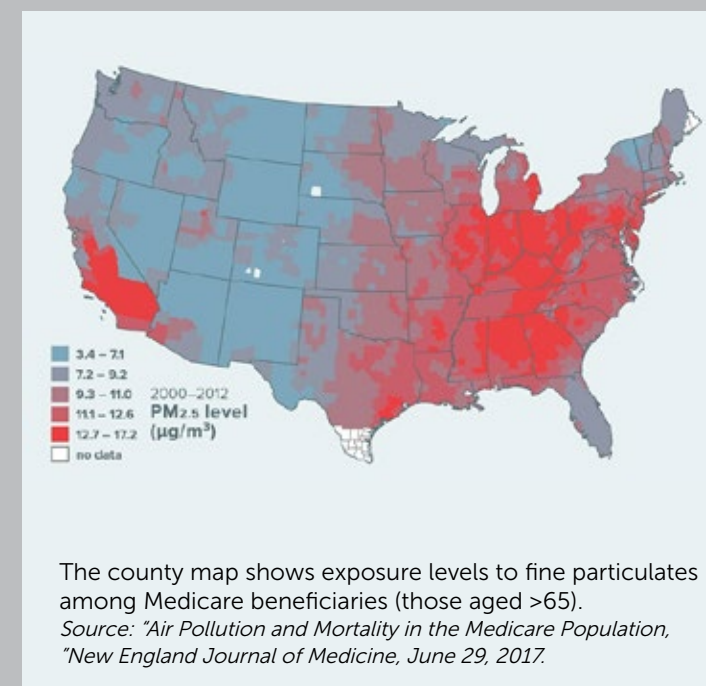
However, fine particulate matter are of particular concern. Fine particulates, or PM2.5, refer to particles that are smaller than or equal to 2.5 microns. They can occur naturally (e.g. from volcanic eruptions) but are mostly man-made. Sources include diesel vehicles, power plants and agricultural burning. They can also be formed as a result of gas and particle interaction in the atmosphere.



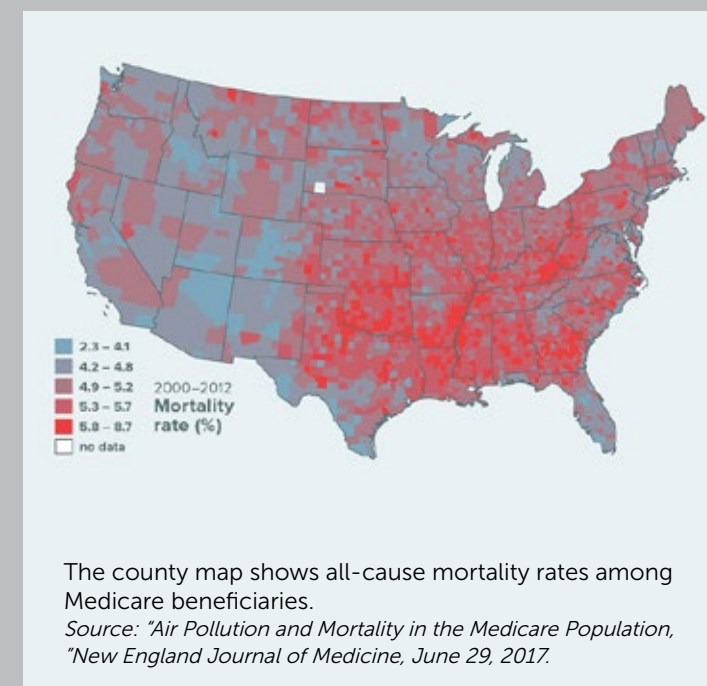
PM2.5 tend to linger longer in the air than heavier particles, thus increasing the risks of inhalation. The small size also means that they can evade the airways' defences and penetrate deeper into the lungs. In the lungs, fine particulates can lead to airway irritation. This manifests as difficulty breathing, coughing and/or chest tightness. Lung function may worsen, especially in those with underlying conditions such as asthma.

However, the effects go beyond the lungs. A study published in the Journal of the American Medical Association showed that long-term exposure to PM2.5 may lead to swelling and hardening of the blood vessels (risk factors for heart attacks and strokes). The authors estimated that for every 10μg/m<sup>3</sup> increase in PM2.5, there is an associated four per cent, six per cent and eight per cent increased risk of all-cause, cardiopulmonary and lung cancer deaths, respectively.

image courtesy of the U.S. EPA



The county map shows exposure levels to fine particulates among Medicare beneficiaries (those aged >65).  
Source: "Air Pollution and Mortality in the Medicare Population," *New England Journal of Medicine*, June 29, 2017.



The county map shows all-cause mortality rates among Medicare beneficiaries.  
Source: "Air Pollution and Mortality in the Medicare Population," *New England Journal of Medicine*, June 29, 2017.



