

HEIGHTS

Volume 3 | 2016

Construction, from a New Angle

**Sarawak's
Construction
Industry Pledges
Support for CITP**

**Careers in
Construction**

Become an Industrialised
Building System Engineer

Money Matters

Budget 2016 and the
Construction Industry

Industrialised Building System

The Path to Enhanced Productivity

CONTENTS

02 Editorial Board

03 Global Frontiers

News and highlights from the construction sector around the world.

06 ABM Column Creating Opportunities for Success

Akademi Binaan Malaysia (ABM), Malaysia's premier training institute for the construction industry, has helped enhanced the livelihoods of many by giving them the skills needed to succeed in the building sector.

10 Events Commitment to Excellence

Sarawak construction industry leaders pledge their commitment to the Construction Industry Transformation Programme (CITP) in Kuching.

14 Cover Story Benefitting from IBS

Otherwise known as pre-fabrication, Industrialised Building Systems (IBS) has been employed in some of Malaysia's most iconic structures such as the Petronas Twin Towers and the KL International Airport, and is an important tool in boosting construction productivity.

22 Feature Upskilling the Industry

In line with this issue's theme of productivity, the **Heights** team looks at how IBS drives the enhancement of skills and competencies in the construction workforce.

26 Prime Movers

Datuk Buhtamam Mahmum, Board Member of the Malaysian Productivity Council and CIDB, speaks to **Heights** about efforts to boost productivity in the construction industry.

30 Careers in Construction IBS Expert

IBS Engineer Ahmad Azhar Abdul Wahab takes the Heights team behind the scenes as we find out more about his chosen vocation



34 Technology in Construction Connecting Everything

A look at the role connected devices and the Internet of Things play in the modernisation of the construction sector.

38 Automation & the Construction Industry

Rising cost of migrant labour and slow domestic workforce participation has Malaysian construction players looking at increased automation.

42 Money Matters Financing Development

Strong emphasis on major infrastructure projects means Construction is a big winner in the 2016 Budget.



46 Going Global Kazakhstan's Construction Boom

The host for the 2017 World Expo, Kazakhstan has been stepping up construction and infrastructure development in time to welcome the world and create the foundation for future economic growth.

HEIGHTS

EDITORIAL BOARD

Honorary Advisor

Dato' Ir Ahmad 'Asri bin Abdul Hamid

CIDB Publication Committee

Sariah Abdul Karib
Megat Kamil Azmi
Datuk Ir Elias Ismail

Publisher

CIDB Malaysia
Corporate Communication Unit
Level 25, Menara Dato' Onn
Pusat Dagangan Dunia Putra
No 45, Jalan Tun Ismail
50480 Kuala Lumpur

Tel: 03 4047 7000
Fax: 034047 7020
Email: ukk@cidb.gov.my

Conceptualised, Produced, and Published for CIDB Malaysia by

AMG Holdings International Sdn Bhd (356247-V)
10-3A, Jalan PJU 8/3
Damansara Perdana, 47820, Petaling Jaya
Selangor Darul Ehsan, Malaysia
Tel: 603-77294886
Fax: 603-77294887
Website: www.amginternational.net
Editorial email: clientservice@amginternational.net

Printed by:

Percetakan Skyline Sdn Bhd (135134_V)
35 & 37, Jalan 12/32B,
Jalan Kepong, 52100,
Kuala Lumpur, Malaysia

PRODUCTIVITY BOOST

Like all other sectors, the construction industry is not immune to the overall downward pressures on the economy. However, we are fortunate as focus on infrastructure development in the 11th Malaysia Plan means that the sector will continue to enjoy the strongest support from the government.

As we highlight in this issue, there are a considerable number of projects that have been allocated funds under the 2016 Budget. These include RM80 million for the construction of Integrated Villages, the RM28 billion MRT2 and RM9 billion LRT3 projects, among others. The successful completion of these projects will enhance socioeconomic standards and boost the economy. They are also expected to help boost the sector's growth to more than 8% this year.

Even so, the slowdown means that construction firms need to keep a closer eye on their bottomline. They need to do more with less. More speed, more efficiency with less manpower, costs, and delays. In other words, productivity



▲ Construction is an integral part of the 11th Malaysia Plan, and this has resulted in the sector receiving a massive boost in the 2016 Budget.

has to be increased. Our cover feature showcases one of the means to achieve that – Industrialised Building Systems (IBS).

The CIDB champions IBS through various initiatives. These include accrediting IBS courses, hosting seminars to promote IBS, providing support for training, and encouraging its use in construction projects.

The effects of IBS on labour cost and usage are significant. It is estimated that using IBS can reduce the number of workers required by half and expenses by 14%. It also allows construction firms to wean themselves off low-skilled workers and hire more skilled ones who in turn help boost efficiency and productivity.

IBS is just one of the means to do so, although a very important one. Aside from that, the CIDB is also encouraging

the use of technology and automation in the construction process. Now more than ever is the time to step-up efforts to boost the performance of the sector and make it a world-class one as per the *Construction Industry Transformation Programme (CITP)*.

The Editorial Team

GLOBAL FRONTIERS



MALAYSIA

▲ The revised Budget 2016 allocates RM40 million for the rehabilitation of abandoned public housing projects like this one in Pekan Baru Subang, Selangor.

Act Penalises Abandoned Projects

The *Housing Development (Control & Licensing) Act, 1966 (HDA)* has received a fresh set of amendments aiming to address the issue of developers abandoning housing projects partway into development.

Abandoned housing projects can bring both environmental and socioeconomic consequences including a depreciation of value in the area, and the loss of investment by buyers, as well as the visual impact of leaving derelict buildings and half completed earthworks behind.

The new amendments would penalise developers who abandon housing projects. Penalties would include a

fine which shall not be less than RM250,000 but not exceed RM500,000, or imprisonment for a term not exceeding 3 years, or both.

A developer is said to have abandoned a project by refusing to carry out, delaying, suspending, or ceasing work continuously for a period of six months or more or beyond the stipulated period of completion as agreed under the sale and purchase agreement.

Another change made to the HDA is an imposition of a 3% refundable deposit to be a housing developer.

UNITED ARAB EMIRATES



▲ Despite rising construction costs, Doha is still a relatively stable location for developers.

Expanding the Qatari Oasis

Doha has been named the most expensive city in the Middle East for construction costs, and 12th worldwide in the new annual ranking published by global design and consultancy firm Arcadis.

A rapidly growing population and preparations for the 2022 FIFA World Cup has driven up inflation and construction costs. Addressing this has been a top priority for Sheikh Tamin bin Hamad Al

Thani, who announced that the government would contain inflation "by all available means and ways."

Qatar continues to be an attractive investment destination, benefitting from access to inexpensive labour and energy.

Over the next ten years, US\$150 billion is expected to be spent on roads, railways, stadiums and

ports, as well as hospitality and social infrastructure, with further investments in transport infrastructure, water and electricity by 2020. However, falling oil prices and a forecasted budget deficit means that the government is set to cut spending to US\$22.2 billion in 2016, compared to US\$30 billion last year.



Sheikh Tamin bin Hamad Al Thani is the eight and current Emir of the state of Qatar

Protesting the Hike

The levy for foreign workers in the manufacturing and construction sectors has been doubled from RM1,250 to RM2,500, increasing their cost of hiring as part of a deliberate policy to reduce over-reliance on low-skilled foreign labour.

Deputy Prime Minister Datuk Seri Dr Ahmad Zahid Hamidi said that the increase in the foreign worker's levy (starting February 2016), should be seen as a positive move to reduce dependence on migrant labour.

This will significantly impact the domestic construction industry, which has a labour composition comprising 25% registered foreign workers, compared to an average of 13% in all other sectors.

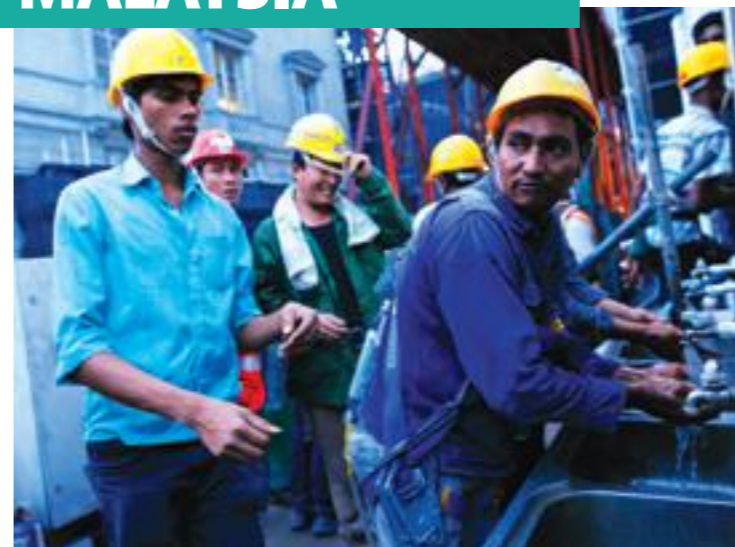
Master Builders Association Malaysia (MBAM) vice president Tan Sri AK Nathan said the government should understand that the construction

industry cannot operate without foreign workers. A case study by the Construction Industry Transformation Programme (CITP) identified that locals often have negative perceptions of the construction industry as challenging to work in, making them reluctant to take up jobs in construction.

He also cautioned that small contractors were the ones most likely to suffer from the new levy, which would drive their profitability down, and eventually close them down.

Speaking separately, MBAM deputy president Foo Chek Lee criticized the levy hike as being untimely, especially with the Goods and Services Tax (GST) and current economic conditions. He projected the new levy would mean an increase in house prices, as developers will be forced to pass on the additional labour costs incurred to the end users or buyers.

MALAYSIA



▲ 25% of Malaysia's entire construction labour force comprises foreign workers.

CHINA



Shanghai Tower Breaks Records

The 632 metre tall Shanghai Tower is finally complete after six years of construction, making it the second tallest building in the world behind the Burj Khalifa. Shanghai's first 'megatall' tower features 400,000 square metres of floor space and 121 floors.

Architect Marshall Straballa who worked on the original design described the tower as "the greenest super high-rise building on Earth". The spiralling form of the structure provides up to 22% in energy savings compared to a rectangular skyscraper of the same height, while the double-skin glass façade helps insulate the building and reduce energy use. A 'sky garden' concept will also be introduced, planting 10 acres of greenery complete with trees, parks, and pathways.

The Shanghai Tower also comes equipped with the world's fastest elevator, reaching top speeds of 40 miles per hour.

Platform for Growth

CREATING OPPORTUNITIES FOR SUCCESS

Akademi Binaan Malaysia (Malaysian Construction Academy-ABM) was established in 1997 as the Construction Industry Development Board's (CIDB) training and accreditation arm. The institution aims to become a leader in the training of workers in the domestic construction industry. Through the ABM's youth programme, it strives to equip youths with skills in various fields in the construction industry and guide them towards successful careers.

