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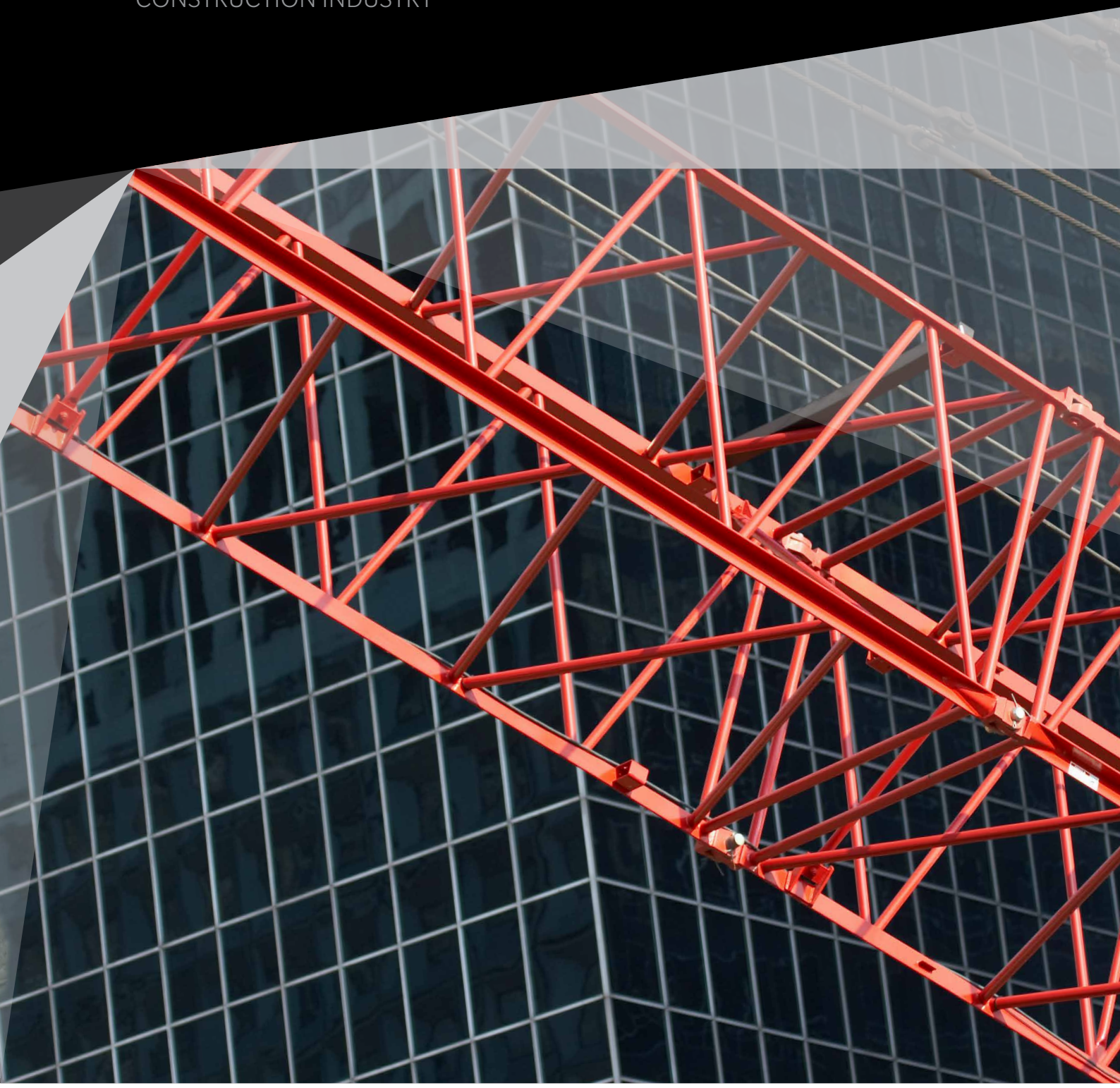
GLOBAL CONSTRUCTION PRACTICE

EMERGING RISKS IN CONSTRUCTION

EXPERT PERSPECTIVES ON THE CONSTRUCTION INDUSTRY



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INTRODUCTION

The world continues to change at an increasing pace, and construction, the world's largest global industry, is under pressure. Shortages in housing, utilities, and modern transportation struggle to keep up with our rapidly expanding and increasingly mobile population. Unprecedented macroeconomic and geopolitical forces are meeting financial and environmental challenges head on, stretching the limited skills and commodities in the construction industry. As a result, companies in this sector now need to look afresh at the emerging risks they are facing.

The articles contained in this publication examine some of these crucial issues and aim to provide critical insight into the risks and opportunities facing construction companies as they navigate through the profound transformation that is under way.

These articles first appeared on BRINK – the digital news service of Marsh & McLennan Companies' Global Risk Center, managed by Atlantic Media Strategies. BRINK gathers timely perspectives from experts on risk and resilience around the world to inform business and policy decisions on critical challenges.

I hope you find Emerging Risks In Construction: Expert Perspectives on the Construction Industry informative and valuable.

Yours sincerely,

JON MARSH

International Chairman
Global Construction Practice

PERSPECTIVES ON INNOVATIO

ON

DISRUPTIVE TECHNOLOGY BRINGS RISK AND OPPORTUNITY TO INFRASTRUCTURE PROJECTS

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The infrastructure industry has not typically been known for its embrace of new technology. In a recent paper,[1] the World Economic Forum (WEF) attributed the industry's relatively slow adoption of technological innovation to a number of internal and external challenges in the engineering and construction sector: "The persistent fragmentation of the industry, inadequate collaboration with suppliers and contractors, the difficulties in recruiting a talented workforce, and insufficient knowledge transfer from project to project."

Change is inevitable and innovation is disrupting the way we design, build, operate, and use infrastructure. Whether it's in civil infrastructure—roads, bridges, pipelines, and ports—industrial infrastructure, or social infrastructure, technological advancements are creating efficiencies in the way we operate. While technology adoption can help to promote sustainable growth, there are also risks to be managed.

INNOVATION TRANSFORMS INFRASTRUCTURE DESIGN

Innovation dictates that infrastructure needs to be conceptualized and designed differently.

Consider something as basic to society as roads, and add to that the coming of autonomous vehicles—both for passengers and in trucking. Because autonomous vehicles rely to a large degree on sensing technology, we need to consider if roads, bridges, tunnels, and other infrastructure are being designed adequately for this new means of transportation. Beyond efficiency gained from proper design, what are the potential liability implications for inadequate design?

Change is inevitable and innovation is disrupting the way we design, build, operate, and use infrastructure.

Big data and analytics have also infiltrated how we design infrastructure. For example, building information modeling (BIM) is realizing broader applicability as its technology develops. Historically used for 3D modeling in the design phase, continuing innovations in BIM will enable faster and better infrastructure development, as well as provide insights into how a project will perform throughout its life cycle, allowing a view into a project's future risk profile. This innovation in BIM promotes efficiency by allowing those who design infrastructure to provide real-time support to those building it.

BUILDING SITES BENEFIT FROM NEW TECHNOLOGIES

Construction sites are incubating grounds for a range of technology innovations in such areas as wearables and telematics.

Wearable technologies, for example, are rapidly changing the work landscape and promoting safety, accuracy, and efficiency. Among the advancements in construction technologies is the smart hard hat, which allows technicians to project 3D images in the natural environment, such as a bridge span, through augmented reality (AR)—the same technology behind Pokémon Go.

Enhanced safety vests borrow concepts from vehicle telematics. These vests are equipped with GPS and radio-communicating technology to enhance workforce safety and prevent injuries by warning users as they enter hazard zones.[2] It's not hard to imagine a future in which workers wear an exoskeleton that will improve safety, enhance efficiency, and allow for the instantaneous exchange of data.

Innovation dictates that infrastructure needs to be conceptualized and designed differently.

Technology will also enable infrastructure to be built by fewer humans—potentially enhancing safety and promoting resource efficiency. Balfour Beatty, a large international construction firm, suggests that by 2050 some infrastructure will be built without physical human labor.[3] It is not difficult to anticipate that in our lifetime infrastructure will be designed and constructed using 3D printing and installed by robots and mechanistic devices that operate with artificial intelligence.

OPERATION AND UTILIZATION OF INFRASTRUCTURE WILL CHANGE

Once these innovative infrastructure assets become operational, they will likely include embedded technologies, such as the intelligent transportation systems (ITS) used on many highways and freeways. These incorporate a variety of technologies including Bluetooth, video, and other wireless systems to promote efficient traffic management, allow for toll tracking and billing, enhance emergency response times, and assist law enforcement. With the coming of autonomous vehicles, it's likely that additional sensing technology will be needed to improve safety.

Beyond impacting how society uses and engages with roads and other infrastructure, interconnectivity will allow individual components to interact on an almost "live" basis. For example, it's anticipated that, in the near future, individual infrastructure components will contain monitoring technology that will provide real-time information about their operating efficiency and life span. When such components need replacing, the sensors will put in the order.

There is no question that innovation in robotics, automation, and other technology will continue to alter the way infrastructure evolves and the way we use it. These technologies promote efficiency, connectivity, and sustainable growth.

INFRASTRUCTURE RISKS ALSO SHIFT

With innovation comes risk, however, as technological disruption also increases volatility and exacerbates emerging issues, including those related to social stability as well financial viability and cybersecurity.

Social disruption: If innovation does eventually displace large numbers of construction crews, drivers, or other workers, it's possible there could be considerable social unrest in some parts of the world. According to executives participating in a recent World Economic Forum event,[4] it will be critical for industry to plan ahead by investing in education and training for workers whose jobs could be made redundant due to technological advancement.

Financial viability: As technology advances, will the infrastructure we design and build today be useful in 20 to 30 years? How quickly will it become obsolete? What if we have flying cars? That may sound harebrained at face value, but compare the world we live in today to what people thought was possible just 20 or 30 years ago. Once we integrate technology into physical infrastructure, it can quickly become outdated.

This is particularly important in the context of privately financed infrastructure, where the private sector takes on the life-cycle management of infrastructure. Obsolescence is of particularly heightened risk to private concession companies who have assumed revenue risk (for example, tolling) based on financial models that were unable to incorporate disruption in infrastructure utilization. The firms exposed to the financial risk related to infrastructure obsolescence could be builders, engineering firms, and/or equity firms and financiers developing and maintaining infrastructure.

Construction sites are incubating grounds for a range of technology innovations in such areas as wearables and telematics.

Cybersecurity: Because infrastructure now needs to be able to integrate with and connect to technology, such as smart buildings, autonomous vehicles, and transit systems, cybersecurity risks become more of a threat than in the past. The interconnectedness of our infrastructure through the Internet of Things (IoT) will face cybersecurity risks. Infrastructure may increasingly become a target for sophisticated organized crime looking to extract sensitive information. Firms with proprietary software, systems, and infrastructure may become targets of corporate and political espionage.

Hackers have long probed for weaknesses in critical infrastructure. The ability for cyber events to affect infrastructure has grown, as seen in two recent global attacks involving malware—WannaCry and Petya/GoldenEye. Infrastructure from hospitals to marine ports suffered financial losses and damage due to those events.

Perhaps the most frightening risk from an infrastructure perspective is that of cyberterrorists seeking to invoke fear. In the age of digitization and IoT, there are legitimate concerns that cyberterrorists could gain access to flood control gates, traffic lighting systems, public transit systems, or even the doomsday scenario of shutting the electric grid down completely. Cybersecurity continues to be one of the global risks of highest concern.[5]

Today's new technologies almost always increase connectivity, including in the ways we build, operate, and maintain infrastructure. Companies involved in infrastructure can no longer afford to think of cyber risk as an afterthought, but need to adopt strong cyber-risk management practices from day one.

Thankfully, there is a bustling market emerging in the risk management and insurance industry to address cybersecurity. In addition to consulting services developed to assess and manage cybersecurity exposures, insurers have developed products to transfer the risks that infrastructure stakeholders face, as well as support risk mitigation by establishing incident response plans. These products, which are triggered by cybersecurity breaches whether motivated by financial crime or terrorism, can cover expenses related to extortion, property damage, or financial loss related to a data and privacy breach or network outage.

One recent estimate from the Global Infrastructure Hub, a G20 initiative, says there is a need for US$94 trillion in infrastructure investments by the year 2040.[6]

At the same time, it's clear that rapid technological advancement is changing the way we design, build, operate, and use infrastructure. Innovation in infrastructure will enable growth and promote economic, environmental, and social vitality.

But advancement comes with risks—including social disruption, obsolescence, and cybersecurity threats. These risks can be mitigated by forward-thinking city planning, investment, and integration of education into our workplace, as well as an increase in cyber-oriented defenses.

THIS ARTICLE FIRST APPEARED ON BRINK.

HOW DATA AND TECHNOLOGY WILL FUEL MEGACITIES OF THE FUTURE

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What will cities look like by the year 2050? Will they be like those in South Korea, centered on a digitally connected retrofit of existing society?[1] Will they parallel the shiny new cities of Dubai or Singapore? Or could they possibly move underground or under the oceans?[2]

Today, innovative cities, such as Curitiba, Brazil,[3] are rethinking entire mass-transportation strategies while debating visions of autonomous cars and drones.[4] The most basic infrastructure needs have always been about how people want to live and move around.

It's also about how things move around. FedEx sees e-commerce increasing by 26% from 2016 to US$2.4 trillion worldwide by 2018,[5] which adds pressure to upgrade roads, highways, and port/airport infrastructure for vehicle use—autonomous or otherwise.

Add to this mix myriad technology disruptions, such as sensors, big data, and the Internet of Things (IoT), which can help adjacent cities work together like cogs in a bigger machine.

But why is that important? Planners have been considering urbanization pressures, often in areas with little room to increase building or infrastructure capacity.[6] One alternative is analyzing collected data to determine how to densify corridors of population between neighboring cities, with mass transit creating megaregions that could easily become home to millions more.

The challenge for cities around the world is: How do they grow? How do they perform and transform simultaneously?

DATA AND THE MEGACITIES OF THE FUTURE

Neighboring cities are coalescing in their shared infrastructure and mutual impact of their economies. Power lines, roads, transit, water systems, and safety don't stop at city limits,[7] and municipalities are facing transformation at unprecedented rates. As a result, there's a lot of debate about who decides the way forward and what that looks like.

The challenge for cities around the world is: How do they grow? How do they perform and transform simultaneously?

When it comes to designing infrastructure, one thing is for sure: Big data collected through the IoT will play a key role in growing the megacities of 2050. "Big Data is all the information around us that is being collected in various streams," says Steph Stoppenhagen, smart cities business development director for Black & Veatch. "If you use a metrocard to get on a subway, then the system knows when you entered, where you went, and the route you took. How is this helpful? By recognizing if the subway service worked. Was it successful? If so, you will do it again and again. That is one example of using data to watch people's movements—creating smarter mobility."

Not all data easily translates into useful or actionable information, though. To address the changing urban landscape, information itself should be seen as a form of infrastructure—one that can be used for better planning to connect cities within a bigger system.[8]

The starting point is people, not technology. Planning, design, and investment decisions—along with supportive policymaking—can be informed and expedited via infrastructure visualization, simulation, and analysis. The rise of big data and advanced modeling technology make it possible to plan and prioritize infrastructure investment with greater foresight, better communicate potential outcomes, and yield measurably better results.[9]

Creating smart cities[10] means more than using the IoT to optimize services or communicate information to residents. It should be a construct used to frame local government decision-making around city transformation.[11] While 2050 seems far off, for existing cities that must perform, transform, and compete with brand-new cities, it's pretty close at hand. Cities need to evolve to develop sustainably; improve resilience; meet citizens' rising expectations; and attract investment, new businesses, and talent. The good news is that data and technology will make work and life better by creating a well-connected community.

But smart investment and policy decisions are crucial to planning, and moving to long-term investment (versus grant funding) is key. To achieve that, cities must connect:

- Projects: Developments that build toward the unified city vision[12] and meet broader economic objectives, such as accessibility, jobs, affordable housing, and healthy environments.
- Teams: Collaborative efforts functioning across all levels of government to unlock public and private infrastructure investment, leveraging big data to track the performance of infrastructure.
- Insights: New technologies that revolutionize how cities are planned, function, and grow the economy by connecting everyone at the beginning of project planning.
- Outcomes: Projects that meet planning/business-case measures and use cost-benefit analyses to meet economic objectives.

THE FUTURE OF PLANNING IS 3D

Building Information Modeling (BIM) gives meaning to the vast information available to architects and engineers, urban citizens, and decision-makers. Advanced 3D modeling allows people to analyze complex information, including risks and problems at a system-versus-asset level. What that means is thinking about what the whole infrastructure system is trying to accomplish versus goals of its individual components. That information helps architects and engineers enhance designs so individuals, firms, and cities can meet their "smart" connected goals, bringing neighboring cities together.