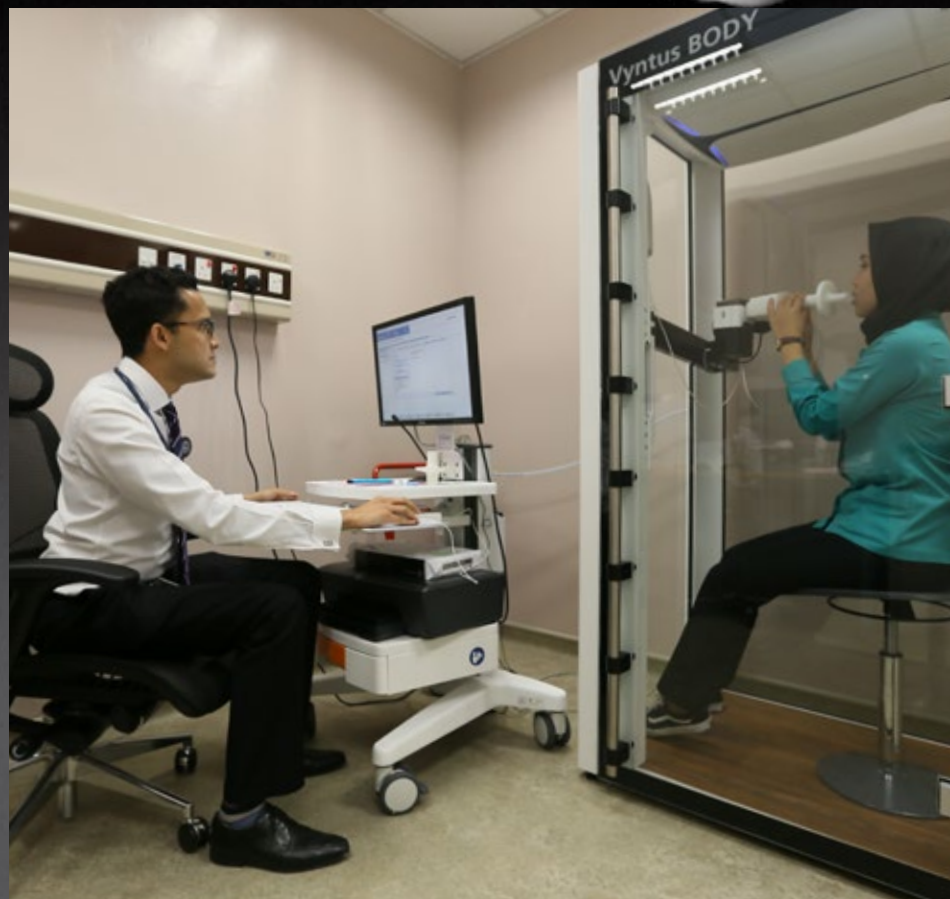


While air pollution affects 100 per cent of the population, some groups are more vulnerable than others. These include those with pre-existing conditions and those at the extreme ends of age.

For example, expectant mothers' exposure to PM2.5 is associated with birth defects. Children themselves tend to inhale more air, and therefore more pollutants. They are also more susceptible to the effects of pollutants because their lungs are still developing. Excess exposure will lead to suboptimal lung function. In other words, a polluted environment prevents them from achieving their full physical potential.

At the other end of the spectrum, a study of 60 million Americans aged 65 and older showed that long-term exposure to PM2.5 increases the risk of premature deaths. These researchers from Harvard's T H Chan School of Public Health demonstrated that if the level of PM2.5 could be lowered by just 1 $\mu$ g/m<sup>3</sup> nationwide, approximately 12,000 lives could be saved annually.

In Malaysia, the annual average of PM2.5 is 15  $\mu$ g/m<sup>3</sup>. This is 50 per cent more



than safe levels as determined by the World Health Organization (WHO). Conditions are worse in urban settings – for example, the air in Petaling Jaya has an annual average of 25  $\mu$ g/m<sup>3</sup> of PM2.5.

As individuals, we need to take small but important steps to help decrease air pollution. Rethinking the manner in which we travel is one way e.g. by taking public transport, carpooling and utilising the sharing economy. Using low or no emission vehicles will also help improve the air that we breathe in.

We can also take steps to decrease exposure. Avoiding exposure during peak hours will help mitigate the adverse effects. This also applies to those who are routinely stuck in traffic during peak hours – exposure can be decreased by ensuring that vehicles' windows are closed and by setting the vehicles' ventilation system to 'recirculate'.

Even more can be achieved with appropriate policies. For example, a move away from coal to cleaner fossil fuels such as gas is likely to bring about substantial health and economic benefits. A 2010 report from the Clean

Air Task Force in the United States stated that particle pollution from existing coal power plants was expected to cause 13,200 as well as 9,700 additional hospitalisations and 20,000 heart attacks.

The report found that the total cost of these ailments was more than USD100 billion per year. Moreover, the burden is not distributed evenly across the population. As stated earlier, the elderly, young and those with existing diseases suffer more. Additionally, those who live in areas downwind of multiple power plants are also disproportionately exposed to the health risks and costs of PM2.5 pollution.

Diesel vehicles, particularly older ones, are large contributors of air pollution. Soot-free vehicles, such as those with electric or hybrid engines, compressed natural gas or biogas, have the potential to reduce the production of the carcinogenic fine particulates. Appropriate policy changes will have an even bigger impact when applied to the energy section – from increasing gas-powered plants to better control of fugitive emissions and capturing of flared gas.

Increasing the role of gas in our energy mix results in the use of a much cleaner alternative to other fossil fuels. The reduction in fine particulates and other emissions such as carbon and sulfur dioxide will result in immediate and long-term benefits for the environment and our health. With clean air, we will be able to do the things that we take for granted e.g. going out for a walk or taking our children to the park without having to worry about the healthcare consequences.