ABM strongly believes in a practical, hands-on approach in all their training programmes.



“It is an initiative to expose the community to the construction industry and for them to acquire a valid license. Many in the sector do not own a valid license.”

– Mohd Ridduwan Ahmad, Professional Crane Operator

Mohd Ridduwan Ahmad was invited to join the academy's crane operator course while working as a paddy farmer. While he was uninterested in joining the course at first, the trainer who invited him was able to convince him of a better future by aiming to be a skilled personnel in the specific field of crane operation. He and a few of his friends enrolled into the academy soon after, aiming to provide a better future for themselves and their families while helping to enhance the country's construction industry.

A Northern Region ABM alumnus and 31 years old, Ridduwan earns a lucrative monthly income of RM12,000 at his current job as a professional 300-tonne crane operator, which he was offered after graduating from ABM. By providing promising career opportunities for prospective construction workers, ABM encourages greater domestic participation, reducing dependency on foreign labour. “It

is in ABM's best interest to assist the local youth gain skills that are much sought after in today's world,” said Ridduwan.

Ridduwan also noted that this was an initiative to provide young people in communities around the country with exposure to the construction industry and for them to acquire valid industry licenses. “Many of those in the sector do not own a valid license,” he explained. Unlicensed workers who have not undergone proper training are a constant challenge for the construction industry, being more prone to making mistakes on-site, which can be especially dangerous as crane operators. By providing adequate training and certification, ABM is able to reduce the number of these unwanted incidents.

Practical Training

As at December 2015, ABM has produced a total of 279,453 highly skilled technical

CIDB HOLDINGS

OUR SERVICES

* CCD 25 POINTS/COURSE
REGISTER NOW!
* points awarded are varied for each course

CONTINUING PROFESSIONAL DEVELOPMENT (CPD)

CONSTRUCTION CERTIFICATION PROGRAM (CCP)

SEMINAR PROGRAM

TECHNICAL SERVICES

03-4042 8880
www.cidbholdings.com.my

CIDB Holding Sdn Bhd

Training provider of
CIDB MALAYSIA

MOBILE CRANE OPERATION COURSE

Qualification & Recognition

Upon successful completion of this course, participants will be issued a *Certificate of Competency* recognised by CIDB and are eligible to register as a Skilled Worker with CIDB.

Course Contents

- Introduction to Cranes
- Lifting Appliance
- Signals and Communication
- Pre- and Post-operation Checks
- Slings Method
- Load Chart
- Calculation of Mass
- Legislative Requirements of Crane Operation
- General Safety

Assessment

At the end of the course the participants are assessed on their skill and knowledge

Application Pre-requisites

- Malaysian citizen
- Physically fit
- Literate
- Completed Standard 6/Form 3
- Aged 21–35 years old for Youth Programme
- Aged 21–55 years old for Personnel Programme
- Possesses a valid Green Card and 6 months minimum experience in a related field for the Personnel Programme
- Minimum completion of Sijil Pelajaran Malaysia (SPM)
- Possesses at least an 'L' class driving license

Duration

Personnel Programme: 5 days | Youth Programme: 2 months

ABM	Personnel Programme	Youth Programme
ABM Northern Region	✓	✓
ABM Central Region		
ABM Southern Region	✓	✓
ABM Eastern Region	✓	✓
ABM Sabah	✓	✓
ABM Sarawak	✓	✓

The availability of programmes offered by ABM at their facilities around Malaysia.

workers—94,272 of whom are from the youth training programme—in the construction field since it was established, offering more than 60 training courses specifically related to the building and construction industry. Coordinator of the Northern Region ABM, Mohd Norlizam Md Ariff, said that the academy offers a youth course for Mobile Crane Operation that is open to those between the ages of 21 and 35. The course is conducted over two months, and accepts up to 20 trainees per session. There is also a separate Personnel Programme for individuals between 21 and 55 years old, which has an additional prerequisite of six months' minimum experience in a related field.

All skills training courses focus on hands-on experience, with 40% theory and 60% emphasis on practical application. After completing the ABM courses, trainees are given Skill Efficiency Certificates that are officially recognised by CIDB and means that the trainees are eligible to register as a Skilled Workers, which significantly increases their employment opportunities. They are then required to register with the Department of Occupational Safety and Health (DOSH) to receive valid licenses as accredited crane operators.

ABM provides construction skills training to prospective personnel in the construction industry to produce experienced and competent skilled manpower in Malaysia. It aspires to support the county's construction industry's manpower needs through the creation of highly skilled workers while creating many more success stories like Ridduwan's. ■



SEMINAR
TOWARDS EXCELLENCE IN
CONSTRUCTION
"A TIME FOR SHARING"

Approved
10 CCD
points

13th April 2016
8.30 am – 1.00 pm
Crystal Ballroom, Corus Hotel, Kuala Lumpur

In Conjunction With:



Organized By :





▲ 30 Sarawak industry leaders in the process of signing pledges of commitment to the CITP.

A Commitment to Excellence

SARAWAK INDUSTRY LEADERS PLEDGE COMMITMENT TO CITP

The Construction Industry Transformation Programme (CITP)—Malaysia’s national plan to transform the construction industry—received another boost on the 29th of February 2016 when 30 Sarawak industry leaders signed pledges of commitment to the initiative. The pledge signing, which was held at the Ranyai Ballroom at the Waterfront Hotel in Kuching, was attended by a number of construction industry players and stakeholders including Dato’ Sri Haji Fadillah Bin Haji Yusof, Minister of Works Malaysia.



▲ The cooperation of agencies and players brings the CITP a step closer to realizing its objective of transforming and improving the Malaysia construction industry.

The CITP was launched by Prime Minister Datuk Seri Najib Tun Razak in late 2015 and comprises four thrusts: Quality, Safety and Professionalism; Environmental Sustainability; Productivity; and Internationalisation. 18 initiatives are spread across these four thrusts, each of which addresses specific challenges in the construction industry. Each organisation’s pledge outlines its commitment to the

realisation of the CITP, listing specific initiatives that the organisation pledges to undertake under the four thrusts of the CITP.

“Among the development projects identified by the 11th Malaysian Plan (11MP) for the state of Sarawak are the Pan Borneo Highway, the Sarawak Renewable Energy Corridor, the upgrade to the Miri Hospital,

and the construction of the Sri Aman Hospital and the airports in Mukah and Lawas,” said Dato’ Sri Haji Fadillah Bin Haji Yusof in his speech.

In October 2015, 80 organisations—comprising 56 stakeholders from Melaka and 24 industry captains from Kuala Lumpur—pledged their commitment to the CITP. CITP sponsors from within the Construction Industry Development Board (CIDB) Malaysia and other agencies under the Ministry of Works also signed pledges of commitment to the CITP last year.

“The Sarawak government fully supports the CITP and will work with CIDB to make every effort to increase the state’s involvement in the construction industry, in line with the goals outlined in the plan,” said Dato’ Sri Haji Fadillah.

The signing was also attended by Dato’ Sri Zohari Haji Akob, Secretary General of the Ministry of Works; Sr Sariah Abdul Karib, Acting Chief Executive of CIDB Malaysia; Mohd Nazli Ahmad Mahyadin, General Manager of the Personnel & Contractor Sector, CIDB Malaysia; Dato’ Sri Profesor Ir Dr Judin Bin Karim, Chairman of ABM; and Sr Abdul Latif Hitam, Chief Executive Officer of CIDB Holdings.

Dato’ Sri Haji Fadillah expressed his hope that the pledge would serve as an example and motivation to agencies and players in the construction industry that the CITP’s objectives and targets cannot be achieved without cooperation between industry players and relevant agencies in the construction industry. ■

Professionals of the Future

A HUNDRED ABM TRAINEES CELEBRATED

On the 29th of February 2016, a graduation ceremony to congratulate and welcome recent alumna of the Sarawak Region *Akademi Binaan Malaysia* (Malaysian Construction Academy - ABM)—the Construction Industry Development Board’s (CIDB) premier training and accreditation institution—to the industry was held at the Ranyai Ballroom at the Waterfront Hotel in Kuching.

“ABM works closely with more than 50 partners in the construction agency to provide training relevant to the needs of the industry.”

- Dato’ Sri Haji Fadillah Bin Haji Yusof,
Minister of Works Malaysia

To date, ABM has provided training and accreditation to 250,000 youths and workers in the construction industry ▼

jobs that will be created by the 11th Malaysia Plan (11MP) will require relevant technical and vocational education and training (TVET) qualifications.

The construction industry is one of the key drivers of the Malaysian economy. Between 2011 and 2014, the construction sector grew at a rate of 8% annually, or RM0.5 trillion in terms of value generated.

Construction also makes up about 15% of the country’s manufacturing output, accounting for 9.5% of the workforce with a total of 1.2 million registered workers. According to official statistics, 75% of these workers are Malaysians, including professionals such as engineers, architects and surveyors.

ABM Sarawak Region’s Chief Operating Officer, Abdul Rahman Ahmad, said that “the country’s infrastructure sector is booming which will in turn push for greater demand for skilled labour. However, we should not ignore the fact that less attractive pay and benefits offered also leads to loss of skilled workers.”

ABM Sarawak is one of the six ABM centres in Malaysia that offers vocational and management training. The campus covers a 60-acre area with a trainee capacity of 1,000. Other ABM centres are located in Sabah, Johor, Kuala Lumpur, Terengganu and Kedah. ■



▲ According to CIDB Chairman, Tan Sri Dr Ahmad Tajuddin (left), the CITP encapsulates the national collaborative efforts required for the continued growth and success of the Malaysian construction industry.

At the ceremony, some 100 graduates received their certificates from ABM. Minister of Works Malaysia, Dato’ Sri Haji Fadillah Bin Haji Yusof also handed out awards to seven trainers for excellent service; namely Mohd Amirul Farid

Abedi, Law Hui Yew, Rahmat Sidek, Nicholas Munyau, Mohd Nor Azizie Musa, Freymio Orlando Edmund James and Sylvester Juing.

According to Dato’ Sri Haji Fadillah, many as 60% of the 1.5 million



◀ Dato’ Sri Haji Fadillah awarded seven ABM trainers for their excellent service to the academy

Benefitting from IBS

INDUSTRIALISED BUILDING SYSTEMS (IBS) MEANS HIGHER QUALITY, FASTER JOBS, AND INCREASED PROFITABILITY

Industrialised Building Systems (IBS), also known as pre-fabrication, involves the manufacture of components off-site ready for installation. The benefits of IBS in construction has been well-documented, but despite high-profile projects such as the Petronas Twin Towers and Putrajaya, both of which include pre-fabricated components, uptake of IBS solutions in the Malaysian construction industry has been slower than expected. **Heights** looks at how IBS can save time and money for contractors, and examines why some are reluctant to adopt this efficient building method.