Consistent use of 3D in-context models coupled with simulation software can create a hypothetical but realistic scenario of the physical infrastructure's performance. It establishes a concrete vision in 3D, setting the context for discussing goals and performance measures that everyone can understand.

Technology lets people see with both eyes open—gaining perspective and depth—rather than with one eye closed, which gives perspective but no depth. The depth comes from information streaming through technology: Information-rich models can help stretch infrastructure investment dollars throughout the design and construction phases.

Going forward, using 2D designs in an ever-changing 3D world won't work. Using 3D BIM processes will be a critical skill set to build the right infrastructure for a megacities-of-the-future vision.

2050 seems far off, but data and technology will soon make work and life better through a well-connected community.

CREATING SMART FOUNDATIONS TOGETHER

Cities are often overwhelmed by big data and lack the ability to make the information actionable. A benefit of BIM is that it can manage connections among all the data useful for complex city design projects—from the micro to macro level.

Through an immersive collaboration, the general public will better understand the future of infrastructure design. This way of stepping into, around, and through infrastructure virtually is becoming the norm. It aids in faster design-concept creation, vetting, and approval, and it reduces stakeholder pushback.

In this era of connected BIM—where information forms the infrastructure for planning, designing, and maintaining manufactured and natural systems—the objective is to create integrated and resilient infrastructure. Then, cities will be able to withstand and recover more quickly from natural and human-caused disasters—and grow to support their future.[13]

By collecting and analyzing more information, civil engineers will better predict what's needed to manage bridges, roads, and other infrastructure assets, prolonging their lifecycles. As populations increase and demand for infrastructure rises, future-proofing assets must take into account true lifecycle costs.

Smart infrastructure connections at a personal, community, metropolitan, or even national level—underpinned by technology—provide the capability for monitoring and measuring data. Then the analysis of data feedback can yield positive steps to address issues (whether through human or machine actions).

This changes the vision of cities and provides the foundation for more holistic planning. In the connected cities of 2050, all kinds of infrastructure—energy, water, transportation, buildings, and governance—will "talk" to each other to prioritize needs, optimize performance, minimize energy use, and make life more enjoyable and productive for the people who live in and travel between cities.

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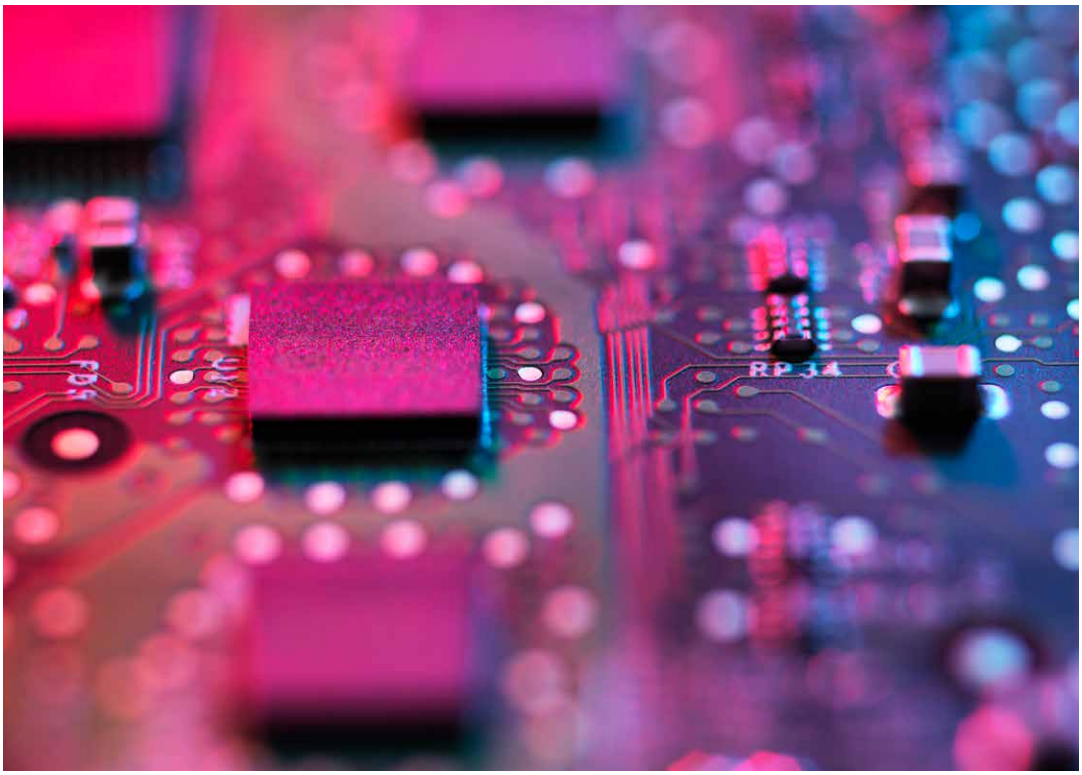

CONSTRUCTION MACHINES IN THE DIGITAL AGE

AUTHOR: ROMED KELP
PARTNER AT OLIVER WYMAN, AND DAVID KAUFMANN, PARTNER AT OLIVER WYMAN

At first glance, giant earth-moving excavators and bulldozers would not appear to have much in common with the microchip-based worlds of drones and multi-dimensional imaging. But in the digital age, they will all be connected and have to work as a team.

Construction equipment itself has lagged in digitization, but it is about to undergo the same digital disruption that has hit information-based industries and is now being felt in the automotive and commercial-vehicle sectors.

The first wave of digitization is already arriving in construction machines, which are becoming increasingly automated and connected, enabling operators to deploy them more efficiently. A bigger change will come as construction projects go digital, in particular through building information modeling (BIM), which will accelerate the deployment of smart, connected heavy machinery.

Equipment manufacturers' success will be determined by how effectively they apply digitized machines in this connected ecosystem. Digitization is not about to replace construction machines, but customers are likely to select the equipment providers that best execute the new digital possibilities.

NEW ERA, NEW VALUE

The changes will open up new possibilities for the industry after a few lean years. European construction equipment sales peaked back in 2007, while global sales reached a high of US$102 billion in 2011 and were just US$70 billion in 2016.[1] Global demand is expected to grow at about 5% per year until 2020, but this will still leave construction equipment sales well below its peak. Digitization—whether or not it boosts sales of machinery—will give equipment makers an opportunity to broaden their product offerings and provide additional sources of value. Players that seize the initiative will do better in the new era than those that wait for change to happen.

The first wave of digitization is already arriving in construction machines, which are becoming increasingly automated and connected.

Most of today's construction machines track information such as idle time and fuel consumption, enabling managers of building sites and public-works projects to make better decisions on the use of their fleets. However, a first major change will come from part or full machine autonomy going mainstream after 2020. A compactor, for example, will be able to adjust its operations to different surfaces and environments, such as the presence of nearby sensitive structures. It will also be able to carry out much of its work automatically—or at least with minimum human input, often remote. Predictive-data diagnostics will make maintenance smoother and less costly: To avoid unplanned downtime, for example, components will be replaced before they malfunction, but not so early as to be wasteful. Operators will also be able to coordinate groups of machines more easily, so that they operate as one, speeding up each phase of a project.

THE CONSTRUCTION SITE OF THE FUTURE

The second stage, which will begin in the early-to mid-2020s, will take fleet coordination even further, using operational and performance data from equipment to help coordinate construction projects. The construction schedule might then be adjusted iteratively, taking into account various factors, such as the work being done by the machines and physical location of the machines needed for the next stage of the work. Construction companies could ask machine manufacturers to create common data standards to facilitate scheduling that involves different makes of equipment.

A third major change will come as construction machines acquire new, highly automated capabilities and BIM goes mainstream. BIM uses a virtual construction site, consisting of a digital model of a building project that includes construction schedules and costs. The modeling enables construction companies to implement a version of lean production, with just-in-time delivery of materials and components. Engineering and construction costs are expected to be reduced by around 20% thanks to better coordination of all the input factors.

So BIM is both a challenge for makers of construction machines—because it demands more advanced, digitized equipment—and a means to help customers boost the efficiency of construction and reduce costs. Construction equipment companies will need to adopt and integrate a "smart construction site" approach, where all aspects of building (including machinery) are connected to the BIM and to each other. And to leverage new efficiencies and reduce costs, they will have to stop operating in silos.

Engineering and construction costs are expected to be reduced by around 20% thanks to better coordination of all the input factors.

CONSTRUCTION MACHINERY FIRMS NEED TO PUSH DIGITAL SOLUTIONS

Equipment manufacturers need to figure out the best approach to succeed in this new era. It is essential for them to digitize their machines, so that they can be connected to the digitized environment. But that alone will not be enough. Digitized machines will be more transparent to their customers in terms of performance, breakdowns, and costs. Hence, new strategies will have to be found to cope with this transparency.

Equipment manufacturers that limit themselves to basic digitization might find their offerings treated as commodities. They will provide more value if they integrate further capabilities and fully become part of the "smart construction site." These could include digital systems to schedule construction in real time and coordinate fleet performance beyond their own machines. Or, they could provide support services such as drone-based monitoring of performance and progress. Some equipment makers might try to offer all such services in an integrated package to provide a strong, differentiated offering and capture a large portion of the new value pool. (See Figure 1.)

Strategic intent will not, however, be sufficient. The new construction capabilities will generate new competition, both from traditional rivals in the equipment industry and from new digital players and software systems providers. Surviving will require quick, effective implementation of digital tools and services, which will in turn require new skill sets. To stay ahead—and even keep up—equipment makers will need to engage with a world far beyond the traditional construction site.

Equipment manufacturers need to figure out the best approach to succeed in this new era.

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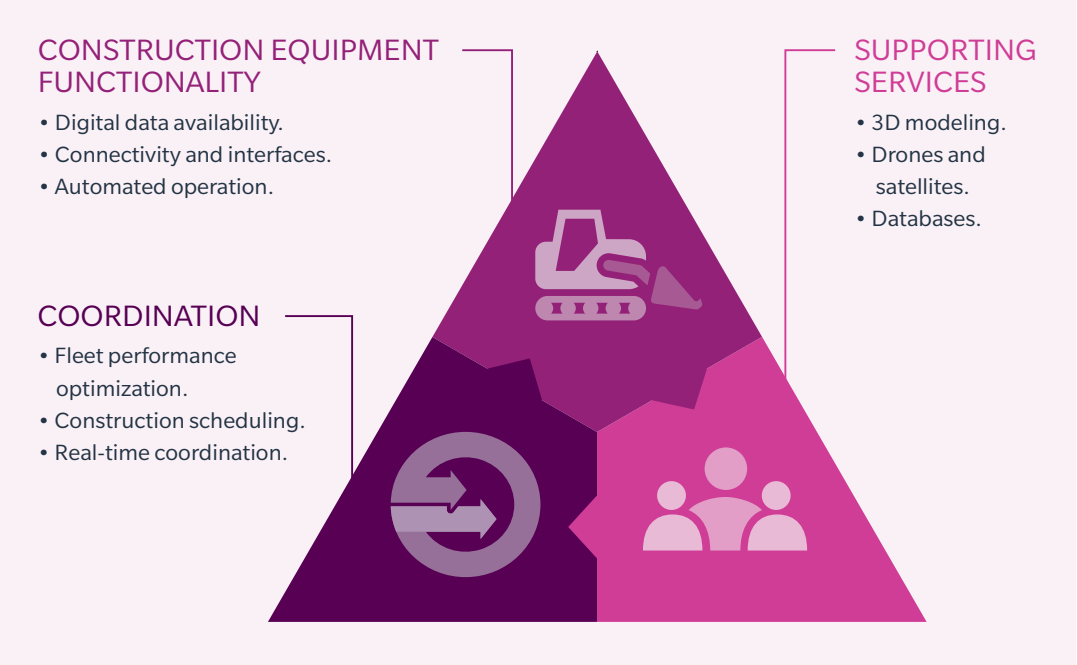
Figure 1: The Future of Digitized Construction
Source: Oliver Wyman Analysis



THE RISING IMPORTANCE OF THE "SECONDARY CITY"

AUTHOR: DARRYLE ULAMA,
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There's a popular saying in Chinese urban geography and architecture: "If you want to understand 5,000 years of Chinese civilization, look at Xi'an, 1,000 years look at Beijing, modern China look at Tianjin."[1]

This adage might surprise many readers outside of China, as Tianjin, like many cities that don't bear the name Beijing or Shanghai, continues to live in the cognitive shadow of its larger and well-known counterparts. But this port city to Beijing has played a pivotal economic role since the first concessions were granted to European powers following the partial end of the Second Opium War, effectively opening China to foreign trade.

Today, Tianjin is among the country's five largest urban areas, and it is an industrial powerhouse with a GDP per capita that is outpacing the national average. In 2016 alone, more than 400 Beijing-based companies opened offices in Tianjin and are expected to invest US$23 billion in the city.[2] Travel between Tianjin and Beijing is so high that a second high-speed rail link is currently under construction.

Urbanists take note: Secondary cities like Tianjin will have an outsized role in the coming decades. Intermediate cities are among the fastest-growing and most creative places in the world, and they're often the economic engines of their larger counterparts.

There are about 2,400 second-tiered cities worldwide, and nearly two-thirds are in Africa and Asia. Additionally, about half of all urban dwellers live in cities with a population of fewer than 500,000 people. Some are gateways to global trade, while others specialize in valuable sectors such as government administration, resource extraction, heavy manufacturing, and technology. Pittsburgh, Bengaluru, and Barcelona are all must-watch secondary cities, as are Abuja, Medellin, and Stuttgart.

Urbanists take note: Secondary cities like Tianjin will have an outsized role in the coming decades.

Despite their more limited fiscal capacity, these cities' ambition to climb the ranks of world cities has unleashed a wave of experimentation with a host of new urban policies, financing tools, initiatives, and partnership strategies.

There needs to be more study of the secondary city. Information and data is often lacking, making strategic planning and research difficult. Much of the talk at October's UN Habitat III conference in Quito, Ecuador, emphasized the headwinds for secondary cities.[3] This is a shame because such cities, armed with the right insights, could avoid the earlier mistakes of larger metros and often act more quickly to implement projects.

One of the highest priority projects underway, as Tianjin has shown, is to build more connectivity as a means to enhance competitiveness and attract talent and investment. The method and degree of connectivity will vary: Some cities will need to focus first on digital infrastructure, while others must invest in physical transport links—potentially a leapfrog technology such as the hyperloop.

DEFINING THE SECONDARY CITY

University of North Carolina professor Dennis Rondinelli is credited with coining the term "secondary city" in the 1980s in his research on rural economies surrounding these cities. The characteristics of secondary cities vary across national contexts, and there is a lack of consensus on its definition. Typically, the population size falls between 10% to 50% of the country's largest city,[4] and the residents often assume administrative, economic, or logistical roles outside of the country's leading metropolitan area.

Cities Alliance, a joint World Bank and UN-Habitat initiative,[5] has produced a body of literature on secondary cities and divides them into three spatial categories:

Subnational cities: Centers of local government, industry, agriculture, tourism, and mining. These cities are the most common and hold important economic and functional roles. Think Vancouver, Philadelphia, Basel, and Milan.

City clusters: Satellite and new town-cities that surround larger metropolitan regions. These settlements usually develop alongside decentralization and firm relocation to areas less than 50 kilometers from historic city centers. The satellite town Navi Mumbai is an example of this.

Corridors: Urban growth centers planned or developing along major transport corridors. These cities are among the fastest growing and are associated with improvements in transport infrastructure. New cities rising along the Silk Road between Asia and Europe fall under this category.[6]

Decision-makers all over the world are realizing the importance of connecting dominant cities with their secondary counterparts to create highly productive and competitive urban clusters.

CITY LINKING AS A STRATEGY FOR GROWTH

Decision-makers all over the world are realizing the importance of connecting dominant cities with their secondary counterparts to create highly productive and competitive urban clusters.

"The functional federation of cities across political borders, united by infrastructure and technology systems, is likely to become a major feature of global cities by the mid-twenty-first century," says Greg Clark of the Brookings Institution.

In New York, Governor Andrew Cuomo's Upstate Revitalization Initiative aims to support intra-regional connectivity through expanded Bus Rapid Transit lines.[7] China implemented an aerotropolis-based development strategy in Zhengzhou, the likely birthplace of your iPhone,[8] in just one piece of its colossal New Silk Road project. An EU report on secondary cities found that connectivity is highly correlated with per capita GDP.[9]

The argument for city-to-city linking comes down to increasing opportunities for economic exchange. Connectivity allows secondary cities to integrate into regional labor and investment pools and access new supply chains and consumer markets.