The evidence from studies worldwide are striking – PM2.5 is linked to a range of medical ailments. High levels of exposure can lead to both premature deaths and a poorer quality of life. There is also no doubt that even a small change in the level of pollutants will have an enormous impact both on public health and the economy. By being more aware of the role of clean air in our lives, we can take the right steps toward ensuring that we live in a better, healthier world for generations to come.

*Dr Helmy Haja Mydin is a consultant respiratory physician at Twin Towers Medical Centre and Pantai Hospital Kuala Lumpur, and co-founder of Asthma Malaysia ([www.asthmamalaysia.org](http://www.asthmamalaysia.org)).*



# A Lifestyle Within Reach

There is a saying that we can't live on fresh air and sunshine alone. That may be true, but we also cannot live without clean air. While it may be imperative to staying alive, clean air is something many take for granted. The only times we worry about the air quality is when our nation is blanketed in haze.

Those who don't take the air we breathe for granted are definitely the people who work and play outdoors, especially the ones physically active. They know when there is a dip or rise in the air quality and are more conscious of it as they breathe in more often and take in more air into their lungs during their outdoor activities.

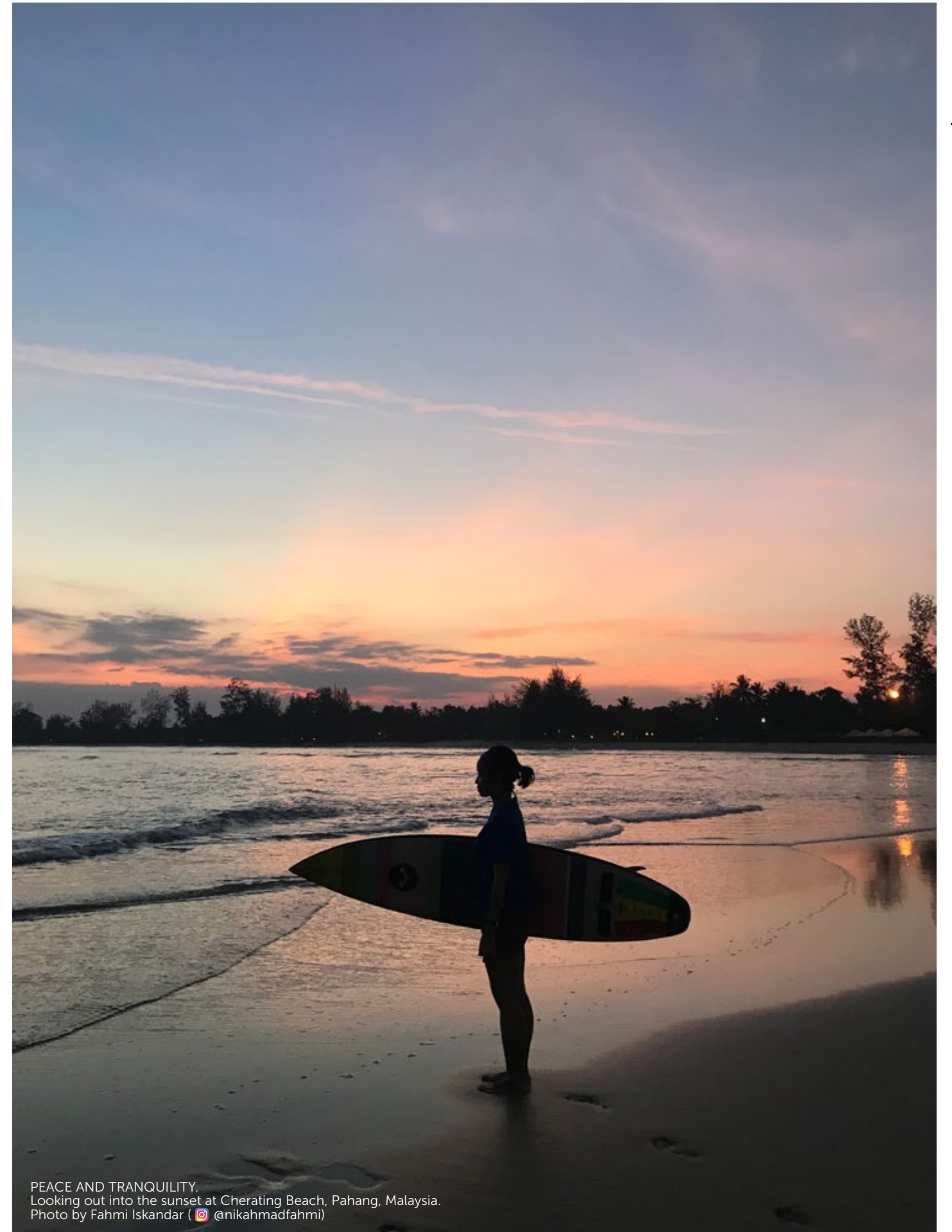
Since they tend to breathe through their mouth rather than their nose while exercising, they may breathe in a larger amount of harmful pollutants as the mouth is not able to filter out certain large air pollutants from entering the lungs. This will lead to more pollutants in the airways which will then lead to negative health effects.