Manufacturing building components off-site to be transported to a project is nothing new. Freshly felled timber has been cut to size for easier transportation for centuries. We know that the 'bluestones' for England's Stonehenge were shaped in the quarries of South Wales before being dragged 160 miles to their current site (though given that 4,000 years ago the ancient Britons had yet to invent the wheel, we can only marvel at how they managed it).

The difference between the masons of Neolithic Europe and the builders of today is the wealth of materials, manufacturing processes and transportation options available to us. We also have far greater demand for fast, cheap construction than at any time in history.

Industrialised Building System (IBS) is a home-grown term to describe the use of automation, mechanisation and prefabrication of components for the building industry in Malaysia. IBS components are manufactured off-site, and require little additional site work once installed. This means faster completion times, greater productivity, less waste, fewer accidents and lower overall construction costs for the industry.

Because components are custom-built to exact requirements in a controlled, factory environment, quality can be closely monitored

and standardised, reducing defects. In projects with a high degree of repeatability, cost benefits appear as high-quality components can be replicated numerous times, reducing the price per unit.

A Proven Track Record

IBS solutions for contractors have been used in Malaysia for almost half a century. In the 1960s, at the start of Malaysia's population boom, parliament sent government ministers, architects and engineers to Europe to study pre-fabricated building processes. Modern 'pre-fab' had begun in Europe as a reaction to the destruction of World War 2 and the massive numbers of displaced persons who were in desperate need of housing. With the first and second Malaysia Plans providing the legislative impetus, early projects planned for Malaysia were largely for affordable housing with a focus on function over form. They also featured a high degree of repetition in their design, making the methods learned in Europe ideal for the purpose. By the late sixties the first apartment blocks using pre-cast walls had been built in Kuala Lumpur's city centre, with a casting plant a few kilometres away in Jalan Damansara.

Unfortunately, while early attempts fulfilled their primary purpose of reducing the housing shortage, the imported materials and methods used were sometimes found to be

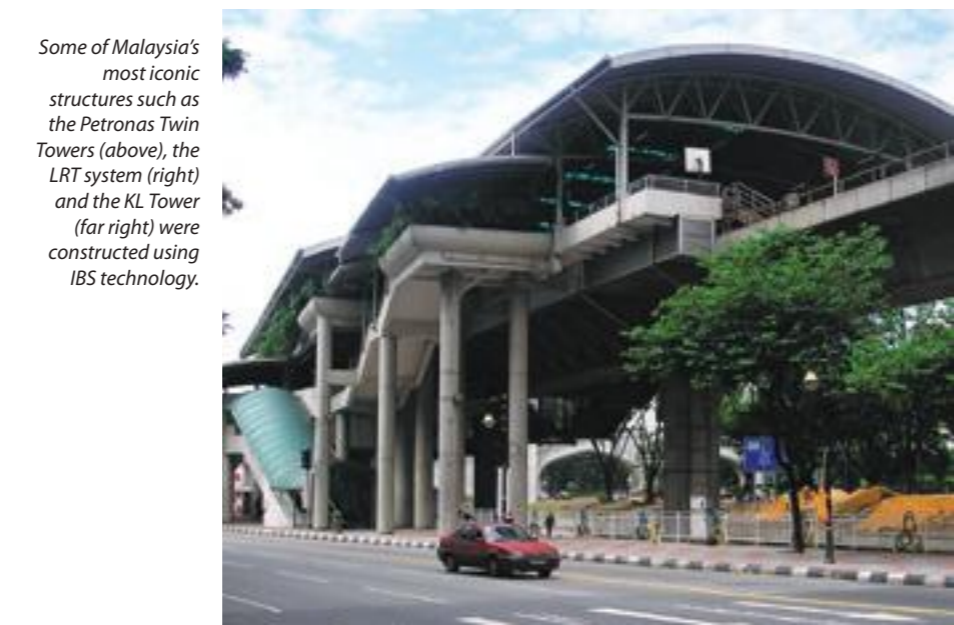
inappropriate for Malaysia's climate. As issues including roof leaks and gaps in walls came to light, IBS fell out of favour with both the public and the industry.

By the 1990s however, new approaches to IBS played an important role in Southeast Asia's building boom. Kuala Lumpur's Sentral station, the LRT system, and KL's new international airport all used prefabricated components in their construction. Very large projects including Putrajaya and Cyberjaya, were heavily reliant on IBS. IBS steel beams and floor decking were used in the construction of the Petronas Twin Towers. The fact that at the time of its opening it was the world's tallest building offered a further boost to IBS's reputation among property development companies.

Since the turn of the century, IBS has been used in private residences and in the construction of much smaller projects, but its main use has still been in the building of projects with a high degree of repeatability in components such as student accommodation, schools, public housing and hotels.

Promoting Quality

Dato' Ir Ahmad Asri bin Abdul Hamid, CEO of CIDB Malaysia, is a keen advocate of the time which can be saved by employing IBS techniques. "The advantage of IBS is that projects are faster," he says. "You have faster delivery, and the quality is much better because you are making components in a controlled environment so the quality is much easier to monitor. Productivity also goes up. A project that normally takes a year can take only 6 months using IBS."



Some of Malaysia's most iconic structures such as the Petronas Twin Towers (above), the LRT system (right) and the KL Tower (far right) were constructed using IBS technology.

"Not only can IBS shorten the construction period, but also cut costs on building materials and manpower, especially during this period of labour shortage."

– Dato' Ir Ahmad 'Asri bin Abdul Hamid, CEO of CIDB Malaysia

The cost savings of IBS are also well-documented. Pre-casting off-site means faster installation and reduced labour costs. Down-time due to adverse weather conditions is reduced as workers spend less time exposed to the elements on-site. A controlled factory environment also reduces waste, lowering material costs, and allows for far closer monitoring of energy usage. Taken together, particularly if building in large volume, the financial savings can be significant.

One driver for IBS in recent years has been the call for more green building materials. Following the Paris climate talks last year, contractors will be keeping a close eye on parliamentary bills which call for more environmentally responsible building methods and materials. The manufacture of cement is one of the largest emitters of CO₂. Kilns are heated to 1500 degrees centigrade. Limestone releases CO₂ as a by-product, and coal is used to heat the kilns. By 2050, cement production will be responsible for emitting 5 billion tonnes of CO₂ a year. This is many multiples of the amount

of CO₂ national governments have pledged to eliminate. In order to get anywhere near meeting these targets, governments will have to introduce legislation reining in the largest polluters. The search for greener materials in construction will become a regulatory (and therefore financial) issue for contractors, rather than a purely environmental one.

Malaysian IBS suppliers have demonstrated increasing innovation, and private companies, sometimes in conjunction with foreign players, have successfully created a local knowledge base for the industry. Construction companies themselves have also driven investment and innovation in IBS by creating their own in-house teams for the purpose of increasing suitability of IBS to their own projects.

Recent developments in 3D printing also allow for precise customisation of components. In recent years 3D printing has gone through two key transformations which make it ideal for the construction industry. Firstly, it has become cheaper. Home 3D printers can be bought for US\$500 meaning individual, custom-made components from bathroom fittings to ornate bannisters can be manufactured directly from downloadable Computer-aided Drawing (CAD) files. Secondly, for the construction industry, 3D printers have become far, far larger. Printers with a 'build volume' of 1 cubic metre are common, allowing for 'printed' coffee-tables and other furniture. At the extreme end of the build volume wars, companies are currently engaged in is China's Winsun printer with a build volume of 2,466 cubic metres. In 2014 it was used to 'print' a five-story apartment block and a 1,100 square metre villa in Jiangsu Province. The villa's components



▲ 3D printing is the latest technology utilised in IBS. Andrey Rudenko of Minnesota in the United States for instance has managed to build a castle measuring 15 square metres using this technology and aims to 'print' a full-live-scale home in the near future.

were printed in Winsun's factory, and assembled for a fraction of the cost – by a handful of workers – in just three hours. Governments around the world have been placing orders with large-scale 3D printing companies for housing projects involving multiples in the thousands.

Analysing Cost Benefits

Although increasing use of IBS is seen in projects across Malaysia, and despite the proven benefits of the technology, uptake within the industry has been slower than the government had hoped. As with any new technology, IBS will only supersede conventional building techniques if it is better, or cheaper.

The principal reason why many developers have been unwilling to invest in IBS is because of the abundance of cheap foreign labour in Malaysia. When conventional methods of building can be done



▲ 3D printing has grown from creating tiny, detailed models to an entire 1,100 m² 3D printed villa. ▶

with cheap labour, further investment in equipment and training will often be seen as reinventing the wheel. Making IBS cost-effective also requires a buoyant housing market driving mass-production of components. In the current climate, unit prices may put off some contractors.



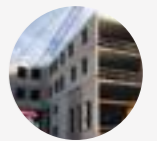
The long-term cost benefits of IBS are clear, but the initial outlay on equipment and training deters some developers. High interest rates and low profit margins mean developers keep a close eye on every penny. The construction industry is in good health currently, growing at 10.3% in 2015, and with foreign labour is so cheap, investing in retraining your workforce or buying large-scale 3D printing equipment may seem extravagant, despite reduced labour costs and other future savings.

Following the success of government initiatives in the past, further drivers can again aid the industry. Standardised training programmes will create a skilled, local workforce, and investment in automation (and even robotics), will reduce the need for foreign labour. The Construction Industry Transformation Programme aims at increasing productivity through building information

modelling and IBS. Universities also have an important role to play. Student architects and engineers need to be introduced to the potential of IBS before they join the job market. With around 400,000 foreign workers in the Malaysian construction industry, the government is keen to encourage greater use of IBS with skilled Malaysian workers using superior technology.

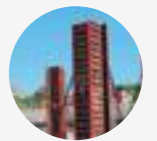
The general public has yet to make up its mind on IBS. When IBS is described as 'pre-fabricated', the stigma of the post-war European experience leads some to think that components are more likely to leak or – for those with an eye to property as an investment – that they cannot be renovated as easily as conventionally built houses. With IBS so ubiquitous in construction however, most private customers will be unaware how a project was completed.