City-to-city links could also lead to rebalancing growth and mitigate the capacity burdens on larger cities in housing and transport infrastructure. Lastly, linked municipalities could result in more coordinated economic and infrastructure strategies for regional development. With the advent of the hyperloop, the potential impacts are even greater, allowing for wider spatial opportunities for employment and living, and the creation of "mega-regions."[10]

Several of the Hyperloop One Global Challenge semifinalists have offered routes that connect key secondary cities to primary cities. In South Korea, a team has proposed to link Busan, an important port city, to the capital, Seoul, which contains almost a fifth of the entire country's population. In the US, a regional planning commission wants to link Chicago to Columbus and Pittsburgh, creating a Midwest megaregion. An architecture firm proposes to connect Guadalajara to Mexico City, and a student-led team in the UK wants to link Edinburgh to London.

These proposals demonstrate that we should take seriously the considerations and future development of second-tiered metro areas and promote policies and ideas that target inter-city connections.

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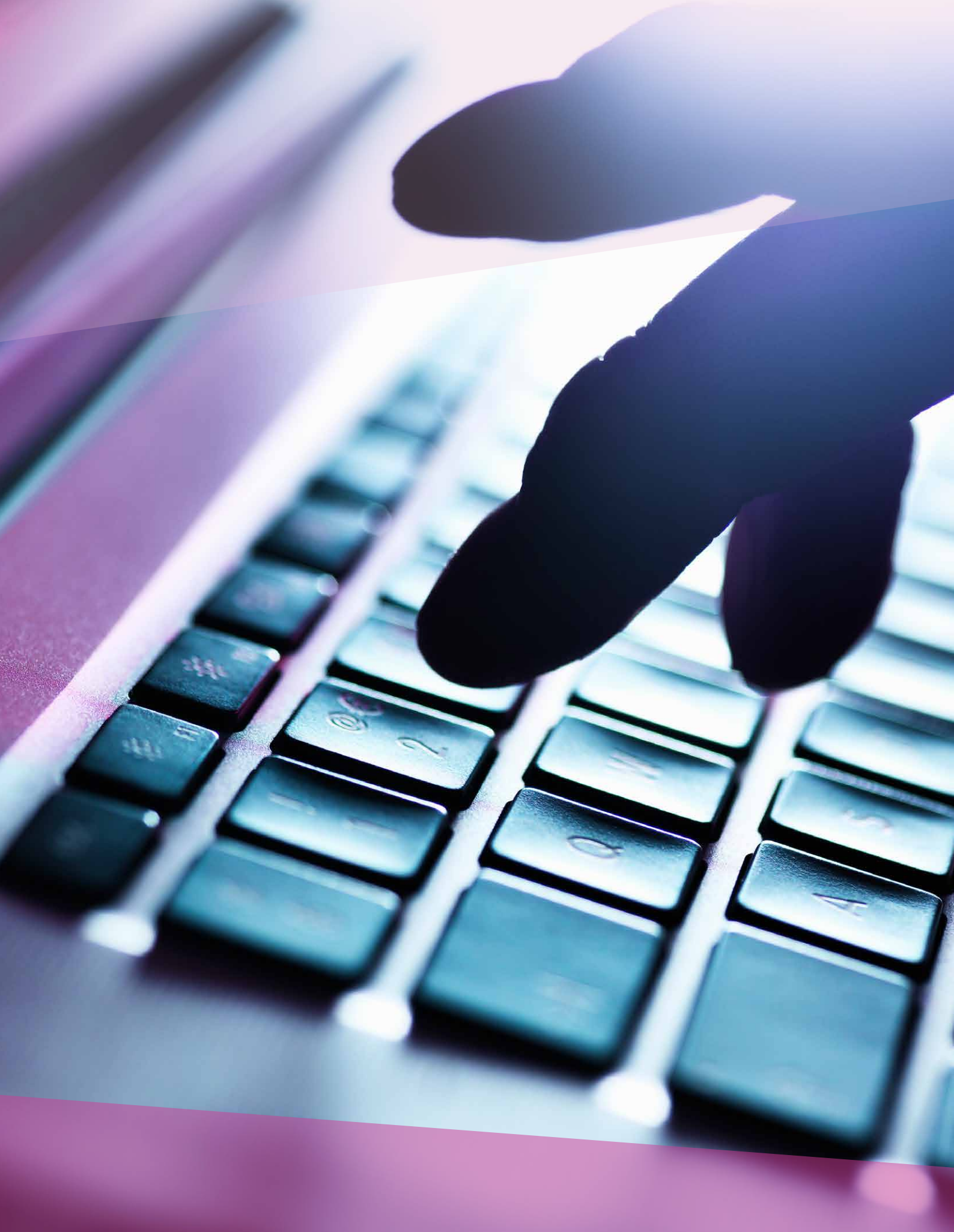


INTERNAL THREATS: FIVE WAYS EMPLOYEES AND BUSINESS PARTNERS PUT INTELLECTUAL PROPERTY (IP) AND DATA AT RISK

AUTHOR: PAMELA PASSMAN,
PRESIDENT AND CEO OF CENTER FOR RESPONSIBLE ENTERPRISE AND TRADE

When a cyber-attack makes the headlines, it's often because the perpetrators are a mystery. We imagine hackers operating out of smoky rooms in distant lands—and sometimes that turns out to be accurate.

But it is also true that the guy whose office is just down the hall past the soda machine may be as great a threat as a remote criminal. Insiders—company employees as well as contractors and business partners—can present a significant risk for misappropriation of sensitive information and intellectual property. Whether they are operating out of malice or ignorance, their actions can be disastrous for company profits, reputation, and future business plans.

KEY FACTORS FUELING INSIDER RISK

Access: Many companies lack appropriate limits on employees' access to confidential, sensitive information—items including customer lists and contact information, intellectual property, and private information about customers, employees, and business partners. In a recent report by the independent Ponemon Institute,[1] 71% of "end users" (employees on the system) said they have access to company data they should not be able to see, and 54% of them said that the access was frequent or very frequent. The vast majority of IT professionals surveyed said that their organizations don't have a "need-to-know" policy of managing access, or don't strictly enforce it.

Many companies lack appropriate limits on employees' access to confidential, sensitive information.

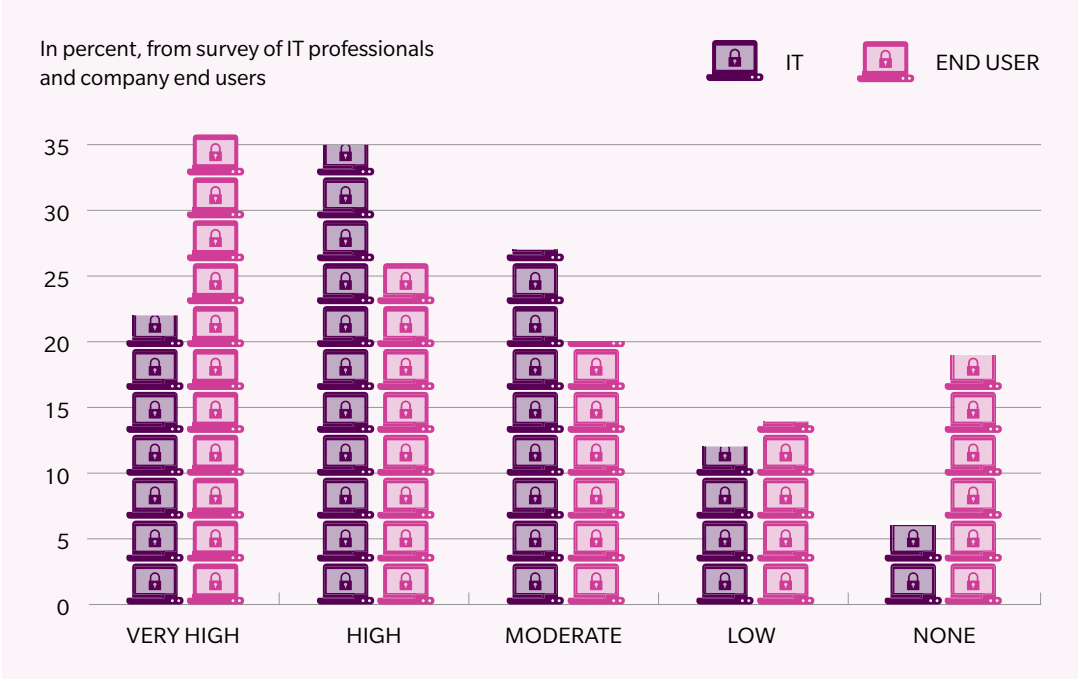
Mobility: In today's globalized economy, professionals in many industries have unprecedented opportunities to move between companies and work in different countries. In an increasingly common narrative, employees with access to trade secrets walk out the door with reams of downloaded documents that they aim to provide to competing companies or foreign governments. The greatest risk comes from employees who are disgruntled, leaving amid layoffs or similar upheaval, or returning to their native country. Typical of these cases is one recently reported by South Korea's Yonhap News Agency.[2] A court in Seoul indicted a man identified only as Kim, a high-level automotive engineer, for passing classified documents from his former employer to competing carmakers in China. The documents he transferred contained details of safety and performance testing technology that the South Korean company had developed. There are many similar cases in a wide array of industries.

Risky digital behavior: In the Ponemon survey, only 47% of information technology practitioners surveyed believed that employees in their companies take data protection seriously. That belief is supported by the response to another question by the non-IT set: 76% of those surveyed said they saw no problem with loading confidential documents onto their unsecured personal computers, smart phones, and the public cloud. By doing so, they may unwittingly open the door to cyber theft. Another common way that internal and supply chain employees may create holes in security is by loading their own software onto work computers. If that software is pirated, it may contain malicious code designed to search their systems for valuable data.

Accountability gap: Many companies do a poor job of conveying their expectations around confidentiality and security to employees and supply chain partners. Monitoring to see whether appropriate procedures are being followed is even weaker. In some sense, it's no wonder employees are not vigilant about protecting intellectual property and preventing cyber breaches.

Insider advantage: A combination of the above factors and first-hand knowledge of a company's information system, and a failure to monitor insider behavior lead to some of the most damaging data breaches.

FIGURE 1: Is the Protection of Company Critical Information a Priority?
Source: Ponemon Institute



Here's how one such case is playing out in Japan: Police arrested 39-year-old Masaomi Matsuzaki last July on suspicion of stealing data linked to more than 20 million customers of Benesse Corp., which provides education materials and services for students.

Matsuzaki, who was working as a systems engineer for a company affiliated with Benesse, reportedly loaded the data onto his smartphone and then sold it to middle men who resold it to a few hundred other companies to exploit for marketing purposes, according to a Kyodo news agency report.[3]

The case sparked outrage in Japan and a national debate about improving privacy laws. Although the perpetrator is now in custody, Benesse continues to reel from the fallout. Parent company Benesse Holdings announced in December 2014 that it was cutting 300 jobs to compensate for an expected net loss of between US$8.3 million and US$75 million in the current business year because of the data breach.

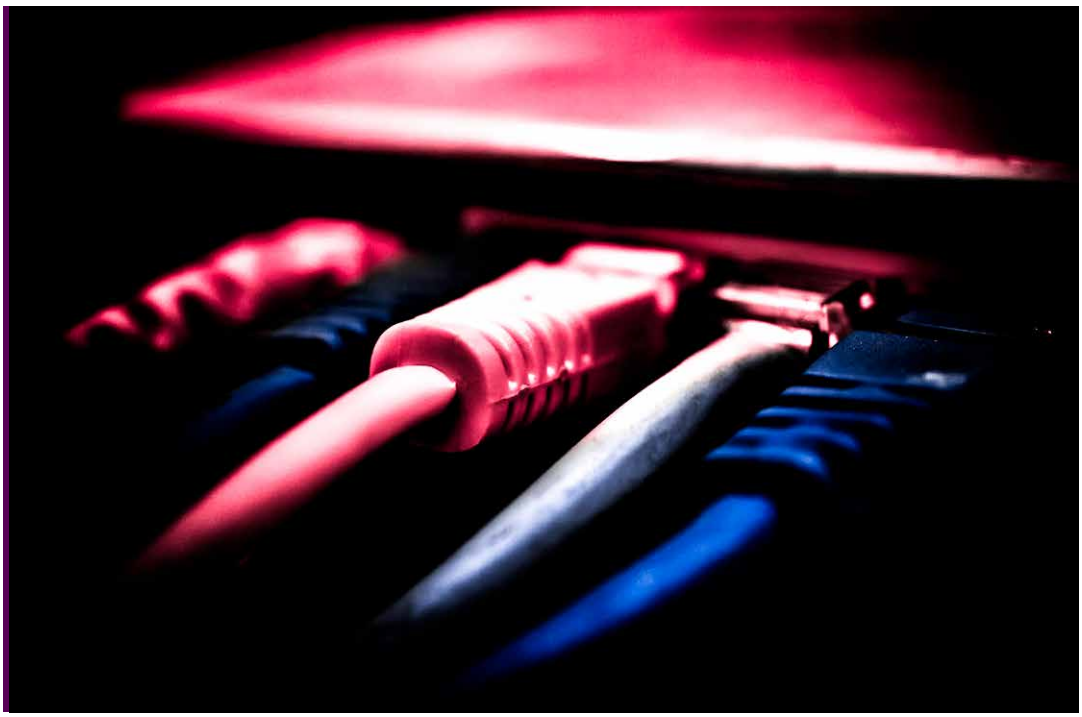
Clearly, the threat from insiders cannot be remedied with an old-fashioned firewall. It requires a solution that is a multi-faceted, proactive approach—one that involves IT security design as well as security procedures, contract provisions, training, and monitoring. These measures must be based on a clear picture of where valuable information assets reside, whether customer data or intellectual property.

In the Ponemon survey, only 47% of information technology practitioners surveyed believed that employees in their companies take data protection seriously.

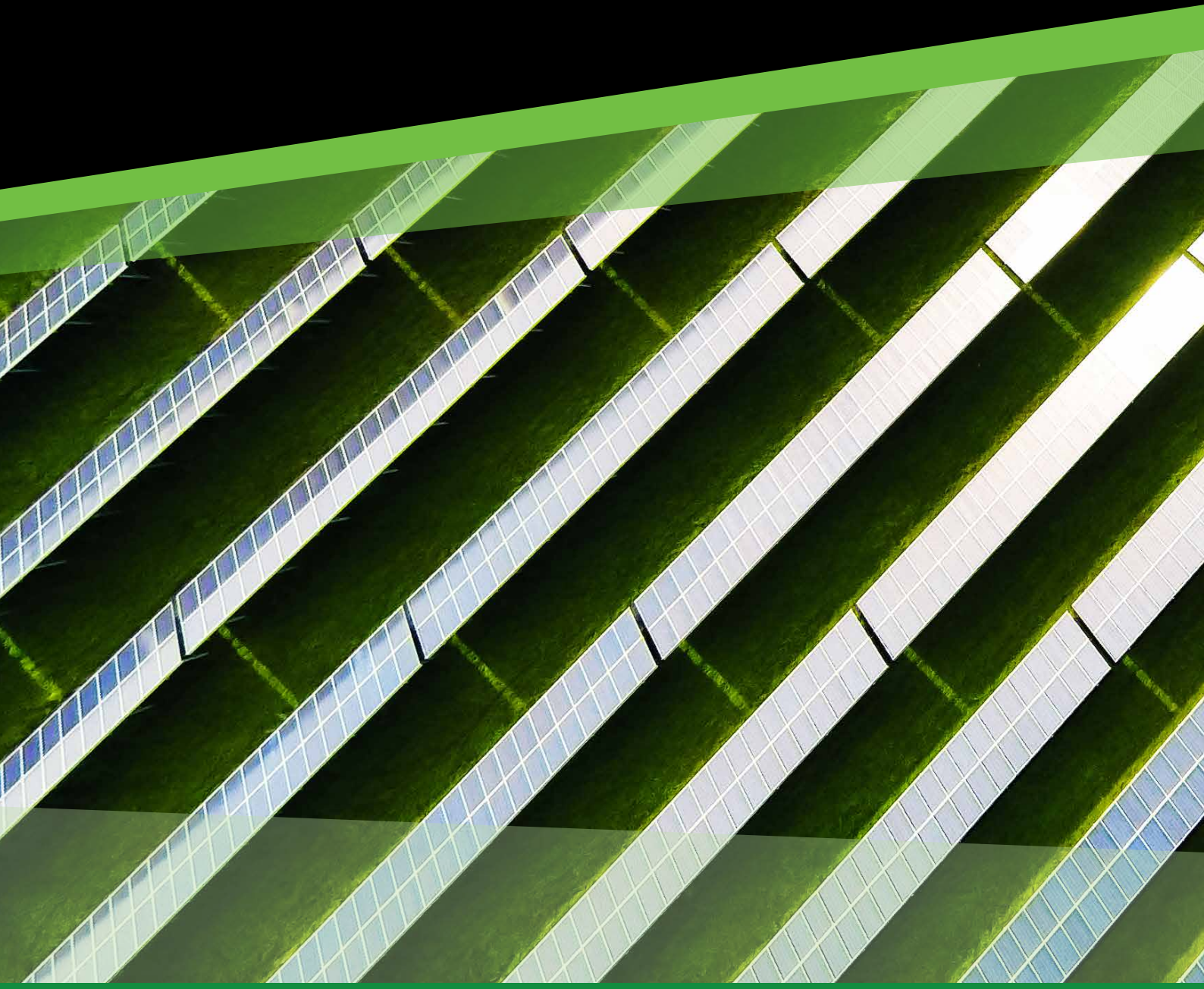
And, importantly, a system to address security risk posed by some insiders must be balanced with the need to facilitate the work of the majority of employees and partners who operate in good faith.