When the air is fresh and clean, it is invigorating and it gives them the motivation to exercise more. Their adrenaline pumps faster when the cool morning air hits their skin, knowing that a cleaner and healthier future is just around the corner.

By **Brigitte Rozario**

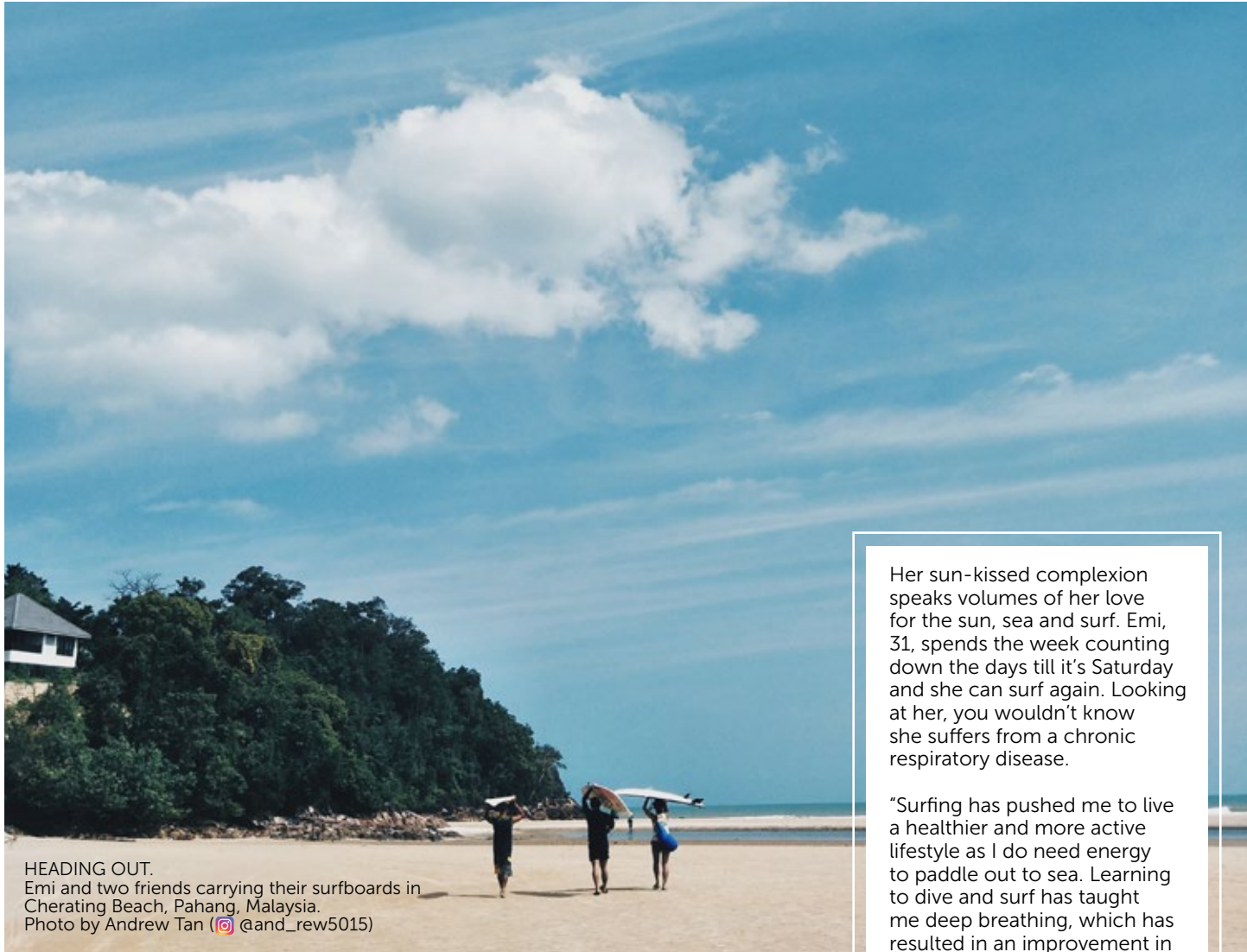
Emalina Aimi Edris  
**Executive (Digital Accelerator)  
Office of the Chief Digital Officer  
PETRONAS**

She was surfing in a deep area of the ocean and tumbled in one of the wipeouts from the crashing wave. Losing control and not really sure which way was up, she tried to reach for her board, but it wasn't there. A leash connecting the board to her ankle had snapped. She looked around but could not see her board anywhere. What she did see was another wave coming straight at her. Taking a deep breath, Emalina Aimi, or Emi, went underwater to avoid being knocked out by the full force of the next wave. Luck was on her side. Another surfer saw her and got her to safety. It was one of the most terrifying experiences she had had to date. Yet, Emi was out surfing again two hours later.



PEACE AND TRANQUILITY.  
Looking out into the sunset at Cherating Beach, Pahang, Malaysia.  
Photo by Fahmi Iskandar ( @nikahmadfahmi)





**HEADING OUT.**  
Emi and two friends carrying their surfboards in Cherating Beach, Pahang, Malaysia.  
Photo by Andrew Tan (@and\_rew5015)

Her sun-kissed complexion speaks volumes of her love for the sun, sea and surf. Emi, 31, spends the week counting down the days till it's Saturday and she can surf again. Looking at her, you wouldn't know she suffers from a chronic respiratory disease.