5 IBS Groups (Structural Classifications):



Pre-cast Concrete Framing, Panel and Box Systems

Pre-cast columns, beams, slabs, 3-D components (balconies, staircases, toilets, lift chambers), permanent concrete formwork



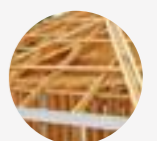
Steel Formwork Systems

Tunnel forms, beams and columns moulding forms, permanent steel formworks (metal decks)



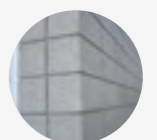
Steel Framing Systems

Steel beams and columns, portal frames and roof trusses



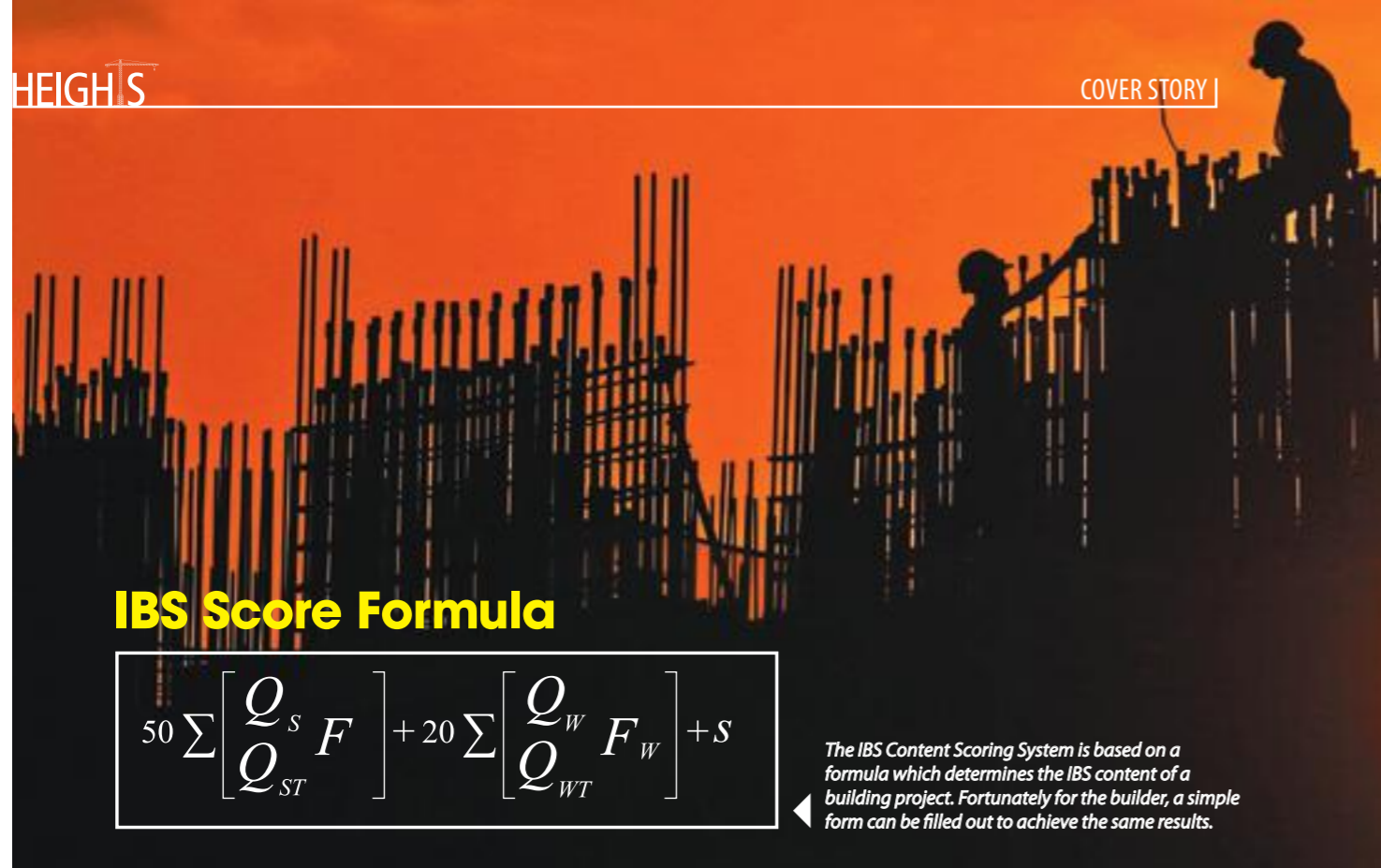
Prefabricated Timber Framing Systems

Timber frames and roof trusses



Block Work Systems

Interlocking concrete masonry units (CMU), lightweight concrete blocks



IBS Score Formula

$$50 \sum \left[\frac{Q^S}{Q^{ST}} F \right] + 20 \sum \left[\frac{Q^W}{Q^{WT}} F_W \right] + S$$

The IBS Content Scoring System is based on a formula which determines the IBS content of a building project. Fortunately for the builder, a simple form can be filled out to achieve the same results.

Incentivising Change

The Malaysian government has been keen to promote IBS. In 1999 the first IBS Strategic Plan was announced, followed by two 'roadmaps' intended to boost the use of IBS by 2015. A key aspect of these initiatives has been to introduce quality control, R&D and training programmes to increase uptake.

As with any new technology, price was going to be a key factor in the appeal of IBS for Malaysian companies. In 2008 the government mandated that 70% of materials in any state-funded construction project had to be IBS (up from 30% in 2004). The proposal was designed to bring down costs, and by extension, encourage use in the private sector.

Tax incentives were also offered to companies which used IBS in projects. Acceleration Capital Allowance (ACA) was announced in

2006, giving users the right to claim expenses against steel moulds used in precast concrete components.

The 70% directive was based on the IBS Scoring System, and an Implementation and Coordination Unit was established to monitor compliance. By 2010, projects totalling almost RM10 billion had been completed using IBS. As a result, the cost of IBS has fallen considerably. In some cases, even before factoring in reduced labour costs, it can be cheaper than using conventional methods.

CIDB has a number of measures in place to increase adoption of

The population of Malaysia reached 30 million in 2015, and it is projected to grow by a further 2 million every five years. Despite falling birth rates, the construction industry has busy times ahead. Industrialised Building Systems could help contractors increase profits, and can provide skilled work for the next generation of engineers. ■

IBS in Malaysia. These include promoting modularisation and standardisation in building processes. Computerisation and robotics are going to play increasingly important roles in construction. Education and training for Malaysian workers is also a priority as the new technology gains ground.

Developers have long been aware of the benefits of using IBS components in their projects, but with labour costs showing no sign of changing, more needs to be done to facilitate adoption of IBS' cost-effective building methods, and the government needs to lead the charge by further incentivizing contractors.



@CIDB_Malaysia

CIDB Malaysia

scan for more info



www.cidb.gov.my



CONSTRUCTION INDUSTRY DEVELOPMENT BOARD MALAYSIA
Level 10, Menara Dato' Onn, Putra World Trade Centre,
No 45, Jalan Tun Ismail, 50480 Kuala Lumpur
Email: cidb@cidb.gov.my
Tel: 03-4047 7000
Fax: 03-4047 7070

TOGETHER

WE DEVELOP THE MALAYSIAN CONSTRUCTION INDUSTRY TOWARDS GLOBAL COMPETITIVENESS.

The Construction Industry Development Board was established under the Construction Industry Development Act (Act 520) to develop the capacity and capability of the construction industry through enhancement of quality and productivity by placing great emphasis on professionalism, innovation and knowledge in the endeavour to improve the quality of life.

Upskilling the Industry

IBS will help increase productivity in construction by 2.5 times to US\$16,500 per worker

the restructuring of human resource in an organization in terms of training and education. As such, more intensive training programmes are needed in the specialised IBS skills like system integrating or assembling."

Another reason why the government is encouraging the use of IBS is because it will help reduce the number of foreign labourers in the construction sector. Presently, they make up around 90% of the construction workforce; a large majority of them unskilled. The government hopes to cap foreign labour dependency at 15% by 2020, and IBS will help the construction sector achieve this.

Another report *The Adoption of Industrialised Building System (IBS) Construction in Malaysia: The History, Policies, Experiences and Lesson Learned* calls on the construction workforce to enhance their skills in IBS. This, it says, will result in "a more skilled workforce which would ultimately enhance the competitive advantage of the industry." The report also identifies design, installation and project management as three areas crucial to IBS.

However, IBS take-up is still low, with an estimated 42% of public projects and 70% of private projects using it. One of the main reasons is the lack of skills and knowledge of the discipline. This was highlighted in *Barriers to Implementation of the Industrialised Building System (IBS) in Malaysia*, published in *The Built & Human Environment Review, Volume 4, 2011*.

The article stated, "The skill level of IBS workers is more demanding compared to the conventional construction methods.... This leads to a transformation requiring

IBS is estimated to reduce construction time by as much as 50%. As one of the goals of the *Construction Industry Transformation Programme (CITP)* is to enhance productivity, IBS has been identified as a key tool. This includes combining IBS with other methodologies, in particular Building Information Modelling.

CREATING COMPETENCY IN INDUSTRIALISED BUILDING SYSTEMS

The Malaysian government through the *Construction Industry Development Board (CIDB)* is championing *Industrialised Building Systems (IBS)*. Better known outside Malaysia as prefabrication, IBS enables construction firms to manufacture building components in a controlled environment and then assemble it on site. This results in better quality and faster completion.

CIDB Takes the Lead

The CIDB is taking the lead in enhancing knowledge of IBS in the construction industry, in line with its mandate to regulate the industry and achieve the aims of the CITP. In June 2015, CIDB announced plans to increase training in IBS through offering discounts and levies to those taking such courses.

The CIDB is also working with universities to reach out to students in architecture and building courses,

and teach them about IBS. This is part of the IBS Roadmap which identified several initiatives to increase IBS knowledge.

These include implementing certification programmes for IBS, working with professional bodies such as the Board of Engineers Malaysia (BEM) and the Board of Architects Malaysia (PAM) to conduct professional development courses.

According to General Manager of the CIDB IBS Centre Ir Noraini Bahri in a December 2015 press statement, the organisation is working with professional organisations such as PAM to conduct training in the management of IBS projects, how to calculate the IBS score, and other aspects of the discipline.

Speaking to *Heights*, Ir Noraini also revealed that CIDB has created an accredited training centre for IBS (PLB IBS) to conduct IBS Professional Training. Attendees are given grounding in all aspects of IBS from design concept to score calculation to project management.

There are three types of IBS-related training programmes – for consultants, installers and contractors. Those who enrol in the first course are mostly architects, civil engineers, quantity surveyors and other construction-related engineering professionals. They have to sit through six modules on the subject including learning how to analyse and design precast structures, modular coordination, and plan IBS projects. The modules are as follows:

MODULES	
1	IBS Project Management
2	Modular Coordination System
3	IBS Score Manual Calculation
3a	Smart IBS Calculator (IBS Score Apps)
4	Design Concept on Precast Concrete System
5	IBS Project Management

The Installer Training Programme is more geared towards skilled manual workers. It certifies their competency in installing IBS components as well as supervising such work. These include precast concrete, lightweight panels, lightweight block walls, and roof trusses. The last is divided into timber and lightweight steel. Incidentally, the cost of training for local attendees is

borne by the CIDB. However, foreign workers need to pay a fee.

Last but not least, contractors undergo courses on general management of IBS systems, which enhances their knowledge of precast concrete, steel framework systems, formwork systems, block systems and timber frame systems.



▲ A small house made with prefabricated walls is one of the exhibits at CIDB's IBS Component Gallery. This as well as other exhibits are used to train IBS students.