The digitized, fast-evolving global economy presents unprecedented opportunities. But capturing its possibility comes with the need to address associated risk. Taking a systematic approach—with dedicated strategies to address risks posed by "insiders", in concert with plans to stop intrusion and associated damage by "outsiders"—is the most pragmatic and cost-effective way for companies to compete in this changing, and often challenging, business environment.

THIS ARTICLE FIRST APPEARED ON BRINK.



ENVIRONMENT IMPACTS



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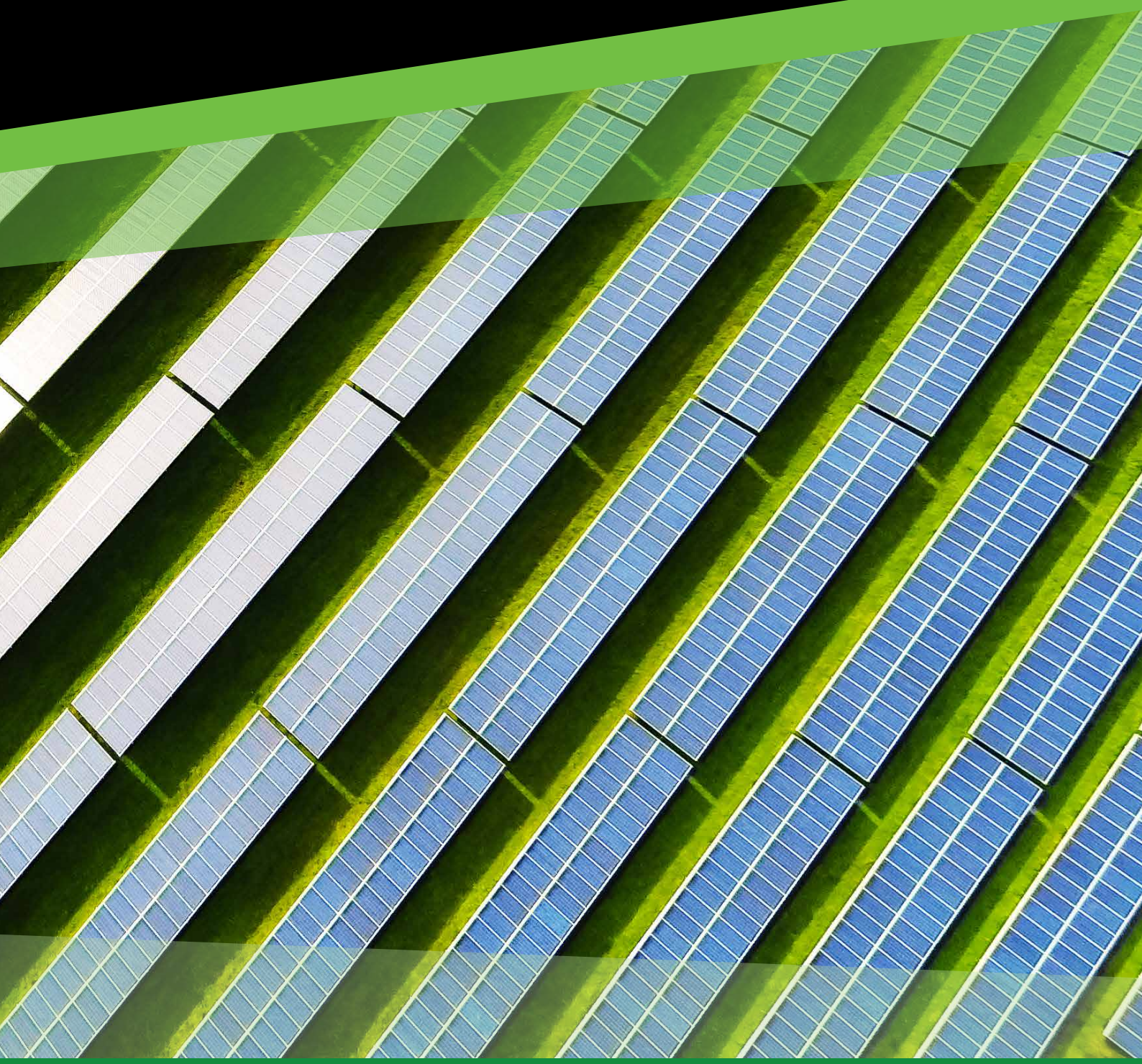


SPENDING MORE TO MAKE INFRASTRUCTURE SUSTAINABLE

AUTHOR: AMAL-LEE AMIN, CHIEF OF THE CLIMATE CHANGE AND SUSTAINABILITY DIVISION AT THE INTER-AMERICAN DEVELOPMENT BANK, AND JANE AMBACHTSHEER, PARTNER, MERCER INVESTMENTS AND MEMBER OF THE FINANCIAL STABILITY BOARD TASK FORCE ON CLIMATE RELATED FINANCIAL DISCLOSURES

"We'll always have Paris." On the same day that the Paris Agreement went into force, delegates attending a warm-up event in Casablanca, Morocco, before last year's UN climate talks in Marrakesh, might have uttered that iconic line from the film *Casablanca*.

Yet, despite the location and timing being a perfect match, the *Casablanca* reference is off-key. As the film depicts, the protagonists may have found love in Paris, but their predicament dictated they must separate. In the case of the Paris Agreement—and its alignment with the finance necessary to implement it—this is not the end, but the start of what could be a beautiful friendship.

The Paris Agreement has the objective of making finance flows consistent with a pathway toward low emission and climate-resilient development. As countries look to boost growth while implementing the Sustainable Development Goals and their Paris commitments, shifting finance flows to sustainable infrastructure is critical.[1]

This requires major investment in clean public transport, smart efficient energy systems and buildings, and the effective use of natural capital such as forests. Studies show that such investments could increase upfront capital costs by approximately 5%, but sustainable infrastructure should generate lower operating costs over the life of the investment, while also reducing risks and negative externalities, including pollution.

The Global Commission on the Economy and Climate estimates that the world is expected to invest roughly US$90 trillion in infrastructure over the next 15 years,[2] a major boost from current levels. Most countries have chronic infrastructure deficits. In the case of Latin America and the Caribbean, the Inter-American Development Bank estimates that up to 5% of the region's GDP, or roughly US$250 billion per year, will be required to meet future demand for infrastructure.[3]

The world is expected to invest US$90 trillion in infrastructure over the next 15 years, far above current levels.

In part, this deficit reflects existing barriers facing private sector financing of sustainable infrastructure. These include a failure on the part of governments to develop transparent pipelines, which has led to a poor estimation of infrastructure needs. Investors may also be deterred by high development and transactions costs.

Fortunately, a large number of initiatives focused on closing the infrastructure funding gap are emerging.

The initiatives generally fall into three categories. One set are "influencers," which focus on thought leadership and attempts to affect policy change. There are also "mobilizers," which work to develop "bankable" projects or convene investors to facilitate capital flows. Lastly, "tool providers" attempt to enable integrated environmental or social analysis of infrastructure projects into the investment and monitoring process.

All of these industry initiatives have the potential to play significant roles in promoting investment in sustainable infrastructure; however, in some cases, they appear to be working against each other.

The Paris Agreement is lauded as helping to provide a long-term signal to investors to allocate capital that is consistent with low-carbon and resilient development. This signal can only illuminate the path forward; these initiatives must achieve far greater coherence and coordination between them to ensure that they and the Paris Agreement are mutually reinforcing.

The Paris Agreement is lauded as helping to provide a long-term signal to investors to allocate capital that is consistent with low-carbon and resilient development.

FOUR STEPS

To achieve this, we propose the following steps. First, industry initiatives need to clarify the principles and develop shared definitions for sustainable infrastructure investment. This can provide greater certainty and urgency across the industry and create a more compelling alternative to traditional infrastructure such as coal-fired power stations, while also enabling comparability for investors.

Second, those infrastructure initiatives that do not consider sustainable infrastructure should change tack and commit to sustainable infrastructure principles through a review of their mission and objectives.

Third, to optimize joint impact, it will be necessary to convene the conveners and work together towards a shared "grand plan" that sets out an effective division of labor and the sharing of ideas between initiatives.

Fourth, collaboration should be encouraged between initiatives sharing common missions so that, collectively, they can work to scale-up investment.

These steps will be essential to provide investors with the right signals and tools required to align their investment strategies with the Paris Agreement and Sustainable Development Goals.

Time is rapidly evaporating. With 70% of the forecast increase in emissions from developing countries likely to come from infrastructure that is still to be built,[4] decisions taken now will determine whether staying well below two degrees Celsius is viable. The time to begin that beautiful friendship among sustainable infrastructure initiatives is now. Our future could very well depend on it.

THIS ARTICLE FIRST APPEARED ON BRINK.

Industry initiatives need to clarify the principles and develop shared definitions for sustainable infrastructure investment.

DRAMATIC DROP IN GLOBAL COAL PLANT CONSTRUCTION

AUTHOR: BRINK EDITORIAL STAFF

In March, US President Donald Trump signed an executive order aimed in part at shoring up the crippled coal industry.[1] The move stands in stark contrast to a new report showing a steep decline in the global number of coal-fired power plants that are planned or have started construction.[2]

Trump's efforts might be too little, too late, as the fate of the coal industry has been in steady decline for decades. Even Robert Murray, head of the largest private US coal operation, Murray Energy, told Trump earlier this year he should "temper his expectations" on the promise to bring back coal jobs.[3] Coal's fate in the US was seemingly sealed last year when natural gas exceeded coal-fired power for the first time on an annual basis, owing to "mainly a market-driven response to lower natural gas prices," according to the US Energy Information Administration.[4] Overall, the US energy profile is in transition and the impact of the recent policy decision on the country's energy performance and energy security will play out over time. Currently, the US ranks fourth overall in terms of energy security in the global rankings on the Energy Trilemma Index.[5]

On the global coal front, from January 2016 to January 2017, there was a 48% drop in planned coal plants and a 62% drop in construction starts, the report said.

The global slowdown in coal plant construction is highlighted in the report as keeping global warming under the two-degree Celsius target set at the Paris Climate Summit. The slowdown appears "to have brought global climate goals within feasible reach, raising the prospect that the worst levels of climate change might be avoided" the report said. "More progress is needed and the margin for error is tight, but the results of the past year provide good reason for optimism."

Figure 1: Change in the Global Coal Pipeline (Megawatts)
Source: endcoal.org

ACTION	JAN 2016	JAN 2017	CHANGE %
Started Construction (past 12 months)	169,704	65,041	-62
Retired (past 12 months)	36,667	27,041	-26
Pre-permit	434,180	222,055	-49
Permitted	168,230	99,367	-41
Operating	1,914,579	1,964,460	3
In Construction	338,458	272,940	-19
Completed (past 12 months)	108,029	76,922	-29
Announced	487,261	247,909	-49

Note: Includes coal-fired generating units 30 megawatt (MW) and larger. According to Platts WEPP database there are about 27,060 MW of units smaller than 30 MW.

The global coal slowdown began in 2013. "[T]he dramatic shrinkage in the coal power pipeline ... shows that power capacity trends are moving into alignment with declining power generation and that climate goals are indeed within reach without massive asset stranding," the report said.

Figure 2: Proposed Coal Plants by Region, january 2017 (MW)
Source: endcoal.org

REGION	PRE-CONSTRCTION	CONSTRUCTION	ON HOLD	OPERATING
Africa and Middle East	49,842	12,838	8,595	50,529
Australia/NZ	1,350	0	1,316	26,972
Canada/US	1,295	582	1,000	296,300
East Asia	167,083	161,146	451,059	1,020,335
EU28	9,360	7,468	7,050	160,722
Eurasia	9,156	980	2,200	61,914
Latin America	6,372	2,175	3,541	17,909
Non-EU Europe	75,626	2,640	19,874	49,929
SE Asia	93,499	31,808	20,992	65,948
South Asia	156,018	53,303	91,740	212,902
Total	569,601	272,940	607,367	1,964,460

On the global coal front, from January 2016 to January 2017, there was a 48% drop in planned coal plants and a 62% drop in construction starts.

CHINA AND INDIA LEAD THE WAY

Policy action in China was the main contributor to the shrinking coal plant pipeline, owing to "the imposition of unprecedented and far-reaching restrictive measures by China's central government," the report said. Coal consumption in China declined by 4.7% last year, according to the National Bureau of Statistics.[6]

China's move away from coal has been replaced with a push for renewable energy sources, including solar and wind, as much as a way to combat debilitating air pollution in its urban areas as to combat the effects of climate change.

In tandem with the moves by China, India is also experiencing a slowdown in coal plant development, the report noted, "driven primarily by the reluctance of banks and other financiers to provide further funds."

India is in the midst of its own campaign on renewables; the Government plans to install 215 gigawatts of renewable power by 2027. "The combination of excessive coal power capacity and declining cost of renewables has caused many financial backers of coal projects to withdraw support," the report said.

India could phase out coal power completely by 2050 if the cost of renewables continues to fall at its current rate,[7] which would put it significantly ahead of its Paris Agreement climate commitments.

An end to the coal plant construction boom brings the possibility of a global phase-out of coal over the coming decades.

From 2006 through 2016, China and India accounted for 86% of all coal power built. "An end to the coal plant construction boom brings the possibility of a global phase-out of coal over the coming decades, a prerequisite to reining in climate change," the report said.

Retirement of older coal plants also factors into the climate goals equation. Coal plant retirements have steadily grown over the past 10 years, the report said. For any phase-out plan for coal plants to be effective, the report said it's crucial that construction currently on hold in China and India remain that way, coal power implementation rates worldwide continue to decline, and Organisation for Economic Co-operation and Development (OECD) countries "move aggressively" to install clean energy sources in place of aging coal plants.

THIS ARTICLE FIRST APPEARED ON BRINK.

IN THE US, RENEWABLE ENERGY SURPASSES NUCLEAR GENERATION …FOR NOW

AUTHOR: BRINK EDITORIAL STAFF

Record electric generation from wind, solar, and hydroelectric power in March and April combined to exceed that provided by nuclear sources in the US for the first time in 32 years, according to the Energy Information Administration (EIA).[1]

The record was the result of a rain-soaked winter environment across much of the West Coast that has wiped out the region's prolonged drought and "contributed to the overall rise in renewable energy generation this spring, while nuclear generation in April was at its lowest monthly level since April 2014," the EIA said.

However, this may not signal a long-term decrease in nuclear power generation. The results, the EIA said, reflect "both seasonal and trend growth in renewable generation, as well as maintenance and refueling schedules for nuclear plants, which tend to undergo maintenance during spring and fall months, when overall electricity demand is lower than in summer or winter."

Renewables lead over nuclear in the energy generation race will likely be short-lived, as official EIA projections estimate that "monthly nuclear electricity generation will surpass renewables again during the summer months of 2017 and that nuclear will generate more electricity than renewables for all of 2017."[2]

In addition, nuclear power is a critical component of a low-carbon infrastructure in the fight against rising temperatures and climate change. "[N]uclear power is a low-carbon technology, with overall emissions of the same magnitude as wind or hydro electricity," the Organisation for Economic Co-operation and Development (OECD) said in a report on nuclear's global place in the low-carbon equation to fight climate change.[3] While acknowledging there are a host of hurdles in front of nuclear power—from societal acceptance to financing to public policy—"in most cases, constraining the evolution of an energy system by limiting carbon levels in the most cost-effective way leads to a high share of nuclear energy," the OECD report said.