"Surfing has pushed me to live a healthier and more active lifestyle as I do need energy to paddle out to sea. Learning to dive and surf has taught me deep breathing, which has resulted in an improvement in my breathing. That's why I run from the city to the beach... to get clean air," she explains.

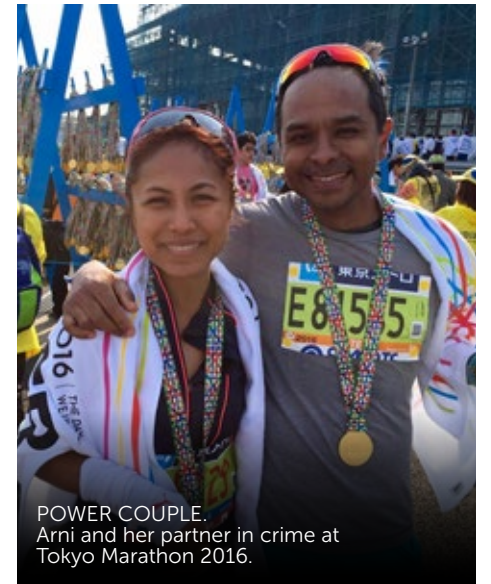
For her, fresh air is a priority. Last year, when she was hospitalised with a lung infection, breathing was really hard. "That made me realise how enjoyable it is to be able to breathe oxygen. We take it for granted. To be able to breathe normally every day is a blessing for me," adds Emi.



**TOTALLY ON BOARD.**  
Her excitement is evident as she wears a huge grin on her face while riding the wave at Salina Point in Dungun, Terengganu, Malaysia.  
Photo by Emalina Aimi (@ematravelina)



**TAKING IN THE COOL BREEZE.**  
Arni cycling with friends at Richmond Park, London.



**POWER COUPLE.**  
Arni and her partner in crime at Tokyo Marathon 2016.

Arni Laily Anwarrudin  
**Head (Group Corporate Finance)**  
**Treasury**  
**PETRONAS**

"All I know is, I need clean air in order for me to be outside," she says, laughing. Arni Laily Anwarrudin needs to run, cycle or do crossfit exercises daily. It's her passion and a part of her DNA. If she doesn't exercise outdoors first thing in the morning, her day is incomplete and she won't be her cheery self.

Exercising is an activity she enjoys with her husband. While others have date nights, Arni and her hubby run and cycle together. It's the best time for them to talk without any interruptions. This is their daily ritual, and on weekends, they are on the golf course where their son, an avid golfer, plays a round. Sometimes he takes part in tournaments. Arni, who doesn't golf, ends up being the buggy driver.

The Standard Chartered Kuala Lumpur Marathon in April will be her seventh 42 km race. She has taken part in the Berlin Marathon as well as Tokyo (twice), Osaka, Paris and Singapore. This year, she hopes to conquer Berlin again. Her 2015 wrist ribbon, which has not been removed for three years, is her motivation to go back.

At home, her morning run usually involves the hilly areas around her neighbourhood where the air is cool and clean. "The air quality is important otherwise you will not be motivated to be outside. The smell of the morning air is amazing. People don't understand why I wake up so early to run, especially on weekends. I like the feeling that I'm the first one to breathe the air in the morning. It's quiet and so serene. I find it very calming," says Arni, whose favourite place to run is Hyde Park in London.



**WORLD, HERE WE COME.**  
Carving memories together at the 2015 Berlin Marathon.





**NO EXCUSES.**  
Chris on one of his morning excursions with his son at Bukit Gasing, Malaysia.

Dr Muhammad Hariz  
Chrisminder Singh  
**Manager (Strategy and Commercial)  
Upstream Business  
PETRONAS**

"I would prefer to be out there than cooped up in an office," quips Dr M Hariz Chrisminder Singh Abdullah, better known as Chris. His favourite activity is bootcamp, which up to a year ago, he used to go for regularly. He would participate in Original Bootcamp's trainings in KLCC Park, Padang Merbok and Padang Timur in Petaling Jaya. But, the arrival of his second child put paid to that.

These days, Chris runs in the KLCC Park at lunch time when most others prefer to remain indoors. "When I run at lunch time, people think I'm crazy. It's good to do heat training because some runs, depending on when they start and how long they are, may see you still running at 10am or 11am and it can get quite hot," explains the father of a three-year-old boy and a 12-month-old girl.

So far, running in the heat has not negatively affected his health. "But, if it's

hazy I won't run. I have bronchitis and I don't want to trigger it especially as I get older. In KL, because of the quality of the air and the latent trapped heat, you get tired very fast as opposed to running in an open space environment where you are surrounded by nature and there is a natural flow of the wind," says Chris.

He is undaunted by challenges, be it bootcamp, the Viper Challenge or Spartan Race. "It's very important to me to be outdoors exercising. If I don't, I'll probably be grumpy the whole day. For me, it's like an addiction," he says, attributing his active lifestyle to his dad Thaman Singh, who played hockey for the Malaysian veterans. His father taught at the Malay College Kuala Kangsar and at 75, walks and cycles to keep fit. Chris' favourite place to run in the country remains his hometown, Kuala Kangsar, where the air is fresher.