Part of the IBS Centre, the IBS Component Gallery showcases various IBS components available in Malaysia and is divided into six zones – Blockwork system, Steel-framing system, Precast concrete system, Formwork system, Timber framing system and other prefabricated construction components.



“Construction companies can reduce the number of workers by up to 50% and also save 14% in labour costs through using IBS in their projects.”

– Ir Noraini Bahri, General Manager of the IBS & Mechanisation Division, CIDB



Encouraging Take-up

To ensure that there are sufficient qualified IBS trainers, CIDB has embarked on programmes such as the Train the Trainer initiative. According to Ir Noraini, CIDB plans to have 250 trained IBS professionals, particularly designers, architects and quantity surveyors. To do so, it will collaborate with other government agencies as well as professional bodies.

Certified IBS consultants are also listed in the IBS portal, an online one-stop directory of IBS experts so they can be easily found when needed for both public and private sector projects. In addition, these IBS experts are also invited to participate in various seminars and roadshows about IBS conducted by the CIDB.



▼ The IBS Roadmap set the strategy for the adoption of the discipline in the Malaysian construction sector.

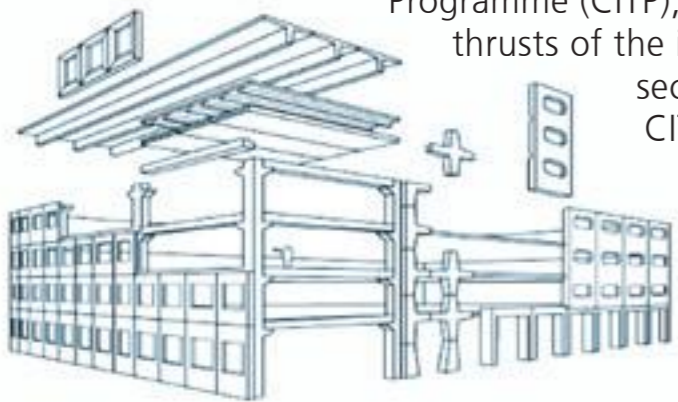
IBS in Malaysia seems to be a chicken and egg situation. On one hand, the lack of skilled workers may be hindering the take-up of IBS among construction firms. On the other hand, if there is no take-up, then fewer people will want to gain skills in IBS. However, construction professionals and workers should bear in mind that IBS knowledge is a long-term investment. The construction industry is changing, and by adopting new technologies and methodologies such as IBS, professionals and companies will be able to meet the demands of the future. ■

Datuk Buhtamam Mahmud

PRIME MOVER IN PRODUCTIVITY ENHANCEMENT FOR THE CONSTRUCTION SECTOR

The construction industry plays a crucial role in the growth of the Malaysian economy, attracting foreign investment and contributing to the national GDP. However, **Datuk Buhtamam Mahmud**—Director of hospital support services company Sedafiat, and Board Member of the Malaysian Productivity Corporation and the Construction Industry Development Board (CIDB)—explains to **Heights** that there is plenty of room for growth and enhancing productivity in the industry by adopting a number of crucial measures.

These measures will also be instrumental in meeting the industry's goals indicated in the Construction Industry Transformation Programme (CITP), particularly as one of the four strategic thrusts of the initiative is enhancing productivity in the sector. The other thrusts outlined in the CITP—which goes into operation this year with a 2020 deadline—are Quality, Safety and Professionalism; Environmental Sustainability; and Internationalisation.



“Industrialised Building System is a KPI of the Malaysian government because they understand that the technique can help build faster with less waste, a cleaner environment, and increased safety and productivity.”



What Are Some Measures To Enhance Productivity In The Malaysian Construction Industry?

There is a lot of debate on how to increase productivity. One of the solutions that the government is considering is creating more skilled workers. This is extremely important and also involves enhancing the design of the construction system because even with highly-skilled workers, there will be no increase in productivity if the right system design is not in place.

The Demand for Skilled Workers

The rule of thumb in the Malaysian construction industry is that the financial allocation for any project is 55% - 60% spent on raw materials, 15% - 20% on labour and manpower, and 20% on gross profit. Comparing this to advanced countries such as Australia where project financial allocations are 40% for raw materials, 45% - 55% to labour, and 5% - 10% on gross profit.

This means that developers and contractors in the country spend more on labour than on raw materials; the workers are highly-paid. Skilled labour in the industry—from plumbers, scaffolding people—are the second highest income earners in the country second to academicians. This positions the industry as a lucrative one that can attract highly-skilled workers from around the world.

How are you going to make the construction industry in Malaysia pay

higher wages? First, we need to have skilled workers. Under the Technical Vocational Education training (TVET), there is an increased focus on enhancing training. In advanced countries such as the UK and Germany, the emphasis is on TVET and providing people with industry-relevant and real-world skills rather than only degrees. The recent announcement by the government to bring in 1.5 million Bangladeshi workers drew a lot of criticism from Malaysians asking why we need more foreign workers when we already have a surplus of them.

The problem is that the 3D (dangerous, difficult and dirty) occupations demand more local participation. Prior to the government announcing the 1.5 million foreign workers, the construction industry had stated that it needed 450,000 workers urgently. These foreign workers can help fill these positions.

Up to 95% of the workers on almost all construction sites in the country are foreigners because they are willing to take the 3D occupations and because they are affordable. Then again, you don't have trained, skilled workers. If Malaysia can create more skilled local workers and the industry can pay them higher, then we will be able to break our reliance on foreign workers.

System Design

In advanced countries like Australia, the UK and neighbouring Singapore, the price difference between the traditional and the present methods of construction are non-existent because orthodox construction methods have not been used in the last 30 years. They currently have only one method of construction, which is Industrialised Building System (IBS). Fewer skilled workers are required while

reducing the number unskilled workers, which will in turn attract more Malaysians because they can be paid higher.

Construction sites are also going to be cleaner and safer because all the building components will be produced elsewhere and moved to the site (no need for in-situ works such as plastering, bar-bending and scaffolding). When such measures have been mastered, Malaysian developers can start exporting their services globally because we will be on par with international standards. This helps achieve the four major thrusts of the CITP and goes to show that the goals of the transformation programme can be achieved if we improve our human resource and enhance the system of construction methods.

What are some Challenges To Adopting IBS and Overcoming Them

There is a lot of rejection in pushing IBS for various reasons, one of which is the impact on the supply chain. For instance, from purchasing 10 bags of cement daily, IBS can reduce the number to about five per day. Of course the supply chain will not be happy. Another challenge is human nature and change; being comfortable with what we already know and understand, and rejecting new ideas.

While the workers in the construction industry need to have the right skill and enhanced TVET training, the professionals also have to update their expertise, from the conventional methods to new construction techniques. Advancing the construction requires that the skilled and unskilled workers, and the professionals have to move forward in tandem. All the parties involved have

to understand and agree that the new construction technique is the fastest way to achieve increased productivity.

Even developed countries take a while before they can get other construction systems, such as Building Information Modelling, to fit into IBS. Another issue is creating standardised specifications for building components. For example, can a developer just walk into a hardware store, see a door that they want and go fit it in their project? Moving forward with IBS requires that we do so progressive phases with an understanding of the targets for adopting IBS. For instance, we can start with schools, two storeys and then we can go higher, 10 and then 15-storey building school building. And to qualify the building for IBS, the developer needs to have a 70% components produced using IBS, such as the recent announcement by the

Ministry of Works that private and government projects above RM50 million and RM10 million respectively will require the use of IBS.

We can also start from low cost housing, such as the under the Ministry of Housing's 1Malaysia People's Housing (PR1MA), People's Housing Project (PPR) and the Housing Development Program for the Hardcore Poor (PPRT). All the components can be IBS-created. The critical components in buildings are walls, slabs, beams and the roof, with the remaining parts just being fixtures inside. For instance, in the low-cost income housing, what the developer may need is 10 panels which they can create off site and assemble on site like LEGOs. An example of how useful modular IBS is the Sekolah Kebangsaan Bawang in Bawang, Tuaran, Sabah that got burnt down. The school's ten classroom building

was rebuilt by a contractor in about 9-10 weeks using IBS, compared with conventional that will take months.

I believe that if we go ahead with the new method of construction and design, the government initiative to have the one million low cost houses available will be achieved faster. We can create more dedicated TVET training centres such as CIDB's Akademi Binaan Malaysia (Malaysian Construction Academy – ABM) specifically for the construction of buildings using IBS. We have to adopt a new way of construction, as it is one of the crucial measures to increase productivity and ensure the advancement of the industry while reducing dependence on foreign workers.

Effectively implementing IBS in the construction industry also requires a strong belief in the technique. The reason being that if we simply believe in



While adoption is slow, the Malaysian construction industry has already recognised the benefits of IBS, and developers and contractors have implemented a number of projects using IBS, such as the Putrajaya Bridge (pictured), Petronas Twin Towers and KL Sentral.

building materials and safety. We are also focusing on enhancing environmental sustainability. When we have achieved safety, quality, professionalism, productivity and good environmental practice, then we can concentrate on selling our construction industry services on an international level, to China, Arab countries, Australia, because we would have reached global standards. This is what the CITP—that begins this year until 2020—is about; enhancing the construction industry and strengthening it for the future. To achieve this however, we collectively have to put in our best efforts. It is important to note that CITP is not just about transforming the construction industry, as it can also help provide affordable, quality housing built faster and cheaper, and solve accommodation problems faced by the people.

building materials and safety. We are also focusing on enhancing environmental sustainability.

When we have achieved safety, quality, professionalism, productivity and good environmental practice, then we can concentrate on selling our construction industry services on an international level, to China, Arab countries, Australia, because we would have reached global standards. This is what the CITP—that begins this year until 2020—is about; enhancing the construction industry and strengthening it for the future. To achieve this however, we collectively have to put in our best efforts. It is important to note that CITP is not just about transforming the construction industry, as it can also help provide affordable, quality housing built faster and cheaper, and solve accommodation problems faced by the people.

What Initiatives Have Been Implemented?

We are already enhancing TVET courses, designed in a way that will increase and improve the capability of human resources in the country by strengthening training. As part of the CITP, CIDB is reviewing the syllabus for ABM courses so that they are focused on new methods of construction. Other initiatives are through policies, such as the recent Act 520 (Amendment 2011) that focuses on the quality of

Increasing productivity in the construction industry requires a change to the existing methods of construction as well as the skill set to manage new construction systems and trends, as emphasised by Datuk Buhtamam. One such technique is IBS which is already being promoted in the country, with the Malaysian government's 2016 Budget pledging RM500 million in soft loans to developers and contractors who adopt the construction method. The increased productivity will translate to safer project sites, less wastage and reliance on foreign labour, and increased profitability. ■



Industrialised Building System (IBS) involves creating the components of the project (such as the walls and floors) offsite and assembling them onsite to form a finished construction.