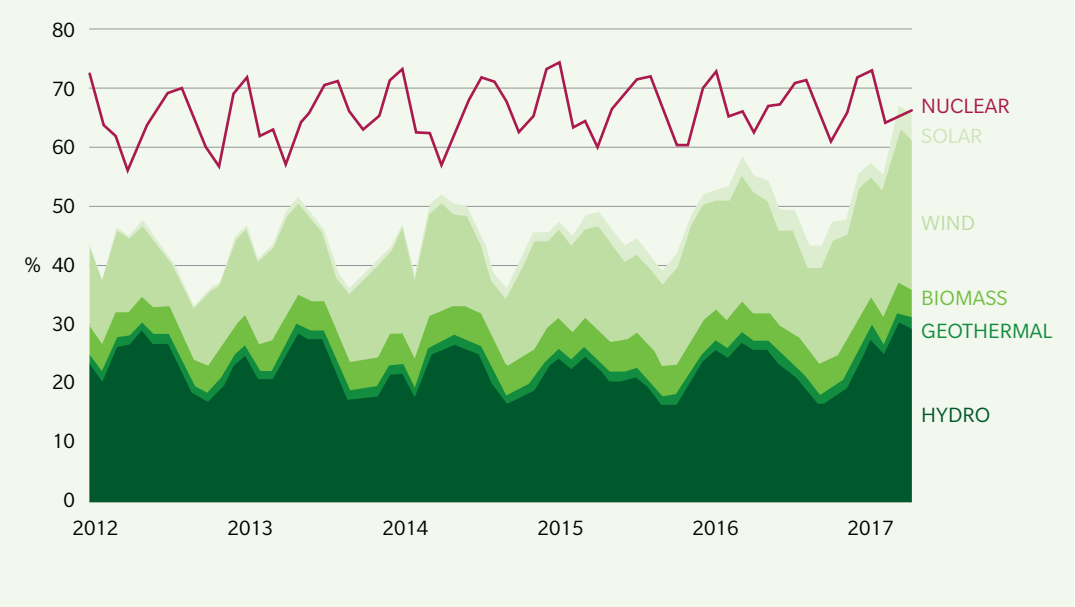
Renewables lead over nuclear in the energy generation race will likely be short-lived.

HYDRO LEADS THE WAY

Thanks to a record wet winter in the West, hydroelectric power—which remains the largest source of renewable electricity in most months and was at its highest level in nearly six years this March—generated 30 billion kilowatt hours. The EIA projects a 14% increase in hydropower this year compared to 2016.[4]

Wind and solar energy increases stem from more capacity coming online. "More than 60% of all utility-scale electricity, generating capacity that came online in 2016, was from wind and solar technologies," the EIA said.[5]

FIGURE 1: Monthly Electricity Generation from Selected Fuels (Jan 2012-Apr 2017)
Source: EIA



Monthly nuclear electricity generation will surpass renewables again during the summer months of 2017, and nuclear will generate more electricity than renewables for all of 2017.

Between March 2016 and March 2017, wind power increased 16% and solar generation saw a huge leap of 65%. Wind power will see a modest increase of 8% in utility-scale generation for 2017, the EIA said, while solar will continue its upward trend, recording a 40% increase.

While renewable generation is increasing, nuclear power output has remained flat since the 1990s, the EIA said. "Retirements of a number of nuclear plants have resulted in a slightly lower level of overall nuclear generation capacity, and in turn, a lower level of generation," the EIA said.[6]

While fluctuations in renewable power generation follow seasonal patterns, such fluctuations in nuclear power reflect scheduled maintenance times, EIA said. Accordingly, an average of 14 gigawatts and 21 gigawatts of nuclear generation went offline in March and April, respectively, representing about 14% and 21% of total US nuclear capacity, the EIA said.

"Retirements of a number of nuclear plants have resulted in a slightly lower level of overall nuclear generation capacity, and in turn, a lower level of generation."

EIA

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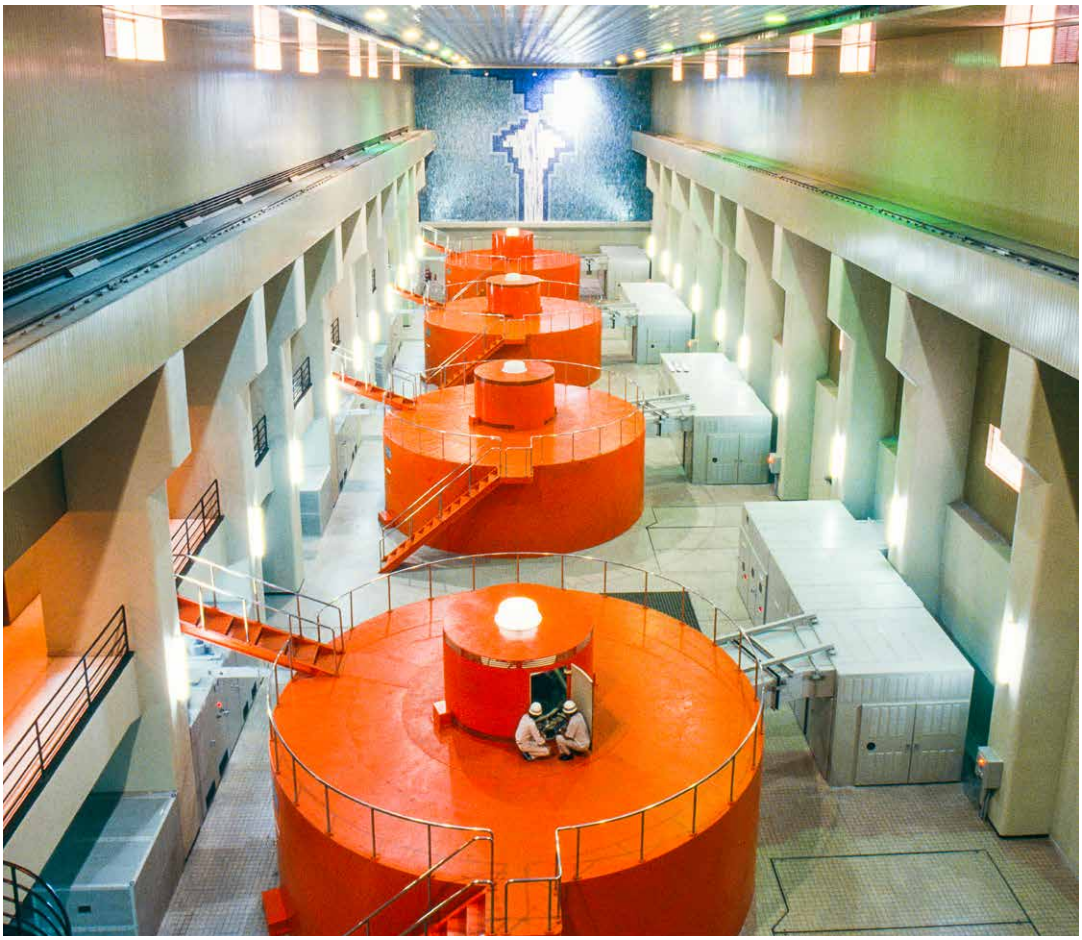


ECONOMIC IMPACTS

PREPARING BANKABLE INFRASTRUCTURE PROJECTS

AUTHOR: FIDA RANA, SENIOR CONSULTANT, WORLD BANK AND PRINCIPAL POLICY ADVISOR AT INTERNATIONAL INSTITUTE FOR SUSTAINABLE DEVELOPMENT

The issue of bankability of infrastructure projects has long been the topic of discussion by the development and investor community, and is one of the key problems of the global infrastructure gap.

Under German presidency, the B20 has submitted 20 recommendations to G20 leaders under the theme "Building Resilience—Improving Sustainability—Assuming Responsibility."[1] Recommendation 14 is on boosting infrastructure finance and reads, "G20 members should boost infrastructure finance by developing and promoting bankable and investment-ready infrastructure project pipelines and by enhancing the role of Multilateral Development Banks as catalysts for private sector investment."

The B20 task force on infrastructure confirms that "the investment gap in infrastructure is not the result of a shortage of capital. Real long-term interest rates are low, there is ample supply of long-term finance, interest by the private sector is high, and the benefits are obvious." However, a number of factors hold back investment in terms of financing and funding. "The main challenge is to find bankable and investment-ready projects."[2]

Unfortunately, there seems to be a lack of understanding of what factors constitute—and more importantly, which parties contribute the most to—making infrastructure projects bankable. Somewhat misleading, perhaps by the semantics of the term "bank," the issue of bankability tends to be associated with bankers. The argument, "Just let the bankers discuss and deal with the bankability aspect of the project," is a misconception at best.

It is important to note that commercial bankers and other commercial infrastructure debt providers do not make a project bankable. Rather, their task is to assess the bankability of an infrastructure project and, if found acceptable, provide the risk capital in the form of debt financing. If not, they will move on in search of other projects.

Infrastructure projects entail risks, in various forms and shapes: preparation, bidding, construction, and development phases. Commercial lenders, like other risk capital providers, are concerned about the risk profiles of the project and as such the riskiness of their investment decisions. Unless this group of investors, who typically provide up to 80% of a project's financing needs, is satisfied with the risk profile of the project, they will not invest. Alternatively, they would ask for various risk mitigations or credit enhancements that would only raise the total cost of the projects.

The investment gap in infrastructure is not the result of a shortage of capital.

The fate of the bankability of an infrastructure project is set at a much earlier phase of project life—at the project development stage.

When the concerned ministry (or responsible agency) starts preparing a project to roll out into the market with an aim to attract private capital, it has to, among many other aspects, decide on the key risk-sharing protocol of the project. Which risks will be shared by whom during different phases of the project, such as pre-construction, construction, and operation?

As mentioned earlier, infrastructure finance entails long-term engagement from banks, and the tenor can extend as long as 15 to 20 years. Understandably, banks want to make sure that they do not get involved in a project that lacks a comfortable risk-sharing protocol.

Designing an optimal risk-sharing protocol at the project development phase is at the crux of ensuring bankability. If the risks are not allocated to the right parties during a project's conceptualization phase, the ultimate consequence is the inability to find investors and lenders. And going back to the drawing board for public/private partnership contract redesigning is a costly exercise.

This brings up an interesting question: If bankers appear at a later stage of the project cycle, how can we ensure the bankability of a project in the development phase? Those who are developing the project at ministry or agency levels are not necessarily banking experts. As such, there is a crucial need to get bankers' and experienced advisors' feedback on board as a project is being developed. Two approaches, complementary to each other, can play important role:

Designing an optimal risk-sharing protocol at the project development phase is at the crux of ensuring bankability.

- **Project Preparation Facility (PPF):** PPFs are used as a means of developing bankable, investment-ready projects. Under PPF, both technical and/or financial supports are provided to project owners/concessionaires, and such supports can cover a wide range of activities, such as undertaking project feasibility studies, including value for money analysis, developing procurement documents and project concessional agreements, undertaking social and environmental studies, and creating awareness among the stakeholders. PPFs can also provide financial assistance to local governments or special public sector agencies to support the financial, legal, and technical advisory services required to facilitate private investment into infrastructure projects.

- **Market Sounding:** Through market sounding exercises, important feedback from the lender community can feed into the project preparation phase and shape the risk allocation matrix in a market-acceptable manner. The lending market and the appetite of lenders can vary over time, due to a host of factors. These include legal and regulatory matters, global interest rate regime, capital market conditions, etc. As such, taking lenders' feedback on board can be very useful to make the project bankable.

There are specialized organizations that can conduct market sounding through their network of banks that are active in funding infrastructure public-private partnership (PPP) projects. A typical market-sounding questionnaire would ask a bank questions such as:

- Does the bank have an appetite to lend to the particular country? Can the bank lend on an uncovered basis or does it need an insurance cover?
- In case of an insurance cover, what kind of insurance instruments would the bank need to enhance the project's credit profile? It could be any or a combination of partial risk guarantee (PRG), political risk insurance (PRI), performance guarantees, etc.
- What are the other key credit considerations such as collateral, off-taker credit quality, supplier credit quality, etc.?
- What could be the approximate maximum facility and tenor for a project of this nature?
- What kinds of risks should the Government cover for this project?
- What kind of minimum government support or other credit enhancements are needed for the bank to fund this project?

An infrastructure project that has risk-sharing protocol based on broad-level early feedback from the lending community will likely be able to raise the required funding with less complication than without it.

THIS ARTICLE FIRST APPEARED ON BRINK.

ASIA NEEDS US$26 TRILLION IN INFRASTRUCTURE INVESTMENT FROM 2016-2030

AUTHOR: BRINK ASIA EDITORIAL STAFF

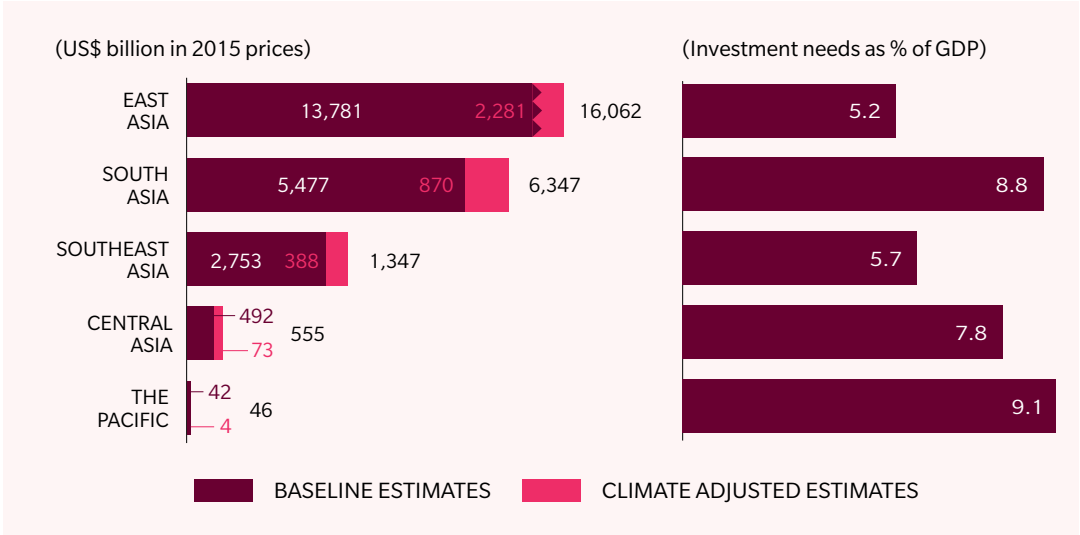
Developing Asia needs to invest a whopping US$26 trillion between 2016 and 2030—US$1.7 trillion per year or 5.9% of projected GDP—to meet its infrastructure requirements, according to *Meeting Asia's Infrastructure Needs*, a new report by the Asian Development Bank (ADB).[1]

The region's baseline requirements—without considering costs related to climate change mitigation and adaptation—stand at US$22.6 trillion, or US$1.5 trillion per year (5.1% of projected GDP).

The region's failure to make the necessary investments in infrastructure will greatly constrain its ability to maintain economic growth momentum, eradicate poverty, and tackle climate change.

Figure 1: Estimated Infrastructure Investment Needs by Region, 45 developing member countries (DMCs), 2016-2030

Source: 2015 Revision of World Population Prospects, United Nations; ADB estimates



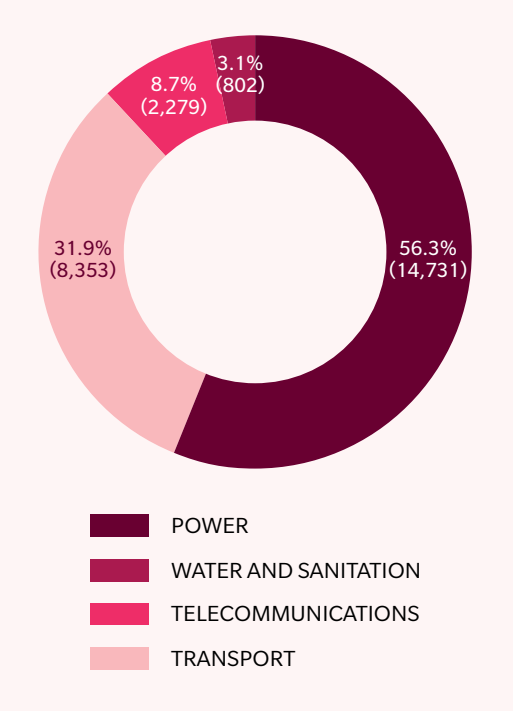
The new estimates from the ADB are more than double the US$750 billion it estimated in 2009.* The inclusion of climate-related factors has contributed majorly toward the increase. The forecast for continued rapid economic growth, however, is a more important reason.

* The inclusion of all 45 ADB member countries in developing Asia, compared to 32 in the 2009 report, and the use of 2015 prices versus 2008 prices, also explain the increase.