**STRONGER TOGETHER.**  
Sweating it out at the Bootcamp in Kuala Lumpur, Malaysia.



**MILES TO GO.**  
Exploring the outskirts of the city during the 2015's OtterBox Salomon Action Asia Malaysia at Genting Sempah, Malaysia.





NEGARAKU REPRESENTED. Irwan gleefully waving the Malaysian flag or Jalur Gemilang as he approaches the finishing line at the BMW Berlin Marathon 2014.

Irwan Anuar  
**Manager (Change Management)**  
**Corporate Strategy**  
**PETRONAS**

He may not look like a runner, his big size misleading passersby into thinking his “finisher” T-shirt belongs to someone else, but Irwan Anuar is definitely a serious marathon participant. He is a late bloomer, only getting into running in 2009 at the age of 33, but he has gone on to run in four world marathon majors – London (2011), Tokyo (2014), Berlin (2014) and Chicago (2016). Come November, he will be flying to the US for the New York Marathon.

“I find solace in running whenever I am stressed. It is a quick fix to balance out the demands of working life. I have proven that size and weight are not deterrents to completing a marathon,” says Irwan, who for the past six years has been an official pacer for the Standard Chartered Kuala Lumpur Marathon. He enjoys doing it as it inspires others to complete their race.

But it’s not just about running for Irwan. He pairs it up with all his other loves – travel, food, shopping and spending time with friends. His “runcations” (a combination of running and vacation) have taken him to Asian countries, Europe and the US. Last year, he competed in 14 half marathons in 14 states in Malaysia so that he would get to see the whole country.

Irwan runs on alternate days in the KLCC Park. On weekends, he either trains or participates in races. “If the air is cool, it’s better and easier to run as it’s less tiring. You don’t want to run in the haze and end up with puffy eyes and a runny nose. Running in clean air is definitely better. I am motivated to run when the air is clean and cool. When I run in the cold weather I can run 10km without water. When it’s hazy, I run at the gym. My health is still paramount. I don’t just simply run because I want to run – safety and health come first,” he adds.



ON YOUR MARKS, GET SET, GO.  
 The starting point of Bank of America  
 Chicago Marathon 2016.





**DONE AND DUSTED.**  
Holding up the medals from all races, with the finale being the 2017's Great Eastern Viper Challenge 2017 in Cyberjaya, Malaysia.



**DOWN IN THE DIRT.**  
Umair all smiles as he crawls in the muddy terrain during the obstacle course.

Mohd Umair Mohd Noor  
**Graphic Designer**  
**(Communications Management)**  
**Group Strategic**  
**Communications**  
**PETRONAS**

Growing up in Kuala Lumpur, he saw the concrete jungle on the way to school and on the journey home. Umair and his four sisters hardly saw their father on schooldays. Abah would leave for work while it was still dark and return home only after the sun had set. But on weekends, his father would make it a point to take the family outdoors to enjoy nature.

A favourite destination was Bukit Belacan in Ampang. It was not too far, yet it afforded the forest feel, resplendent with waterfalls. They would picnic and play in the water. By the time he was nine, Umair even followed his father trekking

**NOT A PROBLEM.**  
Nothing is stopping Umair from having the time of his life completing the obstacles.



up that hill to enjoy the scenic view. The memory of that father-and-son experience stuck with him and he tries to emulate it with his own kids. His eight-year-old daughter loves the outdoors although his four-month-old son is still too young to understand.

The outdoor enthusiast spends his weekends hiking, climbing, camping and anything else to do with nature. He prefers going out of the city to trek as the air is fresher and there is less exposure to fumes and pollution.

"Being outdoors has a calming effect on me. I love doing something that challenges my capabilities as well as the overwhelming excitement on completion of a particular task," adds Umair, who started taking part in Viper Challenges in 2016.

"I was hooked after that first race. It reminded me of my childhood when I used to run around and climb trees," says Umair.





**SWEATING IT OUT.**  
Goofing around for photos after her freestyle step class at Avenue K's Fitness First Platinum, Kuala Lumpur, Malaysia.



**AND SCORE THEY DID.**  
Rashidah with her two friends at the Score Run Series 2018: Night Edition.

Rashidah Alias  
**Chief Financial Officer**  
**PETRONAS Chemicals Group Berhad**

She exercises six days a week, sometimes seven. Rashidah Alias may have given up exercising for more than 10 years while her children were growing up, but she came back with a vengeance when her son wanted to start running. She accompanied him and started freestyle step classes too, sometimes sitting in two hours' traffic jam yet arriving for class with a smile on her face.

While the classes at the gym keep her indoors, Rashidah still runs in races every other week. She takes part in 10 km, 15 km and half marathons. However, Rashidah is picky about which races she goes for.

"My favourite places to race are Putrajaya, Cyberjaya and Setia Alam. Although Setia Alam is a bit far, I don't mind going there because the air quality is so much better. When I sign up for races, I pay attention to who the organiser is and where the race is held. I think, generally, there's nothing much we can do about the bad air in the city, but we have other alternatives like Putrajaya and Setia Alam," she explains.

She also runs when she travels – sometimes on the treadmill at the hotel, and sometimes at a nearby park.