SO YOU WANT TO BE AN... IBS ENGINEER

In our bid to encourage more interest in the construction sector among students, **Heights** showcases professionals in various fields related to the construction sector – from architects to engineers, from project managers to site inspectors. Taking readers behind the scenes to find out more about what working in the construction and other related fields, we speak with Ahmad Azhar Abdul Wahab of IHS Precast, Senior Operation Manager at IHS Precast about being an IBS Engineer.



▲ After the panels have been manufactured at the factory, they are transported to the project site (inset) and installed.

What is IBS?

The Industrialised Building System, or IBS as it is commonly known, is a building method that uses different means to a similar end when compared to conventional construction practices.

The variations between the techniques are subtle enough for either method to be considered to fulfill the general requirements of a construction project, but distinct enough for IBS to possess desirable advantages over the standard approach.

Traditional construction technique involves fashioning wooden moulds, known as formwork, into which the steel reinforcement bars are placed and pre-mixed concrete poured. Structures are built up in this way – a column

is casted and once the concrete has cured, a beam can be casted over it, and so on.

This work is done on the construction sites, with variables such as worker skill and site conditions affecting the final result. This leaves many avenues open for mistakes, and if proper procedure is not adhered to, it can result in a decline in quality standards.

IBS, while also using moulds to cast building components such as beams and columns, is done in a more controlled environment. This simply means that the components are produced off-site, for instance in a factory, before being transported to the site to be installed.

These elements are designed from the beginning to fit snugly with one

“In the 1980s, concrete was mixed on-site manually. Today, you only have to make a call and the concrete will be delivered to you, ready to pour. It was an evolution in the construction industry. Similarly, IBS has changed the way we build, and hence is an evolution itself. It is something to adapt to be on par with the best players in the market, both locally and internationally.”

A DAY IN THE LIFE

What is the work of a Senior Operation Manager at an IBS company like on a daily basis?

Once a project has been given the green light, your job is to make sure it all goes according to plan. When you produce something at the factory, everything is calculated for. You have to ensure that there are no errors and nothing is wasted as a mistake could end up being repeated. This is crucial as the elements cannot be modified or amended after being produced, and re-casting new ones can be a tedious and costly affair.

You manage operations further down the line too. For instance, the sequence for delivery and installation of components must be synchronised, and the transporter and installer must work according to schedule. There is no point if, for example, you produce enough components to build two housing units a day if you can only transport enough components to build one house per day.

Not only would the installation be lagging behind production, but there would be extra elements in the factory to build an additional 30 houses after a month. Therefore a schedule has to be set. Typically, the plan is to have the precast elements carted off to the site within three days of production, as undelivered elements will cost you every day they remain at the factory. This is because contracts usually stipulate payment on delivery.

What advice do you have for anyone who wants to be an IBS Engineer?

IBS can be considered as a new trend in the Malaysian construction industry, and is just gaining traction here. Therefore, other than having the knowledge and technical know-how, you should have the passion to apply yourself in this field. If you are an undergraduate, it is advisable choose an IBS-related company – consultants, manufacturers or even installers – to do your industrial training to absorb as much hands-on knowledge as possible in the industry before encountering IBS later in your working life.

How much can a fresh graduate expect to earn as an IBS Engineer?

The salary of a fresh graduate in this field on average hovers around RM2,500. Companies usually hire degree holders over diploma holders, and preference is given to those who have prior knowledge and experience in IBS.



The components are produced at the IBS factory, where they undergo standardised manufacturing processes to ensure that stringent quality levels are met.



another for easy installation, and it just takes a short time to secure the elements together using various techniques such as welding plates and grouting at the site. As almost every step of the way is monitored and standardised, there is less chance of quality being compromised. This saves money in the long run as it reduces the need for future maintenance.

The IBS Expert

Having been in the construction industry for over 30 years, Ahmad Azhar was first a contractor for conventional building projects, before seriously considering IBS five years ago. "In 2011, I attended courses organised by the Construction Industry Development Board (CIDB), MARA, *Bahagian Pembangunan Kontraktor dan Ushawan Kementerian Kerja Raya* (BPKU) and other agencies that championed the use of IBS," he says.

This spurred his interest and those of others in his construction company to the potential of the IBS, and persuaded them to try the system out later that year. They secured their first project, a six-block school complex in Kulim, Kedah.

"That was the first time we utilised IBS in a project, and we discovered that it is significantly more convenient than the conventional method of construction," he reveals. "We managed to reduce the use of manpower – by more than half – and curtail wastage of material, among other things."

His company switched to using IBS for all its projects, setting up an IBS factory in Alor Setar, Kedah. As other IBS projects came pouring in, including one that involved 400 housing units, they opened another factory in Temerloh, Pahang.

The Work Process

"When we secure a project, the first thing we do is a feasibility study to assess whether IBS would be a suitable fit for the job," Ahmad Azhar explains. "The reason behind this is cost. As the building elements need to be produced at the factory, a process that involves a financial investment, we need to know if the break-even point or return on investment is favourable."

Ahmad Azhar's interest in IBS also stemmed from one of its usually unseen benefit. "By using this system we can drastically reduce our dependence on workers in the construction industry, especially lower-skilled foreign workers. This in turn would help reduce the cash outflow of the country as they channel the money they earn here back to their own nation." ■

According to him, the involvement of an IBS contractor in the planning of a construction project usually begins on day one, when they discuss the design with the other parties involved in the project. "This is to ensure that everyone, such as the architect, civil and structure consultants, mechanical and electrical engineers, and even the quantity surveyors are on the same page as us."

"This is pertinent as we need to design and mould the pre-cast elements, especially walls, with provisions for switches, piping and ducting before they are assembled on site," he says. The early involvement also has another purpose. "We will come into the project in the beginning stage as we need to prepare the moulds and set up the factory accordingly. This process takes two to three months, which is perfect as by the time we deliver the groundwork and piling at the site would have been completed."



The Internet of Things (IoT) has been one of the most talked-about components of technology in the last few years. In most cases, this has been in relation to how it can be applied in homes or businesses to automate processes, and make systems streamlined and faster.

However, according to multi-national research organisation McKinsey Global Institute's (MGI) The Internet of Things: Mapping the Value Beyond the Hype report in June 2015, the implementation of IoT in worksite environments (which encompasses oil and gas exploration and production, mining, and construction) has the potential to yield an economic value of up to US\$930 billion (RM3.92 trillion at current rates) annually in 2025.

EVERYTHING

HOW EMBEDDING TECHNOLOGY IN MACHINES AND DEVICES CAN ENHANCE THE CONSTRUCTION INDUSTRY

Construction sites are high-activity environments, with mobile machines and stationary equipment of all sizes, as well as people who always have to be conscious of their safety. The concept of IoT allows physical objects (machines and humans) to be assigned digital addresses or Internet Protocol (IP) through sensors and actuators linked by networks to computing systems that allows them to connect to and communicate with each other, and other electronic devices on the Internet.

Intelligent Devices

The impact of this widespread connection is massive, particularly as the number of components and equipment used on construction sites and in the operation of buildings is high, which also presents its share of challenges to project managers in terms of monitoring supplies and equipment. Using Radio-frequency identification (RFID) tags and self-detecting sensors, construction site operators can determine how, when and where supplies go missing (if they do) and track them, the number of

machines on construction sites, and automate request for supplies when a monitored storage goes below a pre-determined level.

For predictive maintenance, advanced sensors can also be installed in mechanical parts and equipment that allow them to automatically report when they are in need of maintenance. MGI's report estimates that predictive and condition-based maintenance in site operations can reduce maintenance costs by between 5% and 10% and increase output by up to 5% by avoiding unplanned outages. All of these translate into one of the major benefits of IoT, lowered costs and financial savings from fewer

WORKSITES: POTENTIAL DIRECT ECONOMIC IMPACT OF \$160 BILLION TO \$930 BILLION PER YEAR IN 2025

Sized Applications	Potential Economic Impact	Assumptions	Potential Value Gain ¹
	Total = \$160 billion–930 billion		
Operations Optimization	56 – 47 (US\$ Billion)	\$7.2 trillion in costs in 3 sectors; 10–20% penetration in O&G, 25–80% in mining, up to 20% in construction	5–10% increase in work-site productivity; 10–20% of consumables, 10–20% of personnel
Improved Equipment Maintenance	81 – 363 (US\$ Billion)	10–20% penetration in O&G, 40–100% in mining, up to 20% in construction	3–5% productivity gain; 5–10% of equipment costs; 5–10% of equipment maintenance
Health and Safety Management	3 – 29 (US\$ Billion)	\$640 billion in costs in 3 sectors, 10–20% adoption in O&G, 25–80% in mining, up to 20% in construction	10–20% decrease in health and safety costs
Human Productivity	17 – 37 (US\$ Billion)	\$590 billion in labor costs; adoption 8–15% in advanced economies, 2–5% in developing	10% productivity improvement
Usage-based Design	1 – 21 (US\$ Billion)	\$760 billion in equipment costs in 3 sectors: 30–50% adoption in O&G, 40–100% in mining, 10–75% in construction	6% increase in equipment supplier revenue
Pre-sales Analytics	0.3 – 3 (US\$ Billion)	\$760 billion in equipment costs in 3 sectors: 30–50% adoption in O&G, 40–100% in mining, 10–75% in construction	2% increase in equipment supplier revenue

1. Ranges of values are adjusted for estimated potential penetration of IoT applications in advanced and developing economies (0–100%). NOTE: Estimates of potential economic impact are for sized applications and not comprehensive estimates of potential impact. Estimates include consumer surplus and cannot be related to potential company revenue, market size, or GDP impact; estimates are not adjusted for risk or probability. Numbers may not sum due to rounding.



▲ The Internet of Things will allow workers on construction sites monitor projects, supplies, the site, workers and the machines more effectively by linking everything to the Internet.

breakdowns, higher productive uptime, improved business and construction processes, automated operations (including self-driving vehicles), and reductions in the cost of maintenance, labour and energy.

Safety First

Another area where IoT can make a significant impact in the construction sector is in employee safety. Construction sites can be extremely dangerous environments, with the presence of heavy machinery and materials, the physical nature of the work and sometimes high structures, with the 'Fatal Four' or top four causes of accidents in construction sites being falls, being caught between machines, electrocutions and getting struck by moving equipment.

With IoT, construction site operators a number of measure that can reduce accidents and injuries, and according to MGI, the cost of insurance by up to 20%. These measures can include installing intelligent IoT sensors on

machinery—that shuts down when proximity detectors indicate that a worker is hazardously close—and in employees' tags, or wearable bands and devices that will monitor workers' health, location, activities, and exposure to chemicals.

The increased use of remote-controlled, automated and Internet-connected machinery also means that workers do not have to physically be inside heavy machinery to operate them, particularly when operating dangerous equipment and in environments that may be hazardous to human health. For instance, drones

can be used for aerial and internal survey of buildings that may not be structurally sound prior to demolition. Technology such as virtual reality and augmented reality that are getting more popular, with devices such as Google's Glass and Microsoft's HoloLens, can allow architects, for example, design and make corrections to building in virtual reality, saving time and cost of using physical resources.