VARYING REQUIREMENTS

Of the various subregions, East Asia is expected to account for 61% of all climate-related investments between now and 2030. As a percentage of GDP, however, investments need to be highest in the Pacific region (9.1%), followed by South Asia (8.8%).

Figure 2: Estimated Infrastructure Investment Needs by Region, 45 DMCs, 2016-2030 – Climate-adjusted Estimates
% Share of Total (US$ billion in 2015 prices)
Source: ADB estimates



East Asia is expected to account for 61% of all climate-related investments between now and 2030.

In terms of funding requirements by sector, energy and transport alone account for almost 90% of developing Asia's climate-adjusted infrastructure investment requirements from now until 2030. While US$14.7 trillion needs to be invested in electricity infrastructure, another US$8.4 trillion is required for transport infrastructure, US$2.3 trillion in telecommunications, and US$800 billion in water and sanitation.

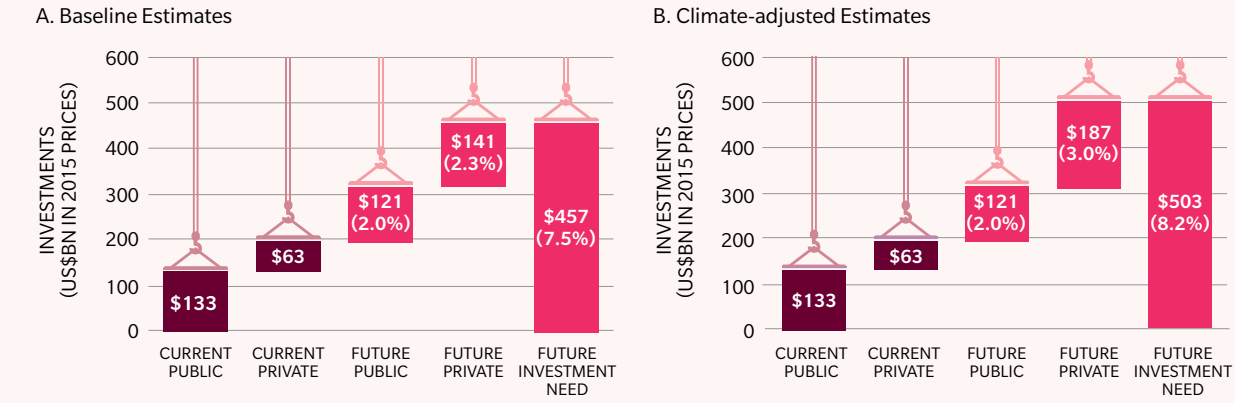
HUGE FUNDING GAP

Developing Asia currently invests about US$881 billion per annum in infrastructure (for 25 economies with adequate data, comprising 96% of the region's population), but the infrastructure investment gap stands at 2.4% of projected GDP for 2016-2020 when climate-related adjustments are accounted for.

In fact, when China is excluded, the gap rises to 5% of GDP. According to ADB, strong fiscal reforms could lead to the generation of additional revenues equivalent to 2% of GDP, bridging about 40% of the funding gap. Even if that happens, the private sector will still need to cover the remaining 60% shortfall, and to do so, it will need to increase its annual investments in infrastructure from US$63 billion today to US$250 billion over 2016-2020.

Figure 3: Meeting the Investment Gaps: Selected ADB Developing Member Countries, *2016-2020 (annual averages, US$bn 2015 prices)

Source: ADB(2016a); Country sources; Investment and Capital Stock Dataset, 1960-2015, IMF; Private Participation in Infrastructure Database, World Bank; World Bank (2015a and 2015b); World Development Indicators, World Bank; ADB estimates



*Countries include the 25 DMCs minus the People's Republic of China; future public investments are based on the 50% fiscal space assumption.
Number in brackets indicate investments as a percentage of GDP.
Note: Numbers may not add up due to rounding.

HOW CAN THE GAP BE FUNDED?

There are various measures that can be taken to narrow the infrastructure funding gap in developing Asia, according to the report.

Governments can boost public investment in infrastructure by collecting more revenues through improving tax administration, borrowing prudently, and refocusing spending by cutting energy subsidies, for example.

Regional governments need to adopt innovative approaches to bolster infrastructure financing, such as "land value capture" to finance infrastructure, or capital recycling, which refers to the selling of brownfield assets, auctioning concessions, and allocating proceeds to finance greenfield infrastructure.

Separately, the private sector should be encouraged to play a greater role in funding infrastructure development, particularly in sectors such as telecommunications and power generation. Reforms in public finance are expected to make up for a little less than half of the infrastructure gap, which means private investment has to increase "dramatically," according to the report.

However, doing so will require regulatory and institutional reforms so that investing in infrastructure becomes more attractive to private investors. Additionally, a pipeline of bankable projects needs to be developed, including public-private partnerships (PPPs). Going forward, Asian governments need to implement PPP-related reforms including streamlining PPP procurement and bidding processes, providing legal recourse to investors, and establishing standalone government units focused on PPPs, among others. Finally, a deepening of capital markets is also required so that the region's substantial savings can be used to fund infrastructure investment.

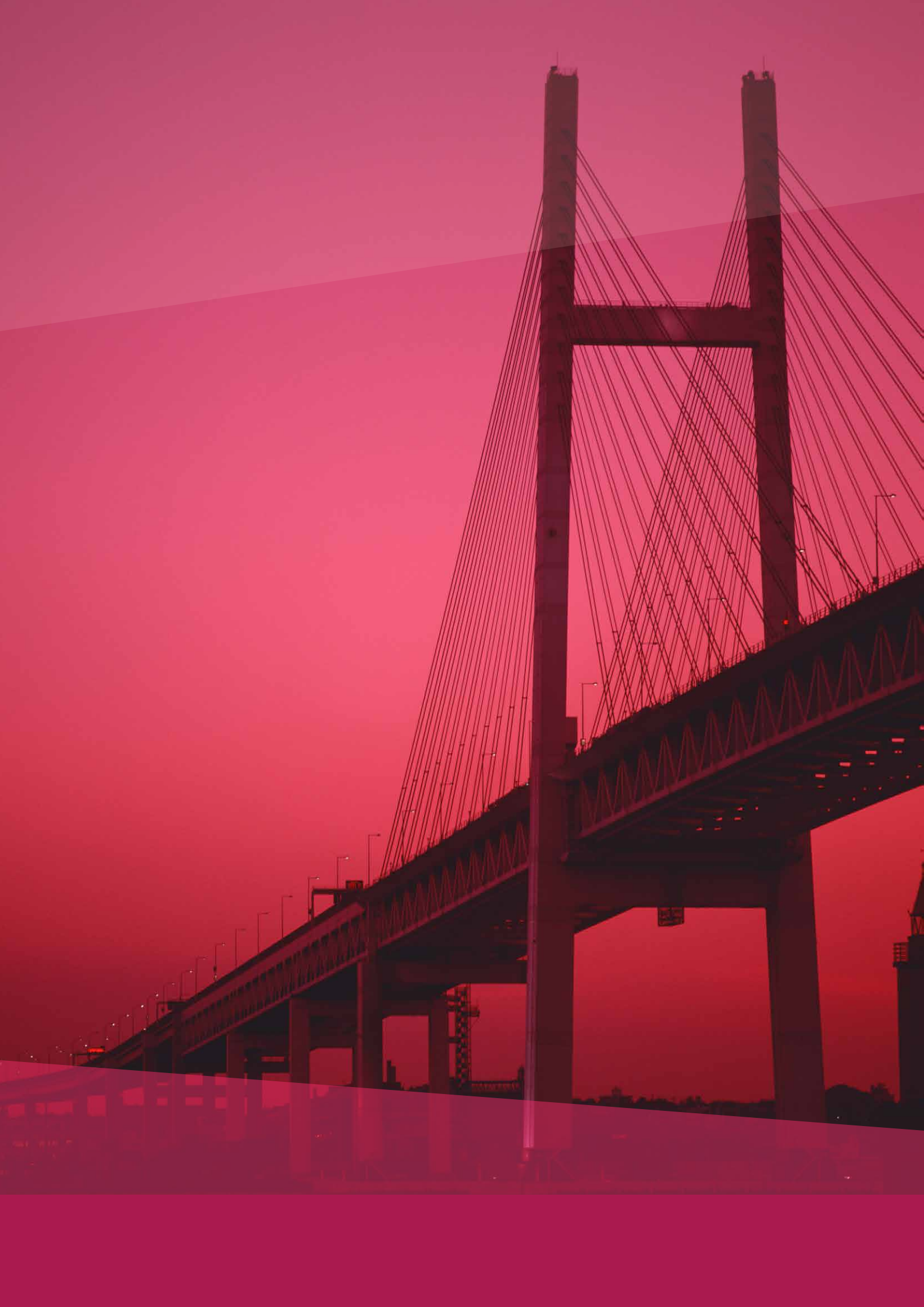
AN URGENT NEED FOR ACTION

"The infrastructure financing gap can't be fixed by any one party," said Blair Chalmers, a director for the Marsh & McLennan Companies' Singapore-based Asia-Pacific Risk Center, which is currently working on infrastructure bankability issues. "There is a deeply connected ecosystem of stakeholders that must take action, individually and in partnership, to achieve meaningful progress on a topic that is of regional importance," Chalmers said.

While Asia's infrastructure has improved significantly in the past decade—especially in areas such as electricity generation, transportation, and telecom and water infrastructure—and this has resulted in strong economic growth and a reduction in poverty, the reality is that an ample amount still needs to be done. More than 400 million Asians still lack electricity, about 300 million don't have access to safe drinking water, and 1.5 billion lack basic sanitation facilities. In several cases where this infrastructure exists, it is of poor quality.

As such, Asian governments have much to do to improving their infrastructure if they want to continue reducing poverty and improving the lives of their people.

THIS ARTICLE FIRST APPEARED ON BRINK ASIA.



ROAD TO ECONOMIC GROWTH PAVED WITH EFFICIENT INFRASTRUCTURE INVESTMENT

AUTHOR: TREVOR D'OLIER-LEES, SENIOR DIRECTOR, INFRASTRUCTURE PRACTICE AT S&P GLOBAL RATINGS SERVICES, AND MAR BELTRAN, SENIOR DIRECTOR, INFRASTRUCTURE PRACTICE AT S&P GLOBAL RATINGS SERVICES

Investment in infrastructure is vital: Without its upkeep and development, the costs to trade and economic competitiveness will only mount.

Working together to help channel efficient investment to infrastructure, governments and private investors alike will need to ensure that the risks are identified, managed, and, where appropriate, mitigated.

INFRASTRUCTURE'S ECONOMIC BENEFITS

Infrastructure investment is closely linked to economic output. In the short term, it stimulates demand, creating employment in construction and related industries, such as manufacturing and materials. In the long term, it boosts supply, enhancing an economy's productive capacity. For example, a new road may facilitate more trade, and it would likely support even more jobs long after the project's completion.

This is known as the "multiplier effect," whereby each dollar spent on infrastructure translates into greater gains for GDP. In the US, according to S&P Global, an additional 1% of real GDP spent on infrastructure could boost the economy by a factor of about 1.2. This multiplier is based on an economic analysis conducted by S&P Global economists and accounts for both the direct impact of infrastructure investment in wages paid to employees hired to build and maintain assets, as well as the indirect increase in aggregate demand spurred by the increase in disposable income.[1] This does not include potential productivity gains in the medium to long term from well-thought-through projects. It's been done before: Eisenhower's great interstate highway buildout in the 1950s boosted US GDP by a factor of six.

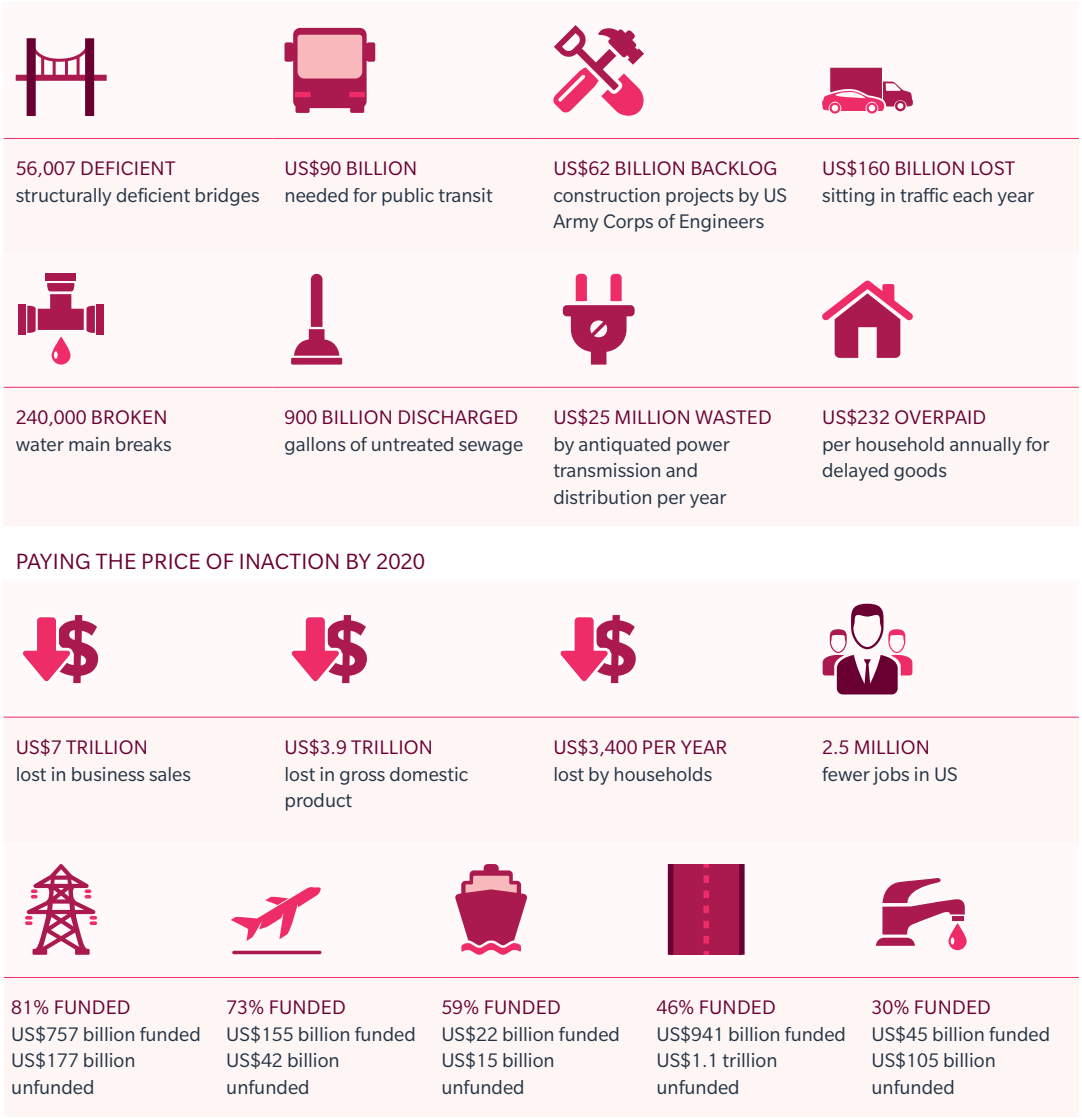
CONSEQUENCES OF INACTION

Without adequate investment in infrastructure, productivity could be limited and economic growth constrained. Modernizing the US energy grid will require an extra US$177 billion worth of investment—until the funds are found, antiquated power transmission and distribution infrastructure could waste around US$25 billion each year. Another US$160 billion is lost from vehicles sitting in traffic; the potential unpaid bill for maintenance of road networks is currently estimated at US$1.1 trillion.

In the US, an additional 1% of real GDP spent on infrastructure could boost the economy by a factor of about 1.2.

According to the American Society of Civil Engineers (ASCE), if measures aren't taken to fund and repair the country's aging infrastructure, business could miss out on US$7 trillion in sales by 2020, with around US$3.9 trillion lost to GDP. This translates into a yearly loss of US$3,400 to households and 2.5 million fewer US jobs (see Figure 1).[2]

Figure 1: The US Infrastructure Need in Figures
Source: S&P Global Ratings



Governments' ability to fund infrastructure projects using their own balance sheets without compromising long-term fiscal sustainability is set to increase.

With Europe´s economic outlook looking more balanced geographically and across sectors, and with more countries posting stronger growth numbers, the spread between the fast- and slow-growing economies in the eurozone is set to narrow in the coming months. Governments' ability to fund infrastructure projects using their own balance sheets without compromising long-term fiscal sustainability is set to increase. To help, in late 2014 the European Union launched the European Fund for Strategic Investment. This is the main execution vehicle of the Investment Plan for Europe.[3] The European Parliament is in final negotiations to increase its capacity from an initial €21 billion to €33.5 billion.