"When I was in Dubai, I ran at the park. It was fine until I got back to the hotel. That was when I realised that I had fine sand particles in my shoes and soon after, I started coughing. When I came back to Malaysia, I fell ill, which was unusual. I believe it was because of the poor quality air on the day when I ran," says Rashidah, emphasising the importance of clean air when running outdoors.

For her, nothing beats running in the morning and having the cool air hit her in the face. "It's just super fresh!" she adds with a big grin on her face.

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\*Registration CLOSES ON 10 AUGUST 2018 or until SOLD OUT, whichever comes first.

In Collaboration With





# The Ties That Bind

By **Chan Shen Onn & Nasyara Deana M Zaffian**

During the monsoon season late 2017, Malaysia was hit with heavy downpours that resulted in severe flash floods in some areas within the country, particularly the East Coast and West Malaysia. Families were forced to leave their homes and belongings behind, and settled at disaster evacuation centres set up close to the affected areas.

It was a time where the entire country bore witness to Malaysians' strength. People from all walks of life became one, offering a helping hand, including staff volunteers from Malaysia's homegrown oil and gas company, PETRONAS.

Able bodies of volunteers including citizens from across the country swarmed the flooded areas with hopes to salvage anything left behind by the victims. They made their way to the disaster evacuation centres armed with aids such as food and hygiene kits.

These are their stories of care, compassion, and of how a nation together is a nation stronger.



Our staff volunteers were joined by Terengganu's former Chief Minister Datuk Sri Ahmad Razif Abdul Rahman and former Minister of Agriculture and Agro-based Industry Dato' Sri Ahmad Shabery Cheek to deliver contributions to the 185 affected families at the two evacuation centres in Dungun, Terengganu.







Staff from PETRONAS' East Coast Regional Office spent some time with the 250 affected families in Kemaman and Kuantan, Pahang and shared with them care packages and food to help them during the difficult time.



## A STATION FOR ALL.

It was good news for the 150 affected families in Seberang Perai, Bukit Mertajam in Pulau Pinang when PETRONAS stations within the vicinity of Taman Permatang Pauh and Sungai Lokan, north of Seberang Prai proved to be more than petrol stations when they turned into community centres for flood victims to collect aids.







PETRONAS Dagangan Berhad's Head of Regional Retail North, Shahrom Harun and owner of a PETRONAS station, Tuan Haji Jasni Md Som lent a helping hand to the 50 families from around Permatang Rawa. One of the recipients was 11-year-old Nur Farisha Dayana who came to receive the aid after spending two days at an evacuation centre.



## KNOWS NO BOUNDS.

With the help of the Malaysian Elite Rescue Foundation and Jabatan Kebajikan, the flood relief distribution continued to serve the flood victims as PETRONAS received assistance from The Super Group, a group of approximately 100 volunteers from diverse backgrounds and all walks of life.



# NO EXCEPTION.

Flood hitting Kota Belud also affected the livelihood of more than 690 families. Through its Sabah Labuan Regional Office, PETRONAS urgently mobilised a group of volunteers to distribute care packages consisting of blankets, pillows, toiletries and hygiene kits to the affected community. Continuous support and assistance were, too, given to the flood victims at Membakut as part of the Sentuhan Kasih programme by PETRONAS. Volunteers also helped to distribute numerous care packages to 38 families at the flood evacuation centre.



# GOING THE DISTANCE.

As the flood situation in Sarawak worsened, PETRONAS' Sarawak Regional Office and OPU's provided relief in the form of food supplies to 700 families at evacuation centres in Samarahan, Serian and Bintulu districts.