Getting There

A number of measures have to be implemented to fully realise the benefits of IoT. One is these is that construction site operators will need to attract a new set of skills and talents from IT—machine learning and data scientists, and statisticians. Another factor is support from the government and policymakers, as well as the manufacturers of IoT components in creating IoT sensors and systems that are easy to use, rugged and durable enough to withstand the weather and harsh working conditions in construction sites. Adoptability also depends on how cheap the IoT devices are and their ability to be retrofitted on older machinery and equipment.

Integrating IoT into the construction is a win situation for everyone involved in the industry. For construction site operators, there is the massive cost savings from increased efficiency, IoT device manufacturers get a new market for their systems, workers enjoy reduced chances of injuries and better working environment and the government benefits from the increased contribution of the sector to the national economy. ■

AUTOMATION & THE CONSTRUCTION INDUSTRY

**IN THE LAND OF LABOUR,
THE ONE-ARMED ROBOT IS KING**



The time to invest in automation is upon us. Automation is the perfect complement to an industry that fails or succeeds by its optimisation of manpower. The Construction Industry Transformation Programme (CITP) was launched in Malaysia on September 2015 as a comprehensive implementation plan, announcing four strategic thrusts: Quality Safety and Professionalism (QSP), Environment Sustainability, Productivity and Internationalisation. With higher levies imposed for foreign workers, and low domestic participation in the construction labour force, automation may be the key to saving both time and labour cost.

Quality Safety and Professionalism

Among the standards to be implemented under the CITP is the Quality Assessment System in Construction (QLASSIC), which creates a unified system for measuring construction workmanship to ensure maximum quality control and standardization.

To facilitate better QLASSIC compliance, machine guidance systems like the Topcon i-53 machine-control system can be used to provide the equipment operator with visual indicators of the position of the tool relative to the surface being constructed. Throw in some automation, and the system will not only guide the operator, but directly control the machine hydraulics in order to perform the task itself. This is typically used for final grading to achieve precision levels of cuts and measurements. Prior to these systems, operators had to rely on verbal instructions and hand signals provided by another worker on site.

Machine guidance systems also record data for quality control, while also

being able to transmit that data to engineers or inspectors to conduct real-time checks.

The CITP also aims to reduce worksite fatalities and injuries by 50%, as well as improve safety conditions on the worksite. Currently, the four most common causes of construction accidents (dubbed the 'Fatal Four' by the Occupational Safety and Health Administration) are falls, electrocution, being struck by debris or falling tools, and getting caught in or between equipment.

Recent advances in automation look like they came straight out of a sci-fi novel. The utilisation of construction robots can mitigate the risks of common worksite accidents. Komatsu has developed robotic bulldozers and excavators are guided by data from aerial drones. These driverless construction vehicles increase workplace safety by moving workers away from having to perform dangerous tasks under hazardous conditions, into more supervisory roles. For more delicate operations requiring a human presence, work areas are often protected by light screens or barriers to keep the operator out of danger.

Environment Sustainability

Part of the ambition of the CITP is to transform the Malaysian construction industry into a role model for emerging nations through innovative and sustainable building practices. Case studies conducted by the CIDB find high volumes of construction and demolition waste dumped in construction sites across Malaysia. Automation of building processes

would result in waste reduction and better conservation of resources.

Again, aerial drones have a practical application here. An idea by start-up company Skycatch is the use of drones to monitor progress on the construction site in real-time, using software to calculate the volume of dirt displaced, or detect soil erosion. In addition to improving awareness for productivity and safety purposes, these

drones could also be used to accurately survey the environmental impact of the construction process before irreversible damage can be done.

But how about machinery? Enter the RoadPrinter, which can lay down 500 meters of road in a single day by sorting loose bricks into a pattern, and pressing them into the ground. This piece of machinery is electrically powered, and has a lower carbon

The RoadPrinter is set to revolutionize the way brick walkways and roads are constructed.



THE FOUR THRUSTS OF THE CONSTRUCTION INDUSTRY TRANSFORMER PROGRAMME (CITP)



¹ . US\$16,500 is equivalent to RM61,939 as stated in the 11th Malaysia Plan; 2.5x increase uses 2011 as a base whereas 11th Malaysia Plan states 1.6x increases in labor productivity using 2015 as a base, thus they are consistent

footprint. It is also quieter than traditional methods of road paving.

Noise pollution itself has a measurable cost. An Economic Assessment of U.S. Environmental Noise in 2015 determined that reducing hazardous noise levels alone could save up to US\$3.9 billion every year in medical fees and regained productivity.

Productivity

Automation is also expected to help Malaysia realise its goal of more than doubling productivity before 2020. At present, the local construction industry is suffering from a lack of information-driven decision making, as well as limited adoption of modern practices and technology.

Malaysia still has a low implementation rate of Industrialised Building Systems (IBS) in construction. IBS involves the manufacturing of building components, usually off-site, in a controlled environment, which are then installed into construction works. However, many modern construction techniques are only feasible with extensive automation, which local companies have yet to adopt.

The new bricklaying robot SAM, otherwise known as Semi-Automated Mason can lay three times as many bricks as a traditional worker. SAM is highly adaptable, and can adjust to incline and weather conditions, while still completing precise and level work.

While technological advances have reduced the demand for low-skilled workers, it has not reduced the need for human labour overall. Robots have been relegated to menial and dangerous tasks, rendering specific jobs obsolete. This results in less dependency on foreign labour to sustain the construction workforce, while simultaneously creating better paying jobs in maintenance and supervisory positions in the process.

Bolstered by an abundance of research into robotics, artificial intelligence, and information technology, automation in the construction industry has grown exponentially. The way local companies capitalise on the rapid availability of new technology will determine how successfully the CITP would be able to transform the Malaysian construction industry. ■

Internationalisation

Malaysian construction companies are facing stiff competition domestically from the presence of foreign players, as well as challenges in expanding into the regional and international market.

Part of the CITP initiative is to win back market share in both domestic and overseas markets. Once again, automation may be the key to winning this battle. Automation reduces construction costs and time. This, combined with strategic investments into modern techniques and technology, may be enough to provide the competitive edge local construction companies have been searching for.

Financing Development

THE CONSTRUCTION SECTOR GAINS BIG FROM BUDGET 2016

Even in the middle of a global recession, with the price of crude oil at one of its lowest points in history and the value of the ringgit wavering, Malaysia's construction industry is expected to continue to grow by 8.4% this year, aided by initiatives in the 2016 Budget.

Prior to the announcement of the 2016 Budget in October 2015 (and a recalibration in January 2016 to take global market volatility and a challenging local economic conditions into account), the 11th Malaysia Plan (11MP)—starting this year—already set the stage for growth in the construction sector. Revealed in May 2015, 11MP proposed four major infrastructure projects worth around RM80 billion in various sectors such as public

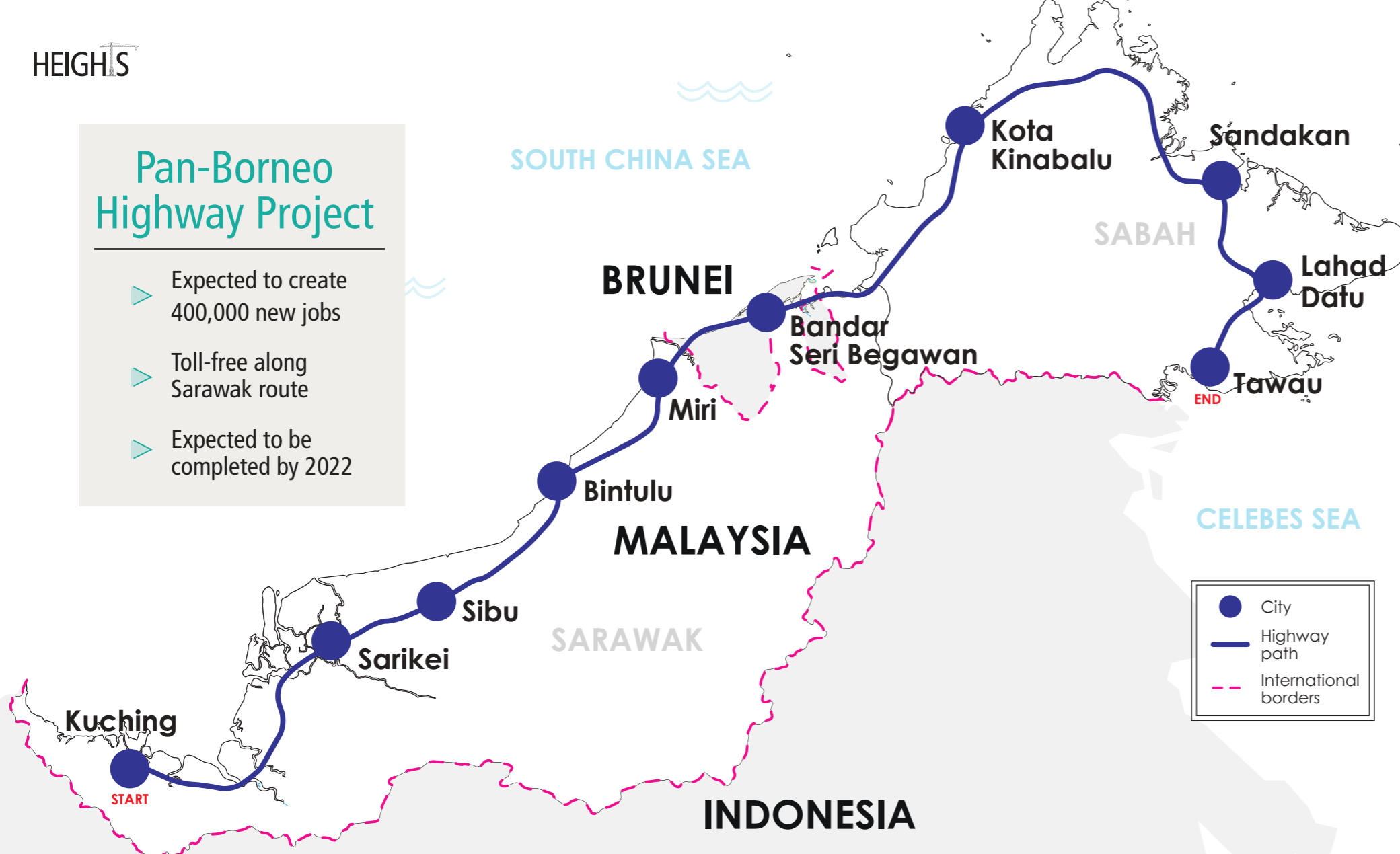
The construction industry features prominently in the 2016 Budget, the first in a series of five as the country moves towards achieving developed nation status in 2020.

transport, oil and gas downstream and water projects. With the developed nation status deadline just four years away, the construction industry is an



Pan-Borneo Highway Project

- ▶ Expected to create 400,000 new jobs
- ▶ Toll-free along Sarawak route
- ▶ Expected to be completed by 2022



◀ The continuation of the 2,239 km Pan-Borneo highway, even with the recalibration of the 2016 Budget, emphasises the government's commitment to enhancing the construction sector in the country.

between maintaining the state of the environment and economic benefits, which is a priority in any development.