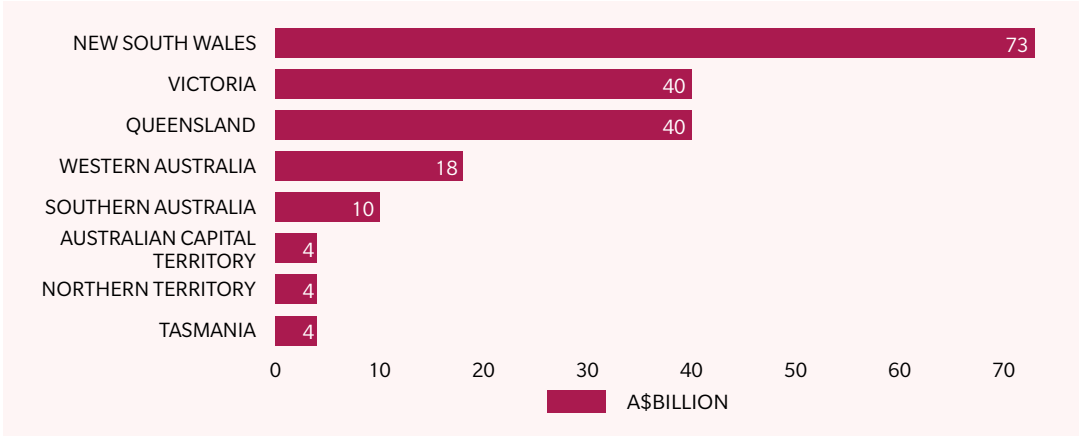
TRADITIONAL TAPPING OF PRIVATE CAPITAL

One might also look to the capital markets to foot the mounting infrastructure bill: Globally, institutional investors such as pension funds and insurers command about US$90 trillion, yet they have less than 1% of their resources invested in infrastructure. If incentivized, investors could bring much-needed capital to the sector through debt-financing projects—without increasing governments' debt-to-GDP ratios.

Partial privatization has traditionally brought this private capital to bear: A state-owned enterprise—perhaps an electricity transmission and distribution network—is sold under a long-term lease, overseen by an independent regulator. In May 2017, the New South Wales Government in Australia sold a 50.4% stake of electricity distributor Endeavour Energy to a consortium of institutional, superannuation, and sovereign wealth funds—freeing up A$7.624 billion (US$5.61 billion) for schools, hospitals, roads and rail networks.[4] The state Government retains a 49.6% interest in Endeavour Energy and will have ongoing influence over operations as a joint investor, lessor, licensor, and safety and reliability regulator. Endeavour Energy will continue to be regulated by the Australian Energy Regulator, which determines network prices.

An alternative approach being increasingly considered globally is "asset recycling," in which a greenfield project—such as a new highway—is divided into stages of development. The higher credit risk of earlier stages—in this case, the highway's construction and ramp-up risk—is transferred to the private sector. The New South Wales Government also announced in May the sale of a majority stake in the M4-M5 Link, a critical road connecting two of Sydney's busiest highways.[5] Along with an initial investment from the state and commonwealth governments, private-sector debt supported by toll revenue has financed the road's development. Effectively, the state has been able to "recycle" its equity investment to help fund the final stage. As Figure 2 shows, New South Wales is the leading investor in infrastructure among Australian states and territories.

Figure 2: Planned Gross Capital Investment in Australian Infrastructure, 2017-2021
Source: New South Wales Government



FURTHER TOOLS TO FINANCE INFRASTRUCTURE

Another means of facilitating collaboration between government and private capital is the public-private partnership (PPP), a procurement model where a private sector partner—normally under a long-term fixed-price contract—takes responsibility for some combination of designing, building, financing, maintaining, or operating a public infrastructure asset. Through a PPP, the government entity retains ownership of the assets.

We've observed that PPPs can put private capital to work developing, building, repairing, and maintaining the public's significant infrastructure needs. They also allow for risks to be allocated to various parties based on their capacity and willingness to manage them. A set of bonuses and penalties are put in place under contract to incentivize the private sector to deliver a well-built and well-maintained asset on time and on budget.

The private sector provides the financing in PPPs, which acts as a key incentive for optimal performance over the long term.

PPPs are widely used, for projects ranging from ports, airports, and high-speed railways to schools, hospitals, and civic buildings (see Figure 3). They also have an established track record. In Canada alone, the model has been used for about 250 projects that together are worth more than US$122 billion; those that have reached financial close have saved the Government an estimated US$27 billion.

Figure 3: Selected Public-private Partnership Projects Rated by S&P Global Ratings
Source: S&P Global Ratings

SOCIAL INFRASTRUCTURE	RAIL AND MASS TRANSIT	AIRPORTS/PORTS	ROADS AND BRIDGES
RATED EXAMPLES			
Ancora (RCH) Pty Ltd. (Hospital Australia).	Line Transit Partners LLC (Light rail transit, US).	Arctic Infrastructure Limited Partnership (Airport, Canada).	Elizabeth River Crossings Opco LLC (Bridge and tunnel, US).
InspirED Education (South Lanarkshire) PLC (School, UK)	High Speed 1 PLC (Rail, UK)	Lima Airport Partners SRL (Airport, Peru).	ITR Concession Company LLC (Toll Road, US).
Properties LTAP LP (Civic building, Canada).	Reliance Rail Finance Pty. (Rail, Australia).	ACI Airport Sudamerica S.A./Cerealsur S.A. (Aiport, Uruguay). Terminales Portuarios Euroandinos Paita SA (Port, Peru).	95 Express Lanes LLC (Managed lance, US).

Investors, of course, need economies of scale for cost-efficient financing of construction and operations to attract capital to smaller assets. We've seen separate ventures "bundled" into one larger infrastructure entity—whether through acquisitions of smaller utility systems by larger companies, the securitization of municipal assets, or the bundling of loans in state revolving funds. In North America, courthouse, highway, school, and bridge assets have been bundled in this way. In Spain last year, we saw the Vela Energy project company issue €404.4 million worth of bonds to refinance the construction debt for a bundle of 42 solar parks nationwide.[6]

A sector that could especially benefit from bundling is North America's water system.[7] The American Water Works Association estimates the cost of modernizing the continent's pipe and sewer facilities at US$1 trillion over the next 20 years. Of the 52,000 community water systems in the US, more than half are characterized as "small" by the Environmental Protection Agency and may struggle to find the funds on their own.

RISKS AND CHALLENGES

Infrastructure development is not without its risks. First, infrastructure investment cannot risk being fiscally unsustainable. Governments must develop assets at the lowest possible costs of capital (not just in the short term, but also across the long term, throughout the useful life of the asset), with funds allocated to those projects with the highest ratio of benefits to costs. Otherwise, higher levels of spending may simply lead to larger budget deficits. This is a particular concern for developing economies where, if the tax base is limited or tax enforcement is weak, even those public investments that could significantly boost economic growth may not reduce budgetary pressures. Yet the most advanced economies may still have little fiscal room for maneuver if—like the UK, for instance—they are already constrained by high debt-to-GDP ratios.

We have observed that a way that governments generally transfer the payment obligation is to follow the principle that users pay for infrastructure services whenever feasible. Colombia, for example—where inadequate transportation infrastructure has impeded economic performance—is currently relying on concessionaires to develop and operate 7,000 kilometers of new toll roads.[8] Regional and international institutional investors have provided financing based on their view that projected traffic volumes will underpin revenues.

A second risk to factor in is poor project preparation. We have observed that, ideally, it is best practice for potential projects to be carefully evaluated, planned, and designed. Before committing capital, investors rely on favorable conditions and transparent insights into creditworthiness. Continued growth of the offshore wind sector, for example, relies on projects being able to overcome engineering, technological, geographical, and regulatory limitations.

Efficient infrastructure markets generally depend on governments outlining both clear infrastructure needs and a long-term pipeline of projects.

Projects can face a multitude of risks: unproven technology or design, operational underperformance, exposure to adverse demand or commodity price movements in the markets, financially insecure counterparties, or unfavorable regulatory environments. In the absence of appropriate mitigants, all these risks could invite the chance of default. At S&P Global Ratings, we've noted that in over two decades of rating project finance debt about 6.5% of projects default, with market risk having been the most common reason, followed by technical risk. At the same time, the median recovery rate has been around 89%.[9]

On a broader scale, meanwhile, efficient infrastructure markets generally depend on governments outlining both clear infrastructure needs and a long-term pipeline of projects. Just look at Spain, where the fragmentation of responsibilities for infrastructure planning across different levels of government has, in some cases, resulted in resources being invested in unfinished or unused projects, such as the construction or upgrade of barely used airports at Castellón, Ciudad Real, Huesca, and Lleida before the financial crisis.[10]

Developing the world's infrastructure presents as many challenges as opportunities. With the risks identified, managed, and appropriately mitigated, the public and private sectors could collaborate to reap the benefits of efficient investment.

THIS ARTICLE FIRST APPEARED ON BRINK.

COMMERCIAL INSURANCE RATES CONTINUE DECLINE IN LIGHT OF GLOBAL MARKET FORCES

AUTHOR: CLAUDE D. YODER, HEAD OF GLOBAL ANALYTICS AT MARSH

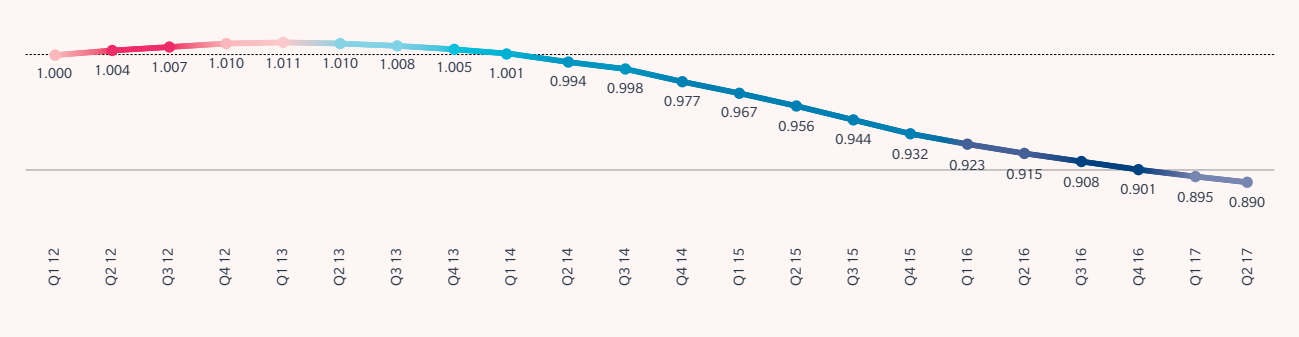
The halfway point in the 2017 fiscal year marked the seventeenth consecutive quarter in which global commercial insurance pricing declined, on average, according to the *Marsh Global Insurance Market Index*.

It was also the sixth straight quarter in which the rate of pricing decline moderated, according to the index, which is a proprietary benchmark of commercial insurance premium rate change at renewal, representing the world's major insurance markets and comprising over 90% of Marsh's premium. Among the index's regional highlights, the Pacific showed an increase in average pricing in the second quarter, with average property rates in the region increasing for the first time since 2013. The index's overall decline is largely due to the continuation of significant capacity in the global insurance market and a competitive underwriting environment.

CAPACITY AND CATASTROPHES

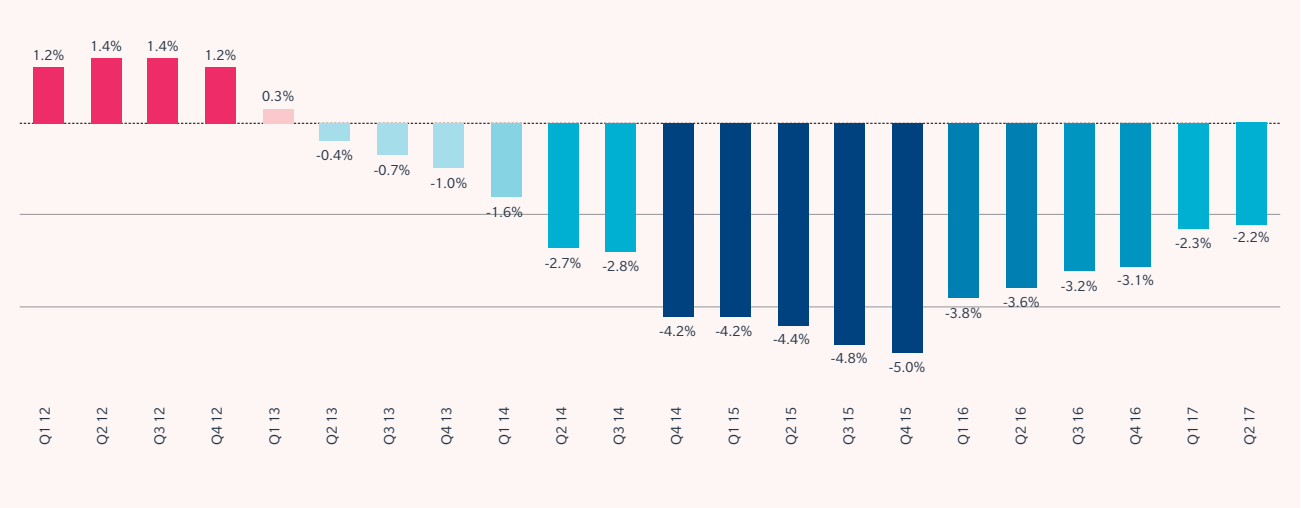
Along with the amount of capacity and attendant competitive underwriting environment, insurance pricing has been affected by an absence of significant catastrophe losses in recent years. Insured global natural catastrophe losses totalled US$19.5 billion in the first half of 2017, according to Munich Re.[1] Those losses compare to an annual average of US$29 billion for the corresponding six-month periods of the last 10 years, according to the Munich Re data.

Figure 1: Global Insurance Market Index
Source: Marsh Global Analytics



The *Marsh Global Insurance Market Index* captures a rolling four-quarter view of rate movement, providing a quarter-to-quarter look at changes in the marketplace. The rate change captures year-over-year rate movement, measured quarterly.

Figure 2: Global Insurance Composite Rate Change
Source: Marsh Global Analytics



AVERAGE CASUALTY INSURANCE RATES DECLINE

Insurance rates in the second quarter declined globally, on average, across all major product lines— property, casualty, and financial and professional coverages. The global casualty composite index was the one area in which the rate of pricing decline was higher in the second quarter compared to the first, driven by the US market.

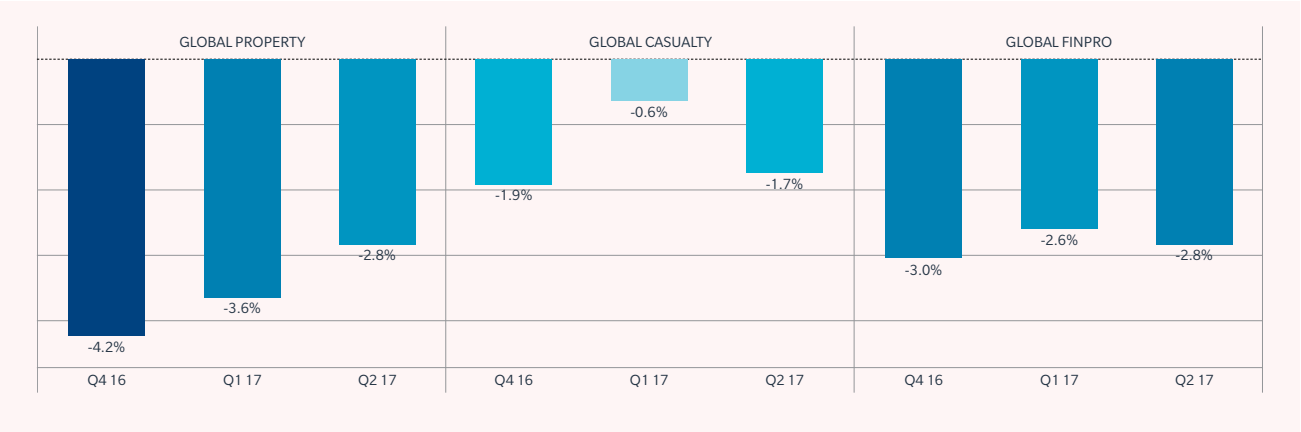
The change in US casualty lines was largely due to an increase in the average rate of decline in workers' compensation pricing and a smaller, continuing increase in average auto liability pricing. General liability renewal rates also declined in the second quarter, after posting slight increases in the previous quarter.

In the UK, composite insurance rate decreases in the second quarter of 2017 remained, on average, greater than the global rate of decline. The average rate of decline for the UK was 4.2% in the second quarter, compared to 4.8% in the prior quarter. Renewal rates declined in the UK across all major product lines, although the average rate of decline moderated in casualty from 4.2% to 1.7%.

Also in the second quarter:

- In Latin America, average casualty insurance rates increased for the fourth consecutive quarter.
- In continental Europe, property pricing, on average, declined at the lowest rate since the fourth quarter of 2014.

Figure 3: Global Composite Insurance Rate Change by Coverage Line
Source: Marsh Global Analytics

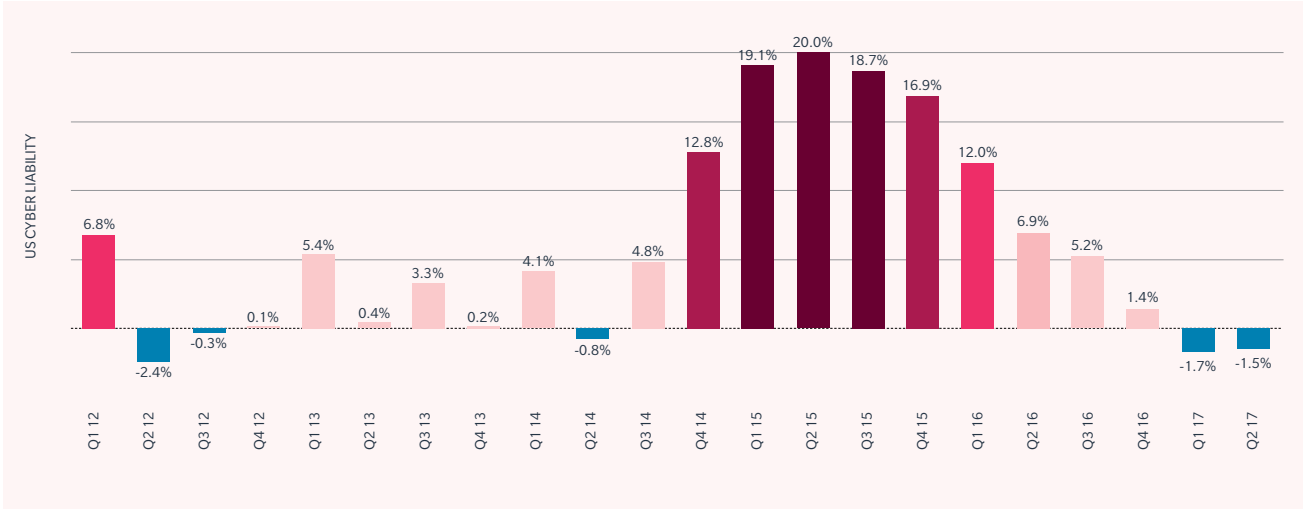


US CYBER LIABILITY RENEWAL RATES DECREASE FOR SECOND QUARTER IN A ROW

US cyber liability rates decreased 1.5% on average, in the second quarter of 2017 - the first time since 2012 that average cyber rates declined for two consecutive quarters. As in other lines, overall capacity is increasing as new insurers enter and existing ones expand their capacity levels.

At the same time, rate improvement continues in the sectors that were most affected by cyber events in recent years. As cybersecurity investments from these firms take effect and the claims environment improves, the general unwinding of historic cyber insurance rate increases is reducing overall market rate change, on average. We will watch closely in the coming months to see what, if any, impact recent high-profile events—including the WannaCry and Petya/GoldenEye malware attacks—have on the cyber insurance markets.

Figure 4: US Cyber Liability Renewal Rates
Source: Marsh Global Analytics



THIS ARTICLE FIRST APPEARED ON BRINK.

DECONSTRUCTING A DIFFERENT KIND OF "NUCLEAR SPILL"

AUTHOR: MARK POLLARD, GLOBAL PRACTICE LEADER NUCLEAR AND RENEWABLE ENERGY AT MARSH

Just as technology from space travel has spilled into our kitchens and garages, a sort of "nuclear spill" is going on, too. The process of nuclear decommissioning, and the methodology behind developing adequate funding where regulators and civil society opinion allow no slack, can find application in many energy and industrial contexts.

Planners of new nuclear projects are obsessed with detail. Investors, equipment manufacturers, plant operators, and regulators alike leave nothing to chance. Nuclear safety and ensuring returns on investment drive the rigor; every aspect of the planning, construction, operation, and ultimately dismantling is defined, configured, integrated, and stress tested beyond doubt.

Construction period and cost overruns, for which new nuclear projects are well-known, have usually been due to inadequate definition of design and construction methodologies or the application of yet more layers of regulatory attention.

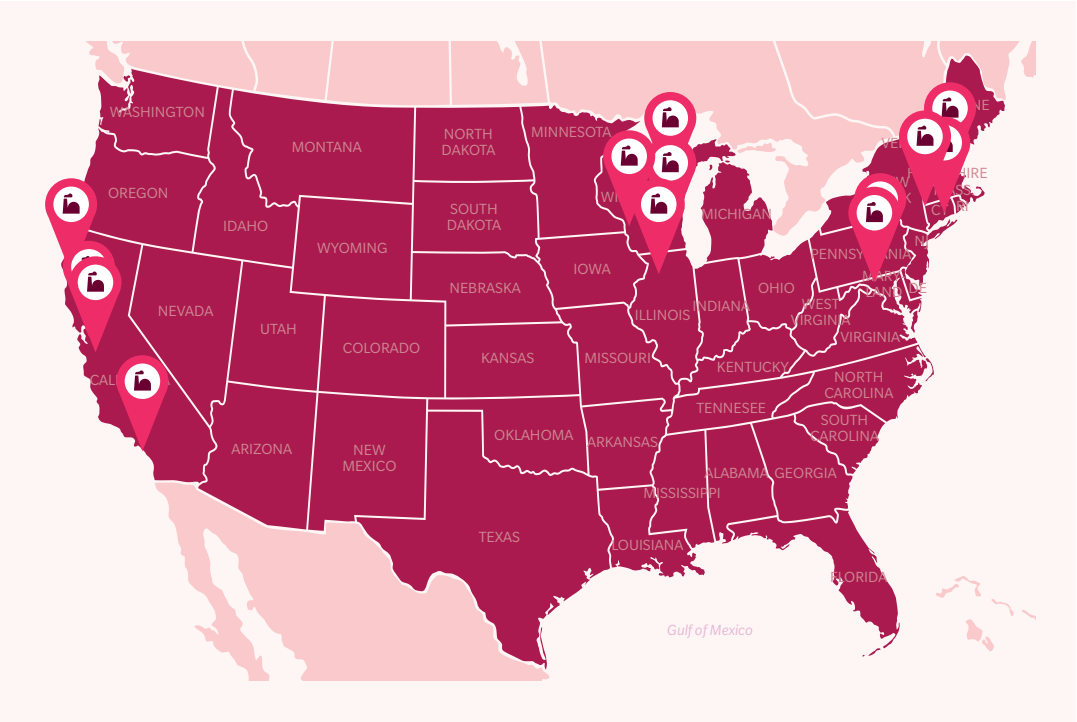
Decommissioning is an important part of this rigor; detailed plans need to be made about how it will be carried out, what the timing is, what the costs will be, and how those costs will be funded. The focus on decommissioning is relatively recent; a consequence of legacy costs passed to the present generation from past decades, when environmental and regulatory considerations were less stringent. Action needs to be taken today on behalf of future generations.

The job is simple to define, but devilish to execute: Model the expected decommissioning costs annualized over the decades necessary to complete the process, understand the volatilities in the model, and then match a funding plan to optimize the investment returns while retaining enough flexibility in the cash-out period to allow for the volatilities.

The world is full of infrastructure where the future decommissioning is unfunded or underfunded. Power stations, oil rigs, mines, and even solar farms will need to be removed sooner or later, and future costs on balance sheets will embarrass managers and disgruntle shareholders. In some cases, the costs won't be met, and the infrastructure will rot and rust until the taxpayer steps in.

Construction period and cost overruns, for which new nuclear projects are well-known, have usually been due to inadequate definition of design and construction methodologies or the application of yet more layers of regulatory attention.

Figure 1: Locations of Nuclear Power Reactor Sites Undergoing Decommissioning
Source: US Nuclear Regulatory Commission



FINDING FUNDING FOR THE LONG RUN

Fortunately, few decommissioning tasks are as lengthy or as complicated as nuclear projects so the first part of the job is simpler; the annualized decommissioning cost model will be more straightforward and less volatile. But the second part, matching a funding mechanism for existing assets, will often have the additional complexity of a short (or even nonexistent) residual life during which revenue can be harvested to feed the fund. In these circumstances, the optimization of the fund resources, including top-ups needed to meet the overall projected costs, becomes even more important to protect shareholders from shouldering costs from the past and managers from having to plunder current revenue.

In many cases a portfolio can be constructed, so the funding flexibility is improved. Putting together future decommissioning obligations, at different times and for different asset types, enhances the fund manager's options to keep more assets locked into better returns for a longer period of time.

In some cases existing funds or vehicles, for example, captive insurance companies, can be used to create an integrated funding solution that leaves fund security intact but improves investment returns and long-term financial sustainability.

What goes up must come down. The need to decommission should be entirely predictable from the outset of any infrastructure project. But more often than not, the costs are underestimated: The now defunct UK Department of Energy and Climate Change estimated that oil and gas decommissioning costs on the UK Continental Shelf, on average, are 40% over budget. The unpredictability extends to the timing, too, and schedules can be affected by events happening outside of an individual plant: In the aftermath of the Fukushima disaster, Germany declared the end of nuclear power in the country by 2022, foreshortening power plant life and hastening the decommissioning obligation.

Clever funding can take away some of the cash flow risk and improve the predictability of the annualized cost over a period, to the delight of CFOs. But what about the truly unpredictable risks?

What if adverse circumstances occur notwithstanding the diligent investigation and planning of the owner of the assets? Such risks are the domain of the insurance industry. Insurers will steer clear of insuring against inadequate planning (although they can cover consequent material damage or liabilities). They will thrive on the unexpected and, in an industry awash with capital, are keen to deploy capacity in new areas.

So far the insurance solutions offered to protect against unexpectedly onerous decommissioning costs are few and the market is immature. Insurers should watch this space: The constraint is ripe for dismantling.

Clever funding can take away some of the cash flow risk and improve the predictability of the annualized cost over a period.

THIS ARTICLE FIRST APPEARED ON BRINK.

ABOUT MARSH'S PRACTICE

CONSTRUCTION

ABOUT MARSH'S CONSTRUCTION PRACTICE

This report has been produced by Marsh's Global Construction Practice, which is at the forefront of brokering insurance and advising the construction industry on risk and insurance issues.

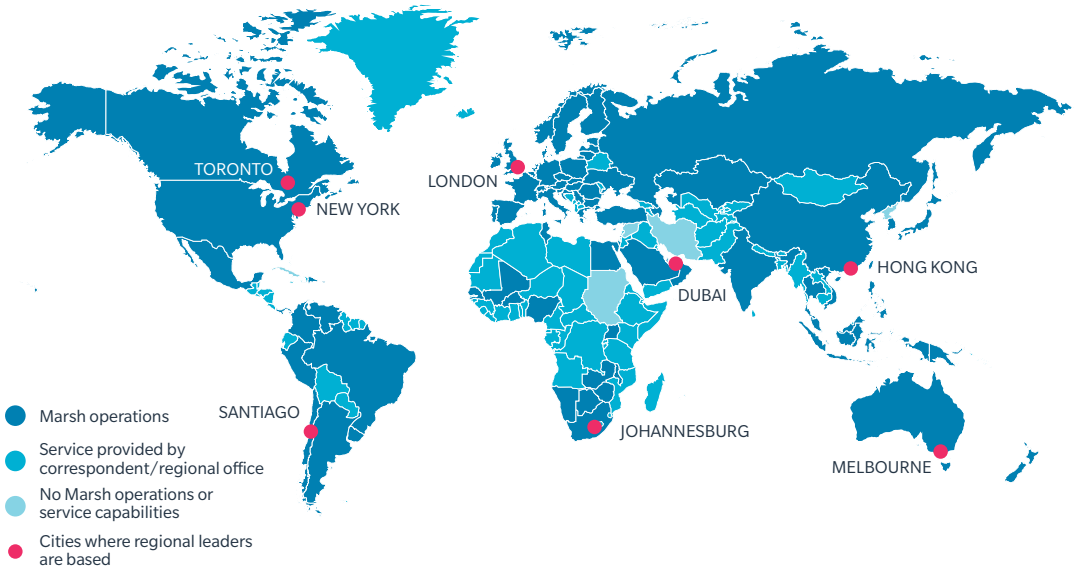
Our team helps you assess risks and opportunities and uncover ways to use working capital more efficiently. We measure your firm's appetite for risk, recommend solutions that meet your needs, and take your program to market knowing the best insurers for the best structure and pricing.

Our strengths include:

- The depth of our resources, experience, and expertize.
- Our network of offices working closely with regional specialists.
- Bespoke policy wording and program design.
- Our ability to manage contractual risk allocation.
- A targeted placement strategy which uses the strength of Marsh's global account and, for international projects, considers the most competitive underwriters, irrespective of their geographical location.

THE RESULT

Marsh's Global Construction Practice is an international team operating across geographical boundaries, which offers you opportunities and solutions to meet your needs.



IN ADDITION, WE HAVE ACCESS TO INDUSTRY SPECIALISTS IN MANY FIELDS INCLUDING:

POWER

The International Energy Agency predicted that a total of 5,890 GW of additional power capacity would be required between 2012 and 2035. This need for ever-increasing sources of power on a global level continues to create ongoing opportunities for the construction of new plants and facilities. At the same time, competition is driving manufacturers to constantly develop new technology, presenting unknown challenges to contractors, risk managers, investors, and insurers. Marsh's power specialists maintain an up-to-date knowledge of technological developments through regular contact with manufacturers and sector insurers. We have dedicated teams that focus on the thermal, nuclear, and renewable power sectors.

OIL, GAS, AND PETROCHEMICALS

With the fluctuating environment of the oil, gas, and petrochemical industry comes the need to develop new and cutting-edge risk solutions to meet the industry's needs and requirements. Every project demands a bespoke suite of cost-efficient insurance services.

Marsh's energy risk engineering team is well qualified to provide risk managers and underwriters with the essential information they need to determine the right limits, scope of cover, and price. Our in-depth knowledge and understanding of the sector provides you with comprehensive contract reviews and advice at the early stage of any project.

MINING AND PROCESS ENGINEERING

As the mining and process engineering industry copes with volatility issues affecting market price and demand, the importance of maintaining a strong balance sheet is at the heart of many organisations.

This need drives the significant investments made in cash regenerative assets, and the projects from which they grow, leading to investments in all areas of the globe. It is unsurprising that protecting such assets and projects is a vital part of risk management strategy.
We offer the opportunity to work with professionals who understand the challenges you face. Marsh appreciates the tough commercial environment of your industry and its increased vulnerability to risk.

INFRASTRUCTURE AND CIVIL ENGINEERING

Experience has shown that the negative time and cost impact of major risks, such as varying geological conditions and exposure to natural hazards, can be particularly severe in the infrastructure sector.

These risks create a wide range of exposures linked to areas of design, construction, interfacing, and sequencing which must be continually evaluated and managed by the project team. Risk management strategy must be tailored to minimize the impact of specific risks on the project works, existing infrastructure, construction equipment, and third parties, in particular.

Marsh experts work with owners, contractors, engineering consultants, and project partners to implement innovative risk management and transfer solutions for many of the world's most technically challenging construction projects. Our dedicated risk engineering services and broking capabilities are proven to support project delivery – on time and on budget.

CONTRACTORS

Some construction companies procure contract works insurance policies on a case-by-case ad-hoc basis when required to do so as a contractual obligation or requirement.

While this may be an appropriate and necessary approach for very large projects, for heavy civil works (such as tunneling and wet works), and projects in specific natural catastrophe zones, there is an effective and advantageous alternative to insure a contractor's portfolio.

Marsh works with many national and multinational contractors to design and arrange annual or multi-year insurance facilities that automatically include all projects within pre-agreed parameters and limits, without the need to arrange single project policies on a case-by-case basis.

A contractor facility should be carefully designed and tailored to cater for your specific requirements and profile, as well as taking into account insurance market conditions, and we would recommend an initial meeting is held to discuss these key issues.

CONTACTS

For more information on any of the topics discussed, please contact a colleague below or your local Marsh office.

Alternatively, you can visit our website: www.marsh.com

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FOOTNOTES

PERSPECTIVES ON INNOVATION

DISRUPTIVE TECHNOLOGY BRINGS RISK AND OPPORTUNITY TO INFRASTRUCTURE PROJECTS

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