# PETRONAS AT A GLANCE

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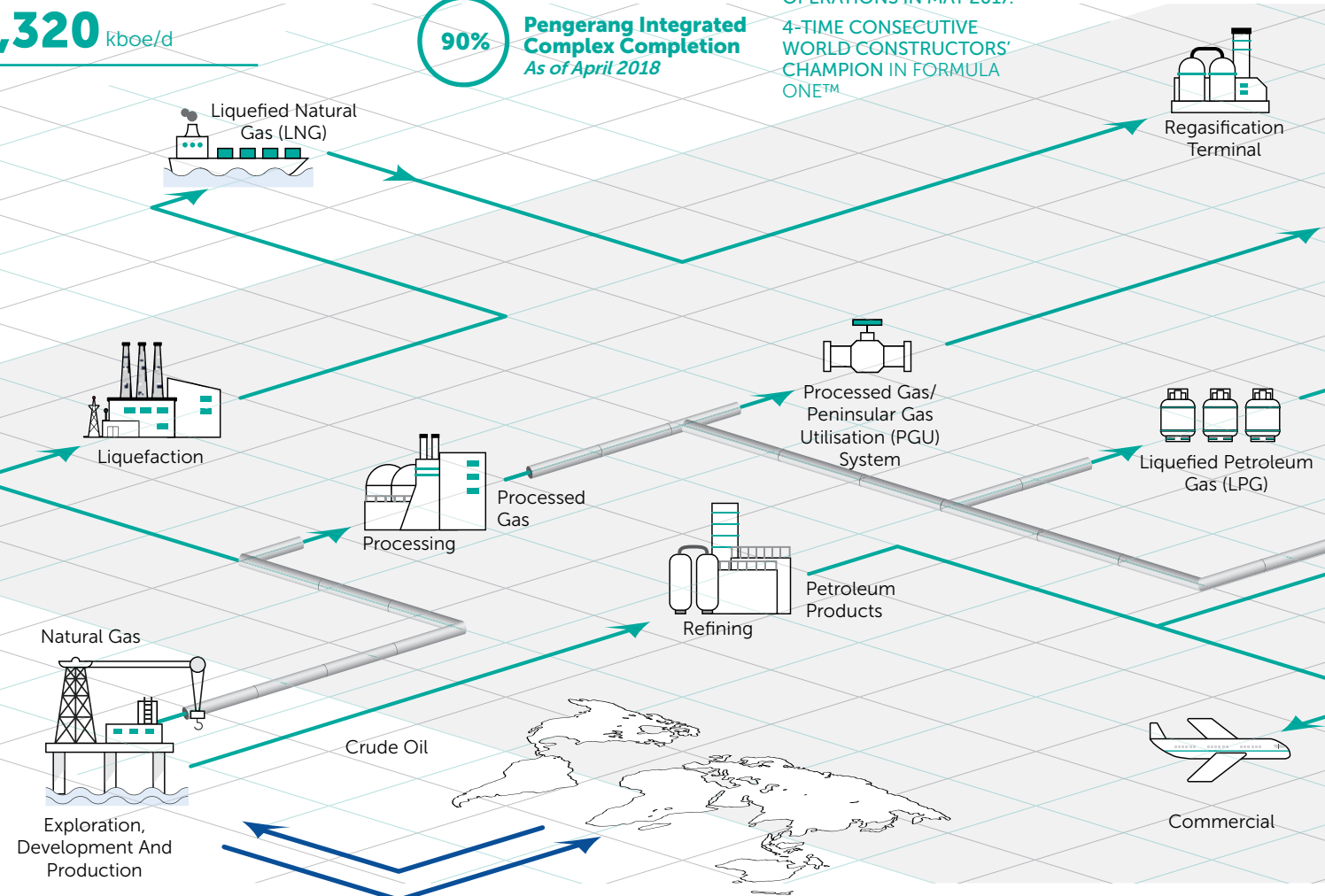
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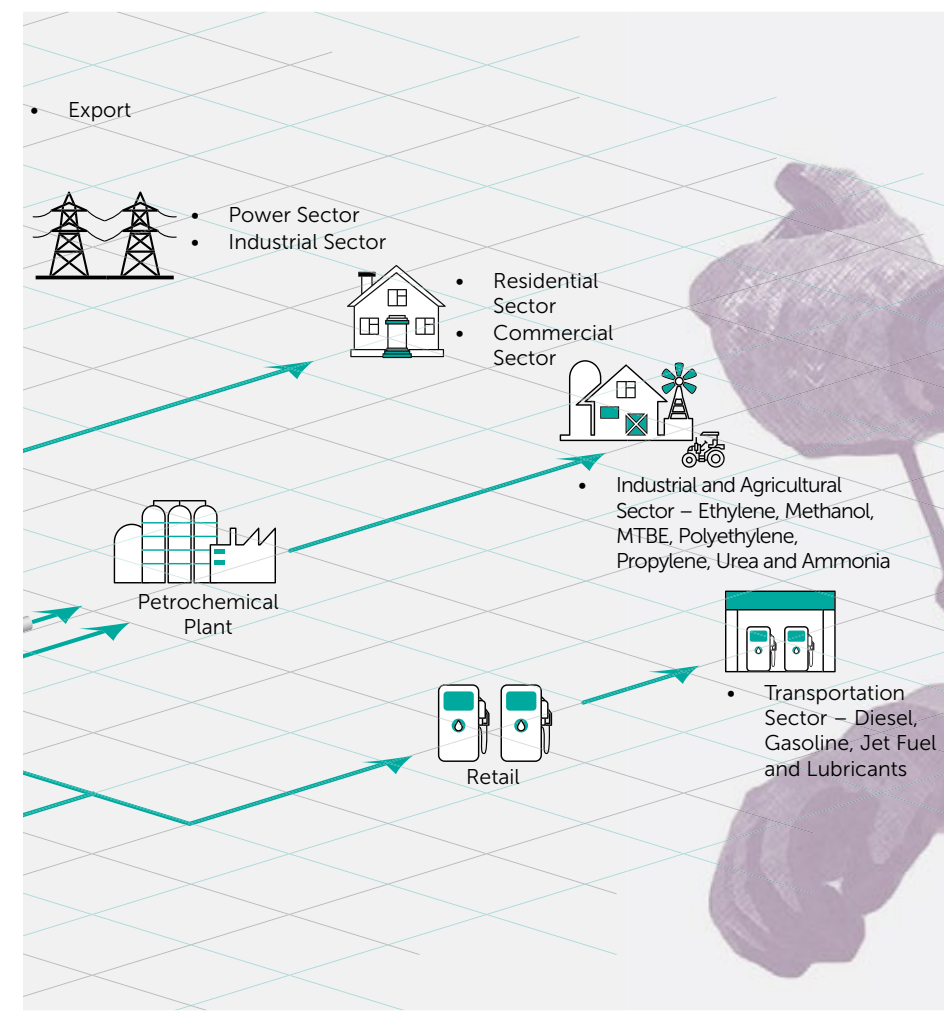
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