To this end, Budget 2016 proposed and allocated RM500 million to the Industrialised Building System (IBS) Promotion Fund to be distributed by SME Bank to contractors and developers in the G5 category (qualified to undertake projects worth up to RM5 million) and below who implement and utilise IBS. The government also extended the implementation of the Green Technology Financing Scheme—which could benefit contractors and developers who utilise green technology in their projects—until 31 December 2017 with a fund of RM1.2 billion. These initiatives are expected to boost the adoption of sustainable construction as advocated by the Construction Industry Development Board's Construction Industry Master Plan.

Attaining Sustainability

It is important to note that adopting sustainability in the construction sector involves more than simply implementing green initiatives in the building phase. According to Ir Dr Kamarul Anuar Mohamad Kamar and Zuhairi Abd Hamid of

the CIDB's Construction Research Institute of Malaysia (CREAM) in their paper *Sustainable Construction and Green Building: The Case of Malaysia*, establishing green procurement procedures is one of the most effective ways of increasing adoption of sustainability in the construction industry.

This involves integrating environmental considerations and planning into the entire life cycle of projects—meeting the need for goods and services using measures that achieve value for money while minimising damage to the environment. Contractors and property developers can build sustainable projects and also be responsible for implementing operations, such as maintenance, that are environment-friendly.

Accomplishing this however will require improved and expanded knowledge and technology by enhancing involvement in research and development (R&D). To encourage and develop such studies, this year was declared Malaysia Commercialisation Year, with Budget 2016 stipulating that companies with paid-up capital not exceeding RM2.5 million are allowed to claim double tax deduction for R&D project expenditures up to RM50,000 for each year of assessment between 2016 and 2018.

The construction industry depends on and contributes to other economic sectors in the country and as the major beneficiary of the recently revised Budget 2016, its growth will have a wide-reaching effect on the nation. ■

important contributor to national development, encompassing buildings, bridges, roads, railways and public infrastructure and contributing to competitiveness and attracting foreign investment.

Growing Groundwork

Analysts in the country maintain that despite the revision of the budget which saw the allocation for development projects decrease from RM50 billion to RM45 billion, the construction industry will continue to thrive and contribute significantly to the economy owing to the high number of massive projects on board for this year up to 2020. For instance,

CIMB Research in their report pointed out that oil and gas infrastructure, such as the Petronas' Refinery and Petrochemicals Integrated Development (RAPID) project in Pengerang, Johor, is expected to see investments worth RM18 billion.

The cuts to government expenditure also meant prioritising physical projects that will have higher positive impact on the welfare of the people. These include the development of hospitals, schools, houses, roads and public infrastructure such as the RM80 million development of Integrated Villages including in Sungai Siput, Perak, which encompasses the construction of connecting roads,

provision of electricity and treated water. Other projects include the RM28 billion Mass Rapid Transit 2 (MRT2) and RM9 billion Light Railway Transit 3 (LRT3), as well as the RM12.8 billion Pan-Borneo Highway (PBH), the Malaysian Vision Valley (MVV)—a 108,000 ha integrated economic development valley in Negeri Sembilan—and the Cyberjaya City Centre (CCC) project.

Malaysia's strengthened ties with China are also expected to boost the construction sector, particularly in projects that include the Kuala Lumpur-Singapore high speed rail, the Gemas-Johor Bharu double track rail and the RM27 billion Penang

Transportation Master Plan (PTMP). According to Maybank Research, "With the Chinese companies' ability to offer attractive financing packages, this would raise their chances of winning the projects, while allaying concerns on project funding issues."

The Balance

Budget 2016 also highlighted the importance that the Malaysian government attaches to its commitment to reduce greenhouse gas emissions (GHG) intensity to 40% of GDP by 2020. One of the main challenges in implementing sustainable construction measures and methods is finding a balance

Kazakhstan's Construction Boom

The largest landlocked country and seventh largest in the world, the Central Asian state of Kazakhstan is a relatively young nation. Once part of the Soviet Union, it became independent in 1991 and has since become the largest economy in the region. Its rich natural resources such as oil and gas have boosted its gross domestic product (GDP) per capita from US\$1,500 in 1991 to US\$13,000 by 2013. This increase in prosperity has also spurred demand for both property and infrastructure. As part of our Going Global series, **Heights** showcases the opportunities in the Kazakh construction sector.

This growth can be particularly seen in the nation's capital Astana, where construction work is being carried out on 13,000 square metres of office space and 50,000 square metres of retail space. There are also more than 80 residential projects under development. This is the result of the Kazakh authorities earmarking US\$273 million to build infrastructure, as well as an additional US\$280 million for public housing.



have been identified for each of them.

These include new administrative buildings and a business centre on a 3.63 square kilometres area in Shymkent and housing projects in Aktobe. The *piece de resistance* would be the US\$10 billion G4 Golden City project in Almaty. Taking up more than 166,900 square kilometres, the Golden City will be a mixed-used development containing residential, commercial, entertainment, educational and retail amenities.

Infrastructure development is also on the rise in Kazakhstan. Aside from new roads and railways being constructed, efforts are being made to strengthen the Kazakhstan's energy infrastructure. This includes investing in new oil and gas pipelines, as well as building new transmission towers and lines, and power plants including nuclear reactors.

The Malaysian Connection

In total, the Kazakh construction sector was valued at RM57 billion in 2015 and this is expected to grow to RM72 billion by 2017. This has led to an influx of foreign construction firms into the country, most of them from Russia. Last year, nearly a quarter of all building and infrastructure projects were taken up by non-Kazakh companies.

Opportunities are therefore plentiful in Kazakhstan and Malaysian construction

One of the key reasons for this spike in construction activity is that Astana has been chosen as the site for *World Expo 2017*. More than 30 countries are expected to participate in this prestigious international exhibition, and Kazakhstan is looking to put its best foot forward.

It is doing this through the construction of 26 projects in Astana. These include 4,000 apartments, a hotel, a school, a conference and meeting hall, and a commercial and retail area, which will be built on a 173.4 hectare space.

The run-up to *World Expo 2017* has also seen Kazakhstan relax its policy on foreign workers. Previously, non-Kazakh workers were subject to quotas so that companies would hire locals. However, the size and scope of the construction projects along with the short timeframe to complete them meant a rethinking of this policy.

Other than Astana, three more cities were named by the President of Kazakhstan Nursultan Nazarbayev as future urban centres: Almaty, Shymkent and Aktobe. Major construction projects



“We have done much, but our country is large, and good roads are among the prerequisites for the development of our economy... We need to link all the corners of our country to the centre so that people can travel, live and work in any place they choose.”

– President Nursultan Nazarbayev of Kazakhstan

companies should look to venture into this market. In February 2014, CIDB CEO Dato’ Sri Ir Dr Judin Abdul Karim and International Division General Manager Zainora Zainal paid a visit to the country, and met with officials there.

The trip resulted in CIDB’s subsidiary CIDB Holdings being named as a provider of construction sector training to Kazakh officials under the Malaysian Technical Cooperation Programme (MTCP). One key focus of this collaboration is to help raise the capability and capacity levels of the Kazakh construction sector in the use of Industrialised Building Systems (IBS).

Kazakh authorities also invited Malaysian firms to bid for maintenance and operational rights for the 326-kilometre Astana – Atbassar Expressway and the 448-kilometre Shymkent – Kyzylorda Expressway. Malaysian companies were also encouraged to submit proposals for the G4 New Town Development Project. This is a US\$45.3 billion venture to build four new towns on a 79-kilometre stretch between Almaty and Lake Kapchagay.

Investor Relations

The Kazakh government has set up the Kazakhstan Investment Agency as a centre to help facilitate the entry of foreign investors into the country. It has also introduced several incentives to attract investors.



An artist’s impression of Dutch architectural firm UNStudio’s proposal for the World Expo 2017 to be hosted by Kazakhstan. Hosting the expo has allowed the country to relax its foreign labour policies and open its construction industry to international infrastructure companies.

For example, equipment, spare parts and raw materials have been exempted from customs duties. The state will also provide grants in kind of up to 30% of total investment in fixed assets. These include land, buildings, machinery, computer equipment, measuring and control devices and vehicles.

The construction of roads and railways, as well as telecommunications and electricity infrastructure, are classified as priority investment projects. This enables foreign investors to receive additional benefits from the Kazakhstan government such as zero percent corporate income and land taxes for 10 years, and waiver of property tax for eight years.

According to BMI Research, Kazakhstan’s construction sector is expected to grow at an average of 5.8% between 2014 and 2024. Its contribution to the economy is also expected to rise, from 6.4% of GDP in 2014 to 7.3% by 2020. The experience Malaysian construction and engineering firms have in building and infrastructure projects gives them an advantage in this young but vibrant market. ■

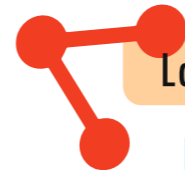
Jom 'LIKE' CIDB Malaysia **facebook**

LIKE YANG KE

100,000

AKAN MEMENANGI HADIAH MISTERI

CARA PENYERTAAN



Langkah 1 : ‘Share’ gambar ini di wall anda.



Langkah 2 : Sila Komen “Jom LIKE @CIDB MALAYSIA dan menangi hadiah misteri!”



Langkah 3 : Sila ‘Tag’ minimum 8 orang rakan anda untuk mengesahkan penyertaan.

Contoh : Jom LIKE @CIDB MALAYSIA dan menangi hadiah misteri! @topikuning, @kasuthitam, @batubata..(‘Tag’ sekurang-kurangnya 8 rakan fb)



Langkah 4 : Untuk menyertai kempen ini, pastikan meletak tetapan privasi ‘post’ anda kepada ‘PUBLIC’ untuk membolehkan pihak kami mengenal-pasti penyertaan anda.



Ikuti CIDB di laman sosial:
www.facebook.com/CIDBOfficial
twitter.com/cidb_malaysia
instagram.com/cidbmalsia

**International
Construction Week** ICW
2016

ecobuild
southeast asia 2016

11-15 April 2016 Five-day Construction Conferences

12-14 April 2016 Ecobuild SEA Three-day Exhibition

Driving Productivity in Construction

Kuala Lumpur Convention Centre

For more info, contact:

 +603 2176 8788

 ecobuild-sea@ubm.com

www.cidb.gov.my | www.ecobuildsea.com

Hosted by:

Featuring:

Organised by:

