

# FROM THREATS TO IMPACT

Evolving Risk Concerns in Asia-Pacific | Volume 3





# TABLE OF CONTENTS

- 1 INTRODUCTION**
- 2 AN OVERVIEW OF THE ASIA-PACIFIC RISK LANDSCAPE**
  - The Global Risk Landscape: Key Messages from the Global Risk Report 2018
  - Top Concerns in Asia-Pacific: Perspectives from Local Businesses
  - Preparing for a Complex, Interconnected, and Emergent Risk Landscape
- 16 SAFEGUARDING DEVELOPMENT IN ASIA-PACIFIC: KEY RISKS TO THE PHYSICAL AND HUMAN INFRASTRUCTURE**
- 17 Critical Infrastructure Failure or Shortfall**
  - Future Complications: How Ongoing Trends Exacerbate Infrastructure Failure or Shortfall
  - Business Implication
- 28 Talent Shortage**
  - Future Complications: How Talent Shortage Will Continue to be a Top Concern
  - Business Implication
- 43 CONCLUSION**
- 44 APPENDIX: THE WORLD ECONOMIC FORUM SURVEYS**
- 46 BIBLIOGRAPHY**

# INTRODUCTION

Throughout 2018, we have witnessed several tumultuous developments around the world, spanning a wide array of technological, environmental, geopolitical and economic problems. From cyber-attacks in various parts of the world to major hurricanes and floods in the US and Asia-Pacific in 2017, and from the unexpected developments around North Korea to the United States (US)–China trade war in 2018, several key global risks have crystallized.

Many of these risks were captured in the annual *Global Risks Report* by the World Economic Forum, with whom Marsh & McLennan Companies is a strategic partner. The report brings together the viewpoints of thousands of business executives and risk experts around the world. The latest edition of the report adopted a cautionary tone as it laid out the prevalent geopolitical, economic, technological and environmental challenges the world is facing. Perhaps most importantly, the report documented the extraordinary pace of the multi-directional changes in the world, and how emerging uncertainties have put increasing pressure on institutions and systems to react in time.

**We believe that the Asia-Pacific region has been at the center of these changes.** Not only has the region become the global economic growth engine and is expected to remain so in the coming years, it is also fast becoming a center of innovation and home to many new technological advancements. With the ascent of China, as well as India and ASEAN as regional powers, the geopolitical importance of Asia-Pacific continues to increase. At the same time, these remarkable developments have heightened existing risks and created new vulnerabilities in the region, most clearly observed not only in evolving geopolitical tensions but also in the form of severe environmental disasters, a growing number of cyber-attacks, and worrying signs with regards to some key economic indicators.

In light of Asia-Pacific’s growing importance in the global economic and political landscape, Marsh & McLennan Companies’ Asia Pacific Risk Center (APRC) launched the Evolving Risk Concerns in Asia-Pacific series in 2016. The series expands upon our partnership with the World Economic Forum, using insights from the *Global Risks Report* to highlight a selection of the most important risks to businesses operating in the Asia-Pacific region. In the second edition of the report in 2017, we broadened the scope to delve deeper into the underlying disruptive trends from which key risks to businesses are identified, and set out the most important imperatives for businesses going forward.

This year, we start from a broad overview of key business-relevant risk hotspots in Asia-Pacific and focus on two particular risks that pose a great threat to doing business in the region, namely **(1) Critical infrastructure failure or shortfall**, and **(2) Talent shortages**. These are contextualized in the evolving risk landscape of Asia-Pacific and the megatrends that will likely shape them in the future. Through this analysis, we hope to show how these two risks are of exceptional importance to businesses in the region, and how risks and risk trends interact with and reinforce each other. These discussions will be followed by suggestions regarding how businesses can respond to these risks.

We believe the report will continue to be an informative read, and a rich reference guide to the Asia-Pacific risk landscape both for businesses, as well as for policymakers and interested observers of the region.



# AN OVERVIEW OF THE ASIA-PACIFIC RISK LANDSCAPE

## THE GLOBAL RISK LANDSCAPE: KEY MESSAGES FROM THE GLOBAL RISKS REPORT

The *Global Risks Report* stressed the **extraordinary pace and variety of change** in the world across a wide array of risks and risk trends, and prompted us to think about how institutions and systems may or may not be able to absorb and adapt to future shocks. While this year's report focused particularly on "**economic storm clouds**" and "**geopolitical power shifts**", **environmental risks** and **cyber risks** also dominated the discussion.<sup>1</sup> This is especially true in discussions of future shocks, in which a confluence of interconnected risks can lead to potentially catastrophic scenarios. The report revisited some of the risks that have been highlighted in the past, such as youth unemployment, and provided a brief discussion on risk management in the evolving risk landscape.

Environmental risks occupy a paramount position in the long-run according to global risk experts. Major hurricanes and floods across the world in 2017/18 and the devastation caused in affected areas prompted risk experts to place extreme weather events and natural catastrophes in the top five most important risks in terms of impact in 2018.<sup>2,3</sup> Experts also considered failure to address climate change as one of the most likely risks to materialize, most likely owing to the US' withdrawal from the Paris agreement in June 2017, which once again raised concerns over the world's commitment to the 2 degree Celsius goal.<sup>4</sup> Finally, water crisis continued to be among the top five most impactful risks. The recent conflict over the Nile dam project in the Horn of Africa, for instance, raised serious questions over whether water will become the next straining global geopolitical issue.<sup>5</sup>

Apart from environmental risks, technological and geopolitical concerns also came to the fore. In the realm of technological threats, much attention was paid to cyber-attacks and data fraud, as risk experts considered them to be among the top five most likely risks. This is understandable given the series of major cyber incidents, from the WannaCry ransomware in May 2017,<sup>6</sup> to the most recent attack on SingHealth,<sup>7</sup> the largest national group of healthcare institutions in Singapore, in July 2018, in which the personal information of 1.5 million patients was stolen. On a related point, the *Global*

*Risks Report* also discussed the vast amount of personal data being collected by large technology companies, raising serious questions on personal privacy and autonomy, as well as around national security and the outsized power that a few technology giants are holding.

Among geopolitical threats, weapons of mass destruction firmly retained its position as the most important risk in terms of impact according to experts, mainly due to the escalating situation in North Korea in August 2017. While the recent meeting between the two Koreas, and the summit with the US might yet prove to be a breakthrough step forward towards denuclearization and regional peace,<sup>8</sup> the situation on the peninsula remains delicate. More widely, the *Global Risks Report* stressed on the rise of "strongman" leaders, and on how global and regional powers are redefining their commitments and the potentially destabilizing impacts of these processes.

A decade after the 2008 Global Financial Crisis (GFC), the absence of economic concerns in the *Global Risk Perception Survey* does not come as a surprise as the global economy has continued its slow but steady recovery, albeit against the backdrop of turbulent geopolitical developments, a flurry of cyber-attacks, and myriad extreme weather events. Recent global developments, however, have prompted the International Monetary Fund (IMF) to adjust risk outlook towards the downside for the short- and medium term, and cut to its forecast of global economic growth from 3.9 to 3.7 for 2018 and 2019.<sup>9</sup> Notably, escalating trade tensions, particularly between China and the US, have meant that growth is no longer synchronized, with growth projections revised downwards for Japan, India, the European Union, and in countries with weaker fundamentals, such as South Africa and Argentina.

At the close of the G20 Meeting of Finance Ministers and Central Bank Governors in July 2018, Christine Lagarde, the managing director of the IMF, highlighted the short-term risks in the global economy and stressed the importance of safeguarding the international trade system and the importance of sound precautionary fiscal

policies to avoid a downward financial spiral.<sup>10</sup> The address also touched upon challenges arising from digitalization, artificial intelligence (AI), automation and the need to prepare for the future of work. This resonates with her warnings at the beginning of 2018 at the World Economic Forum on persisting inequality and low productivity growth in an era of rapid population aging and the proliferation of automation.<sup>11</sup>

The *Global Risks Report* adopted a cautious tone with regards to the global economic outlook, and it is important to continue monitoring the existing economic fault lines it highlighted. Apart from a sustained high level of inequality, other pertinent

economic concerns include the high global debt load (notably corporate debt) as a percentage of GDP, the increase in protectionist measures, and the overvaluation of assets in comparison with forward earnings estimates. The report particularly stresses the increasing complexity of the macro-level risk landscape, in which multiple sources of volatility and the incredibly fast-paced changes can lead to sudden and dramatic breakdowns.

In the following discussion, we will examine how the four key risk areas outlined in the *Global Risks Report* manifest themselves in Asia-Pacific, and recent developments in what we think are the most important vulnerabilities in the region.

## TOP CONCERNS IN ASIA-PACIFIC: PERSPECTIVES FROM LOCAL BUSINESSES

Corroborating the results of the *Global Risk Perception Survey* and the findings in the *Global Risks Report*, the results of the Executive Opinion Survey show that businesses across Asia-Pacific economies continue to face a multitude of risks, with the four main risk areas in the *Global Risks Report* adequately represented (Exhibit 1). In the following discussion, we will review the Asia-Pacific risk landscape, focusing on these four risk areas, namely economic, geopolitical, technological and environmental.

### ECONOMIC RISK: UNDERLYING FRAGILITIES







































































**Despite continued strong growth, fragilities in Asia-Pacific economies are crystalizing. While the region continues to register strong near-term growth, projected at 5.6 percent for the next two years, worrying signs around high debt levels, soaring housing prices, ongoing protectionism and rising inequality have are being observed in recent years across the region.<sup>12</sup>**

According to the Global Debt database published by the IMF, Asia-Pacific **debt** (both private and public) has been growing substantially since the

GFC. The region has overtaken North America as the biggest contributor to global debt in 2008, accounting for 35 percent of global debt in 2016.<sup>13</sup> Analysts have been rightly worried about a default crisis if credit conditions tighten,<sup>14</sup> such as in the event of an interest rate hike. Debt growth in the region has been fueled by rapid credit expansion in China, where credit to the non-financial sector (includes credit to the government, households and non-financial corporations) reached CNY211 trillion (\$32.4 trillion) or 255.7 percent of GDP in the fourth quarter of 2017, from 141.3 percent of GDP in 2008. High debt in the non-financial sector is also observable in other major economies in the region, notably Hong Kong, Japan, and Singapore (Exhibit 3A).

The nature of the debt problem differs across economies. For example, while credit to non-financial corporations and household debt have been increasingly serious in China,<sup>15,16</sup> the main concern in Japan continues to be the extraordinarily high level of public debt, which threatens the nation's sovereign bond market.<sup>17</sup>

**Exhibit 1: Top concerns for doing business in the next 10 years for selected economies in Asia-Pacific 2017/18**

CHINA	JAPAN	INDIA	SOUTH KOREA	AUSTRALIA	INDONESIA	TAIWAN
 Natural catastrophes	 Cyber attacks	 High unemployment	 High unemployment	 Energy price shock	 Cyber attacks	 Interstate conflict
 Deflation	 Natural catastrophes	 Fiscal crisis	 Interstate conflict	 Asset bubble	 Energy price shock	 Energy price shock
 Data fraud/theft	 Interstate conflict	 Terrorist attacks	 Fiscal crisis	 Cyber attacks	 Terrorist attacks	 Fiscal crisis
 Illicit trade	 Fiscal crisis	 Misuse of technologies	 Social instability	 High unemployment	 High unemployment	 High unemployment
 Cyber attacks	 Terrorist attacks	 Financial inst. failure	 Cyber attacks	 Climate adaptation	 Data fraud/theft	 Asset bubble
THAILAND	MALAYSIA	SINGAPORE	PHILIPPINES	HONG KONG	VIETNAM	NEW ZEALAND
 National governance failure	 Cyber attacks	 Terrorist attacks	 Natural catastrophes	 Asset bubble	 Man-made environmental crisis	 Natural catastrophes
 Man-made environmental crisis	 Inflation	 Cyber attacks	 Terrorist attacks	 Social instability	 Fiscal crisis	 Extreme weather events
 Critical infra. shortfall	 Energy price shock	 Asset bubble	 National governance failure	 Cyber attacks	 Illicit trade	 Cyber attacks
 Asset bubble	 National governance failure	 Data fraud/theft	 Extreme weather events	 National governance failure	 Interstate conflict	 Asset bubble
 Cyber attacks	 High unemployment	 Infectious disease	 Critical infra. shortfall	 Data fraud/theft	 Cyber attacks	 Urban planning failure

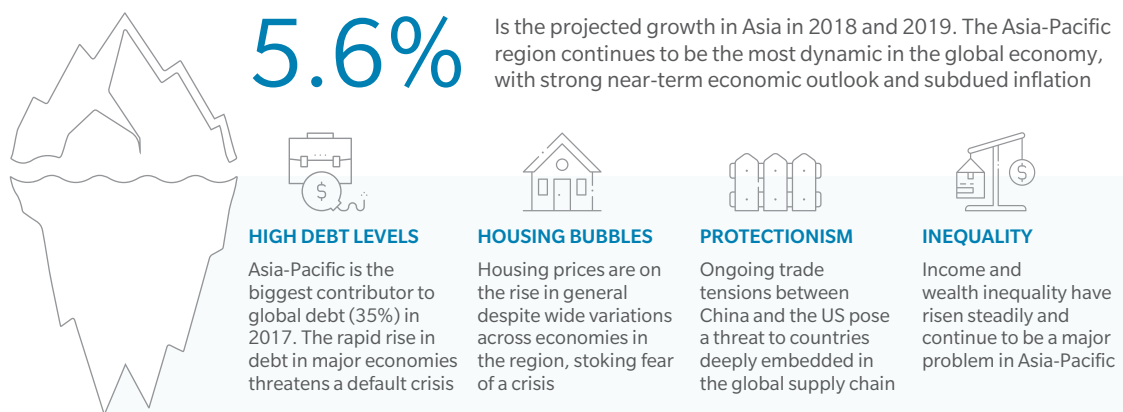
● Economic ● Environmental ● Geopolitical ● Societal ● Technological

**Note:** World Economic Forum Executive Opinion Survey (~12,400 responses worldwide). Results are based on 2,477 responses across the region. Respondents could choose up to five risks which they viewed as being most important for doing business in their country in the next 10 years. Top regional risks are calculated as the average across all countries of the proportion of respondents in each country identifying each risk as one of their five choices

**Source:** World Economic Forum Executive Opinion Survey 2017, APRC analysis



## Exhibit 2: Economic risks in Asia-Pacific



Source: Data from IMF, APRC analysis

Elsewhere, while debt levels in India remain relatively manageable, the situation with regards to non-performing assets in the country can be considered precarious (Exhibit 3B). Weak governance and lax due diligence processes for underwriting following the GFC have resulted in a borrowing spree that has led to about US\$210 billion of non-performing assets in state banks after a slowdown in the economy made it difficult for many businesses to service their debt.<sup>18</sup> The Indian government has attempted to reduce the debt through a recapitalization plan, but there are fears that their efforts have been insufficient.<sup>19</sup>

Another major economic vulnerability in Asia-Pacific stems from complex developments in the **housing sector**. According to data from the Bank of International Settlements (BIS), house prices have been growing faster than income in most economies in the region since 2010. Notably, annual growth of more than 8 percent has been recorded in housing prices in Hong Kong and India from 2010 to 2017 (Exhibit 3C). This growth is indicative of how housing is becoming increasingly unaffordable. More detailed analysis of specific housing markets showed that besides Hong Kong, Sydney, Melbourne, and Auckland are also among the most unaffordable housing markets.<sup>20,21</sup> The house price-to-income ratio in New Zealand, for example, has increased by 40 percent since 2010,<sup>22</sup> the largest increase globally. Other reports have also pointed to Mumbai as being second only to Hong Kong in terms of how unaffordable housing is; and while prices have cooled as a consequence of new regulations, urban home prices are still largely out of reach for many Indian families.<sup>23</sup>

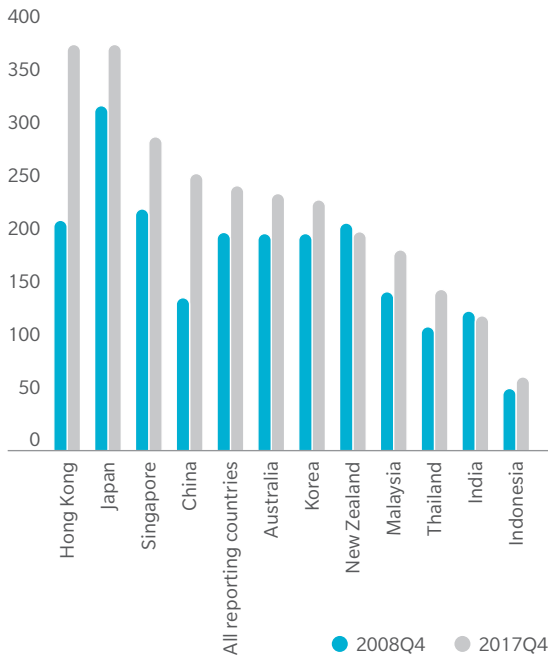
High housing prices in the region have stoked fears about possible asset bubbles ready to burst, particularly in markets where the property price boom has shown no sign of slowing, such as in Hong Kong.<sup>24</sup> Recent developments in the sector have seen prices drop in some key markets such as India, Australia and New Zealand.<sup>25,26</sup> Whether this is the start of a substantive correction remains to be seen, but what is clear is that prices remain at historic peaks when seen as a ratio to household income.

One lesson from the 2008 US housing market failure is to closely follow how housing is being financed, whether private household debt has played a large role in financing these properties, and whether these debt levels are sustainable.<sup>27</sup> For example, there have been warnings that countries/cities with higher household debt loads in the housing sector such as Australia may be particularly vulnerable.<sup>28</sup>

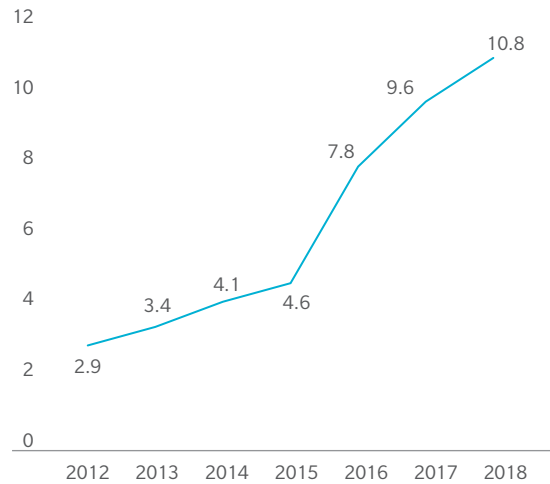
There are two other vulnerabilities in Asia-Pacific that may be harder to see amidst rapid economic growth in the region. First, Asia-Pacific continues to face the threat of **protectionism**, despite continued regional economic integration. While the ASEAN Economic Community (AEC) has abolished most trade tariffs among member countries, non-tariff barriers such as import- and export-permit related measures have nearly tripled from 2000 to 2015.<sup>29</sup> And despite the signing of a revised Trans-Pacific Partnership (TPP-11) that may benefit the region in the long run,<sup>30</sup> countries in Asia-Pacific will have to deal with the spill-over effects of an escalating US-China trade conflict in the short run (In Focus).

**Exhibit 3: Signs of economic fragilities in Asia-Pacific**

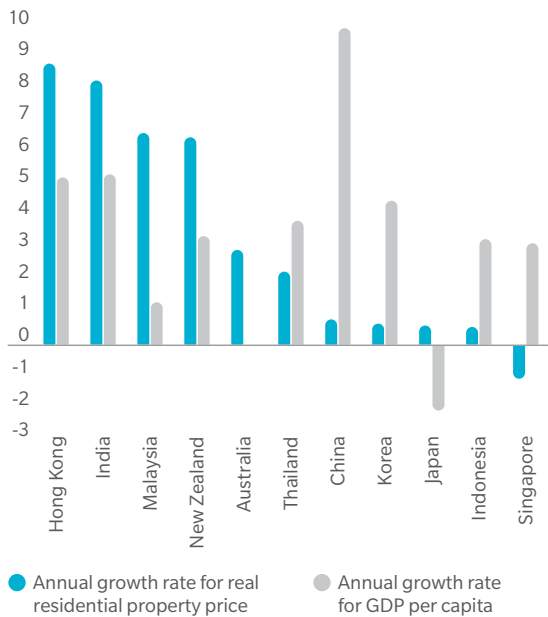
**3A. NON-FINANCIAL SECTOR DEBT ACROSS ASIA-PACIFIC AS A PERCENTAGE OF GDP**



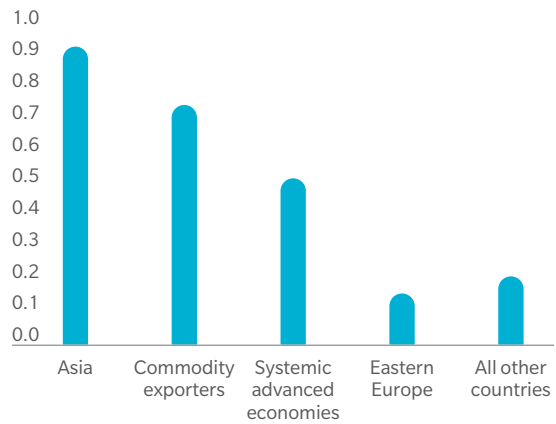
**3B. NON-PERFORMING ASSETS IN INDIA (%)**



**3C. COMPOUND ANNUAL GROWTH RATE FOR REAL RESIDENTIAL PROPERTY PRICES AND GDP PER CAPITA FOR SELECTED ECONOMIES ACROSS ASIA-PACIFIC 2010-2017 (%)**



**3D. IMPACT ON EXPORTS OF A 1 PERCENT SHOCK TO CHINA'S DEMAND\*1 GDP-WEIGHTED AVERAGE (%)**



\*1 Asia = HKG, IDN, KOR, PHL, SGP, THA  
 Commodity exporters = AUS, BRA, CHL, COL, RUS, ZAF. Eastern Europe = CZE, EST, HUN, LTU, LVA, POL, SVK, SVN, TUR  
 Systemic advanced economies = DEU, JPN, USA  
 All other countries = ARG, AUT, BEL, CAN, CHE, DNK, ESP, FRA, FIN, GBR, GRC, ISR, IRL, ISL, ITA, LUX, MEX, NLD, NOR, NZL, PRT, SWE  
 Data labels in the figure use International Organization for Standardization (ISO) country codes

**Source:** Data from BIS, the Reserve Bank of India, the Economist Intelligence Unit and IMF, APRC analysis

More broadly, the continued integration of Asia-Pacific's economies has also resulted in regional financial risks becoming increasingly concentrated in East Asia, and this poses a risk to the tightly knit economic networks in the region. For example, spill-over effects from China have increased over time, and a 1 percent shock to China's final demand is estimated to reduce Asia's exports by 0.9 percent after one year (Exhibit 3D).<sup>31</sup> This is significantly higher compared to the impact on all other countries.

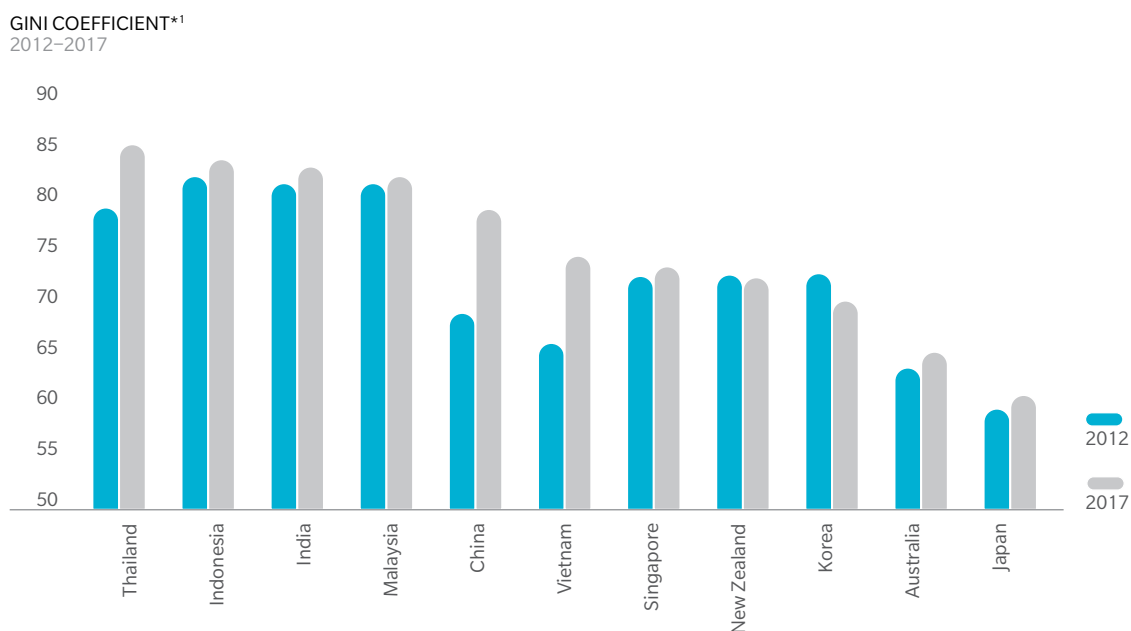
Finally, the steady increase in **economic inequality** in the region continues to be a cause for concern (Exhibit 4). Amidst strong economic growth in Asia-Pacific, inequality can be easily overlooked. However, dormant feelings of being marginalized can quickly cascade into social unrest and geopolitical turbulence when other catalysts such as an economic downturn materialize. Furthermore, as the last version of this report stressed on, inequality not only impedes economic growth but also hurt "the

rising Asian middle class" which is the main driver of demand and consumption growth, thus severely impacting businesses.

The dynamics of inequality are also changing quickly. For example, while the rural and urban divide has been a major issue in China,<sup>37</sup> the country's shift from heavy industrial manufacturing to higher value-added sectors has also led to economic decline in several provinces in the northeast, including Jilin, Liaoning and Heilongjiang. These areas have been dubbed "the Chinese rust belt".<sup>38</sup>

This development adds a new dimension of inequality along geographical lines, where the divide is no longer only between the rural and the urban, but also between the metropolis and the peripheral cities. Spill-over effects are also visible, as this widening gap is threatening instability in the provinces mentioned above, which constitute a geopolitically important region near the China-Russia-North Korea border.

**Exhibit 4:** Wealth GINI Coefficient in selected countries in Asia-Pacific



\*1 The **wealth GINI coefficient** shows the differences in the distribution of wealth. Higher GINI coefficients signify greater inequality in wealth distribution, with 0 implying perfect equality and 100 reflecting complete inequality

**Source:** Data from Credit Suisse's Global Wealth Data book 2012-2017, APRC analysis

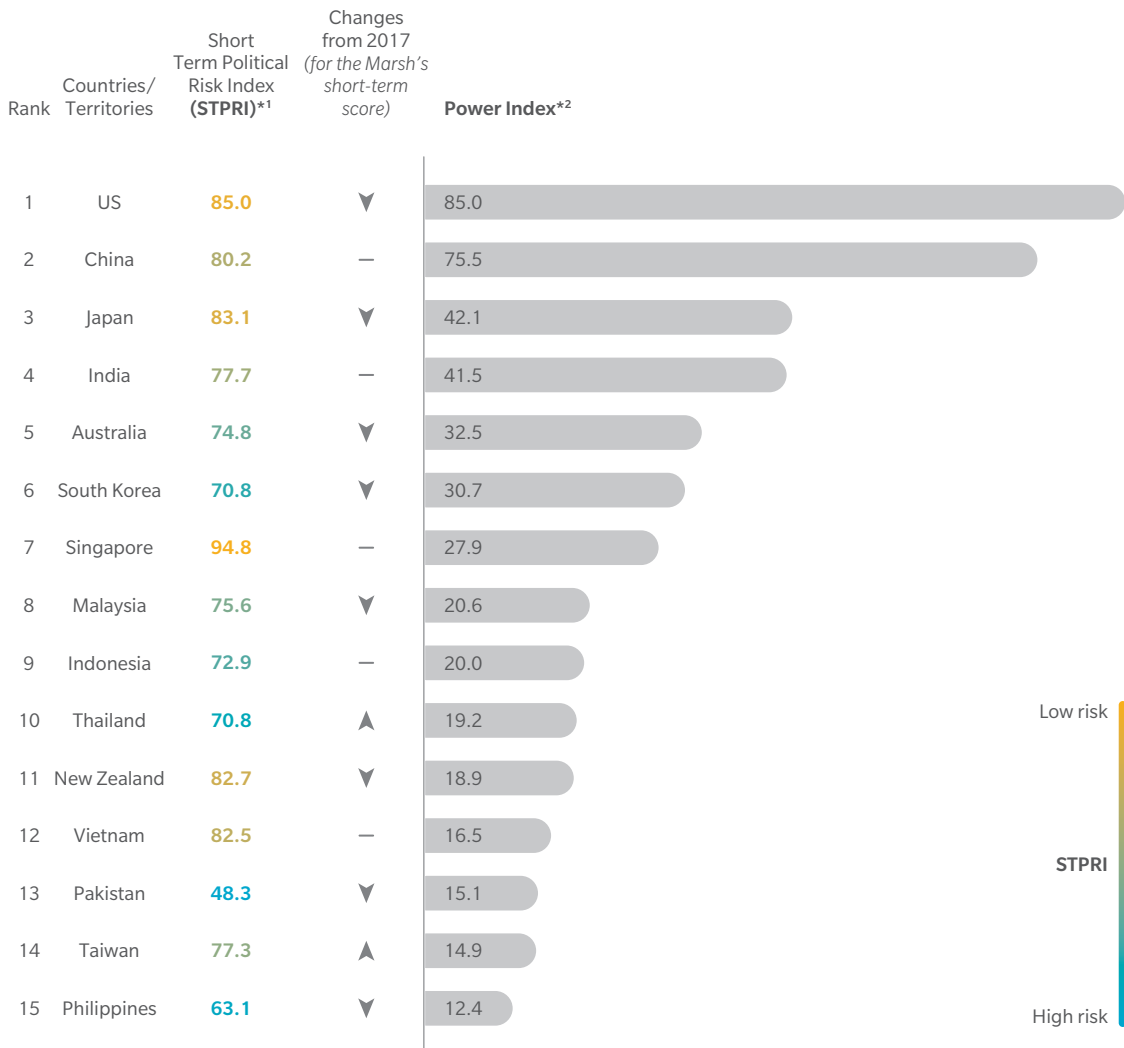
## GEOPOLITICAL LANDSCAPE: MANEUVERING SHIFTING GEOPOLITICAL SANDS

**Rapid geopolitical developments have created new uncertainties in the region. With global and regional powers redefining their priorities, smaller states are being forced to reconsider their foreign policies, making it harder for regional cooperation and integration.**

Geopolitical complexity in Asia-Pacific is ongoing and continues to throw up challenges. Territorial tensions such as the island disputes in the South and East China Sea remain, even though there have been no new developments. The increasingly precarious state of international relations, however, has created new uncertainties.

The Marsh/BMI Political Risk Map,<sup>39</sup> which quantifies the risk of a political shock that will affect

**Exhibit 5: Changes in short-term Political Risk 2017/2018 and Asia-Pacific**



\*1 The 2018 Marsh and BMI's Short-term Political Risk Index quantifies the risk of a sudden change in the political environment that would affect business conditions within a country/territory in the short-term. The key question is whether a government can deliver its chosen agenda, and is measured across 4 components: Policy making process, social stability, security/external environment, and policy continuity

\*2 The 2018 Lowy Institute Asia Power Index ranks 25 countries and territories in the Asia-Pacific in terms of their ability to exercise power. Power is defined as the capacity of a state or territory to direct or influence the behavior of other states, non-state actors, and the course of international events. A country/territory's overall power index is its weighted average across the eight measures of power, which consists of: military capability and defense networks, economic resources and relationships, diplomatic and cultural influence, resilience and future trends

Source: Marsh and BMI's Political Risk Map 2018 and Lowy Institute's Asia Power Index 2018

a country's business environment, shows that short-term political risk in major countries, namely Australia, Korea, Japan, Malaysia and the Philippines, has increased over the past year (Exhibit 5). This reflects the various complicated recent geopolitical changes in the region, from the ongoing developments on the Korean Peninsula to the continuing presence of the Islamic State. Domestically, there have been not only surprising election results (such as that in Malaysia), but also an overall spread of populism, nationalism and strong-state politics – a continuing trend from 2015/16 – which further complicates geopolitical relations in Asia-Pacific.<sup>40</sup>

At a higher level, the ascent of China onto the world stage as a global leader, together with the US' more protectionist stance on trade, has led to major power shifts.<sup>41</sup> Countries in the region have found that they will need to recalibrate their relations with major powers, particularly with China and the US. Some states, such as Cambodia, seem to have realigned themselves with one of the major powers,<sup>42</sup> while others such as Singapore

continue to navigate complex state relations and manage balanced ties. India, a regional major power, is also trying to maintain a delicate balance between cooperating and competing with China.

Geopolitical considerations have significantly complicated initiatives for deeper trade and investment ties. For example, China's Belt and Road Initiative (BRI), which aims to bolster regional connectivity and cooperation, has exacerbated tensions and prompted strong reactions due to its potential geopolitical underpinnings. For instance, Thailand plans to reduce its reliance on Chinese investment by creating a regional fund for infrastructure together with Laos, Vietnam, Cambodia and Myanmar.<sup>43</sup> Another example is the development of another major infrastructure project proposed by Australia, the US, Japan and India (dubbed "the Quad"), as a geopolitical response to the BRI.<sup>44</sup> The fear is that these geopolitically driven projects are not based on sound projections of economic returns and will end up resulting in wasteful expenditure.<sup>45</sup>

## | I N F O C U S |

### FALL-OUT FROM THE US-CHINA TRADE DISPUTE

According to recent analyses,<sup>32</sup> the US-China trade war will have far reaching impacts beyond direct effects to the US and China as it hits the global supply chain. In particular, economies that are deeply embedded in China's supply chain, based on added value to Chinese exports to the US, such as Taiwan, South Korea, Malaysia, and Singapore, will be most exposed.<sup>33</sup> The Bank of Japan Governor Haruhiko Kuroda has also sounded an alarm over the potential indirect impact of the trade war on Japan's economy.<sup>34</sup> Similarly, 16.7 percent of the Philippines' exports are part of China's value chain, making the country vulnerable to softened demand for Chinese exports in the US as a consequence of the tariffs imposed.<sup>35</sup>

The trade war also poses a major threat to other economies that are dependent on exports for economic growth in general. The effects vary depending on the type of export goods. For example, manufacturing goods exporters such as Vietnam – whose shipped goods totaled 99.2 percent of national GDP during April 2017 – March 2018, and whose total value of exports has more than quadrupled from 2008 to 2018 – may be more adversely impacted by the trade war than Hong Kong, which mainly exports services to the US and China.<sup>36</sup> Separately, the appreciation of the US dollar as an effect of the trade war has also brought about potential currency and balance of payment risks. As their currencies depreciate, economies such as the Philippines and Indonesia, which are less export-oriented, may be faced with inflationary pressures and the risk of growing account deficits.

## TECHNOLOGICAL RISKS: RAPID CHANGES

**Advances in technology have become the focus of many governments and is featured heavily in national development strategies. However, emerging technologies are evolving faster than society’s ability to effectively regulate and manage them. Governments across Asia-Pacific will increasingly have to actively weigh between the benefits that technology can bring, while attempting to prepare for unknown operational, security and ethical problems arising from it.**

Many Asia-Pacific countries have recognized the strategic importance of technological development and accelerated their push for a more technologically-savvy society, exemplified by Singapore’s launch of its “Smart Nation” initiative for digital transformation.<sup>46</sup> Countries are also looking to leverage technology as one of the avenues to address the aging dilemma in Asia-Pacific.<sup>47</sup> Notably, the application of new technologies in areas such as healthcare and job redesign are expected to partially alleviate demographic pressure on aging societies’ workforce productivity. In Japan, for example, automation has been deployed at a large scale to help address the tight labor market as more older employees exit the workforce.<sup>48</sup> Another notable area where new technology has contributed is in renewable energy, which help with climate change adaptation and mitigation.

Among the rapidly developing technologies, AI has become the focus of intensifying technology competition between major powers such as the US and France,<sup>49</sup> as well as Japan and China, which are also taking steps to better understand and advance AI. More recently, China’s “Made in China 2025” blueprint, which calls for “self-sufficiency” through technology substitution, has become a bone of contention in its trade dispute with the US.<sup>50</sup> Tellingly, China’s total equity funding to AI startups exceeded that of the US in 2017 (Exhibit 7).

As interest in advanced technologies has increased, the adverse effects of these emerging technologies have become more visible as well, demanding swift regulatory responses. In the last version of this report,<sup>51</sup> for example, we stressed on the consequences of technological advances and automation – in particular the loss of manufacturing jobs, especially in emerging economies, and how this has impacted employees in lower-skilled jobs/industries the most.

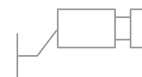
Over the past three years, cyber-attacks have also come to the fore,<sup>52</sup> especially in Asia-Pacific countries where cyber security frameworks and preparedness are significantly weaker than in the West. Singapore, for example, recently experienced a massive cyber-attack on its national healthcare institutions, in which personal data of millions of patients were stolen, including that of the prime minister.<sup>7</sup> Also on the rise are state-on-state cyber-attacks across the region,<sup>53</sup> with various regional

### Exhibit 6: Weighing the benefits of technology and its various risks



#### BENEFITS OF TECHNOLOGICAL ADVANCEMENT

- Technology can be applied to boost productivity and help alleviate other social/environmental problems
- Key emerging technologies have become part of national strategies and key investment priorities, globally and in Asia-Pacific



#### OPERATIONAL, SECURITY AND ETHICAL RISKS

- Cyberattacks in Asia-Pacific have been increasing in both frequency and sophistication
- Societal consequences, such as how automation can lead to job loss, have been highlighted before
- Possible geopolitical implications such as state-on-state cyberattacks and cyber laws



Source: APRC analysis

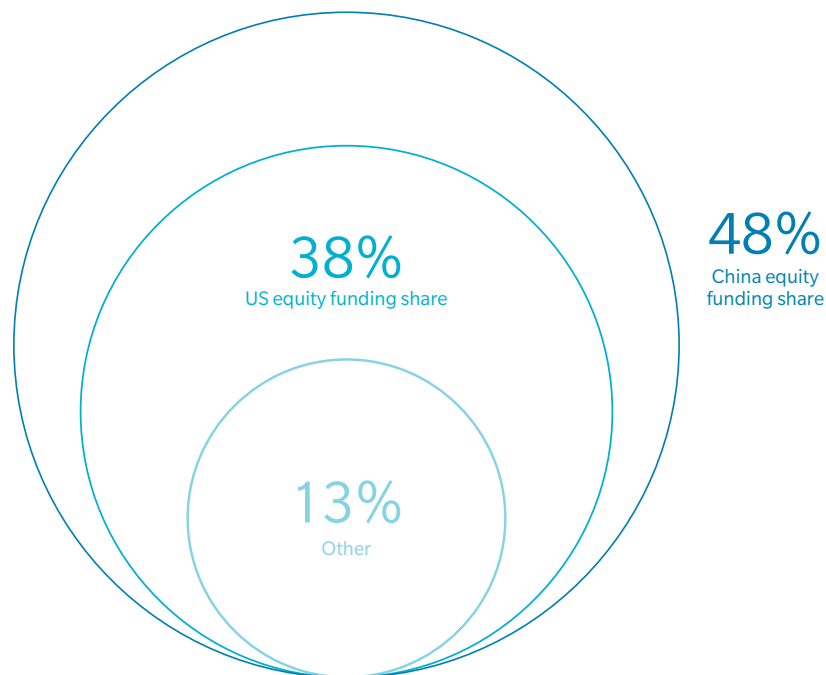
state-sponsored groups taking advantage of network vulnerabilities to collect personal information for political purposes. New Zealand, for example, reported that 122 out of the total 396 cyber-attacks it faced in 2017 were linked to state-sponsored computer network exploitation groups.<sup>54</sup> North Korea has also been accused of sponsoring cyber operations to attack and raise cash for the regime, emphasizing the prevalence of such acts in Asia-Pacific.<sup>55</sup>

The need to tighten cyber security frameworks has led to the development and enactment of new cyber laws across Asia-Pacific. However, the possible geopolitical and economic implications of such processes are often left out. For instance, the wide and ambiguous mandate of recently passed cyber laws in China and Vietnam have

been criticized as enabling more state control over multinational companies' data, while putting these businesses at risk of regulatory troubles outside the bounds of cyber security.<sup>56,57</sup> These laws also require multinational companies to store critical personal data collected locally, which will significantly increase business costs. Related to these developments, another worrying trend is the potential shift from the "Internet" to "splinter-net",<sup>58</sup> where protectionist policies could evolve into a tech-based trade war on the back of already tenuous relationships. Between China, the US and the European Union (EU), each region has been looking to develop its own policies regarding data and cyber security, which may not be compatible with those in others, resulting in a fragmented Internet.

---

**Exhibit 7:** US and China total equity funding to AI startups in 2017



Source: CB Insights

---

## ENVIRONMENTAL RISKS: BALANCING DEVELOPMENT AND SUSTAINABILITY

**The volatility of extreme weather events and natural disasters is increasing, making them harder than ever to manage. Countries in Asia-Pacific continue to grapple with the economic and social consequences of these events, while balancing between economic development plans, the climate change mitigation and adaptation agenda, and the potential geopolitical ramifications of climate change.**

Asia-Pacific continues to be the most disaster-prone region in the world – human loss,<sup>59</sup> displacement and ensuing social disruption due to extreme events in the region have been well documented. According to the United Nations' Department of Economic and Social Affairs, half to two-thirds of Asia's cities with at least one million inhabitants are exposed to climate-related hazards.<sup>60</sup> Floods and tropical cyclones are the main drivers of economic losses and often hit coastal areas, where most people and assets are concentrated. Natural disasters have caused immediate economic loss through asset destruction, and through disruption of the complex networks of global supply chains when key economic centers (such as industrial zones or key ports) have been hit.<sup>61</sup>

While environmental risks are expected and relatively well understood, they have not been adequately addressed and can still surprise us. In fact, as the frequency and destructiveness of natural disasters in Asia-Pacific are projected to increase in the coming years,<sup>59</sup> efforts to shore up resilience will have to be intensified going forward.

However, a multitude of domestic and international factors have conspired to frustrate this process.

Domestically, governments continue to have to balance between economic development, energy security, and making progress towards climate change mitigation and adaptation. For instance, in October 2017, China abruptly closed thousands of factories as part of the government's crackdown on pollution.<sup>62</sup> The move sparked fear that the resulting disruption may damage the country's economic growth,<sup>63</sup> even as the government argued that there are no longer-term economics.<sup>64</sup> Similarly, the Philippines government decided in late April 2018 to close the popular Boracay beach for six months in an attempt to rectify sewage and environment-related problems, at the cost of 56 billion pesos in tourism revenue if the closure lasts for a year.<sup>65</sup>

Problems arising from this difficult balancing task can also be observed in Asia-Pacific countries' national efforts to meet renewable energy targets.<sup>66</sup> Globally as well as regionally, the renewable energy agenda has garnered support from not just governments but also the private sector, which has stepped away from coal-fired generation. For example, larger insurers such as Zurich, AXA, Allianz, Munich Re, Generali and Swiss Re have limited their coverage for coal-fired power generation assets.<sup>67</sup> However, in some cases, the push towards renewables has come into conflict with the need to meet national energy demand.

For instance, in Indonesia, which is the second biggest coal exporter globally, the government aims to increase renewable energy capacity to 23 percent of total energy mix by 2025, but this is

---

### Exhibit 8: Projected vulnerability changes for Asia and the Pacific

As Asia-Pacific becomes more vulnerable to climate change, economies in the region continue to grapple with major challenges



Balancing between **climate change mitigation and adaptation agenda** and **economic development plans**



Seeking **international cooperation** to address environmental risks in a **geopolitically complicated region**

Sources: UNESCAP

---



made difficult partially by the continued dependence on coal to meet soaring energy demands. As such, the need to persist with subsidies for the coal industry has made renewable energy significantly less competitive despite the government's ambitious target.<sup>68</sup> Australia's transition to renewable energy elucidates this point further. In this case, some coal plants have been shut down before renewable sources have been able to reach the required capacity to replace them, thus contributing to a supply-demand mismatch and a serious energy price shock.<sup>69</sup> Debate at the federal level around this transition has been mired with political fracture and unclear directives, exacerbating the problem.<sup>70</sup>

Finally, a significant component of environmental risk reduction is directly tied to climate change mitigation and adaptation, which more often than not requires concerted efforts from all countries. In 2016, a landmark agreement was reached at

the United Nations Framework Convention on Climate Change, which sought to pave the way to limit global temperature rise this century to below 2 degree Celsius. Since then, in Asia-Pacific, positive headway has been made across several countries. China continues to make efforts to combat its pollution problems and it is leading the energy transition to renewables. Some countries, such as India and Nepal, have established cross-border advanced warning systems to safeguard against flooding, cyclone, drought and heatwave.<sup>71</sup>

However, similar cooperation in the region to curb climate risks has been limited, partly due to geopolitical tensions. For example, the border dispute between China and India may have played a role in China's refusal to share hydrological data for the Brahmaputra river from upstream China with downstream India in the monsoon season for flood projections, heightening flood risks in the region.<sup>72</sup>

## PREPARING FOR A COMPLEX, INTERCONNECTED, AND EMERGENT RISK LANDSCAPE

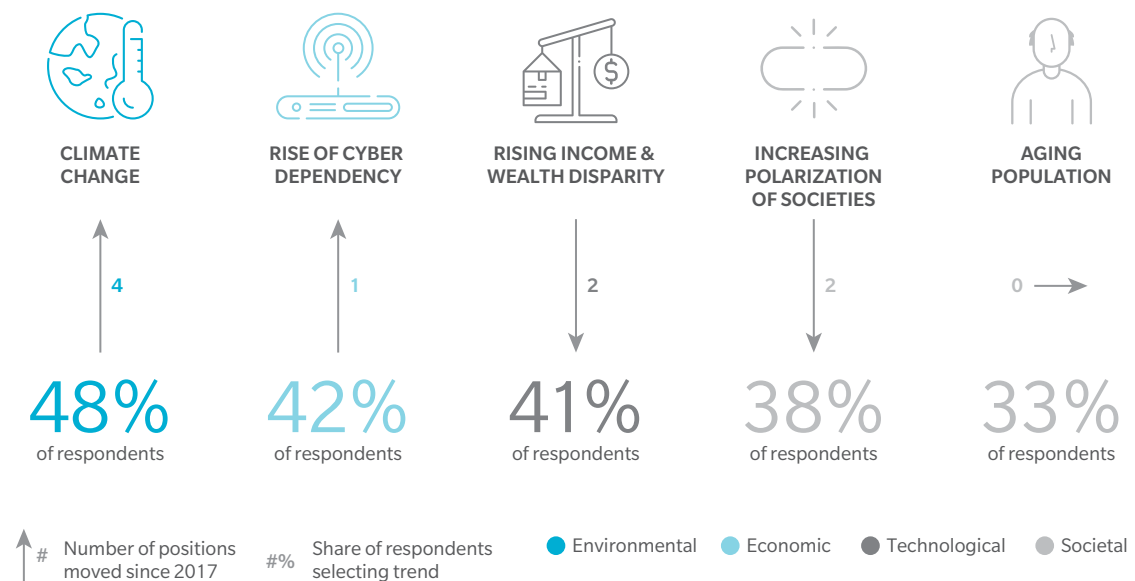
The Asia-Pacific region will continue to remain economically dynamic and vibrant, but businesses will also be looking at a complex web of interconnected risks that are simultaneously pulled by various trends. Findings from the *Global Risks Report 2018* show that the five trends shaping global development identified in the *Global Risks Report 2017* continue to be high on the minds of risk experts (Exhibit 9).

The turbulent pace of global and regional change in 2017/2018 has given rise to risks that can no longer fit into a singular category. A prime example of these risks is the permeation of technological elements into other categories of risks, notably geopolitical concerns. For example, it is now arguably impossible to have an informed discussion on geo- or socio-political issues in Asia-Pacific without referencing the increasing frequency of state-on-state cyber-attacks, or the political, economic and ethical implications

of enacted cyber laws in response. An equally illuminating example is how the risk of water crisis has transformed from an environmental risk to a societal risk due to its wide-ranging effects on communities, and may lead to geopolitical instabilities in the future. For example, the construction of dams by countries in upstream Mekong river for water and energy security has adversely affected the livelihood and the river ecosystem of countries in the downstream, exacerbating environmental risks in these localities and heightening geopolitical tensions, too.<sup>73</sup>

In the discussion that follows, we aim to show this complexity, interconnectedness, and emergent characteristic of the Asia-Pacific risk landscape through in-depth analyses of two important issues for regional development, namely the risks of **critical infrastructure failure or shortfall, and talent shortages**.

**Exhibit 9:** Top trends shaping global development 2018

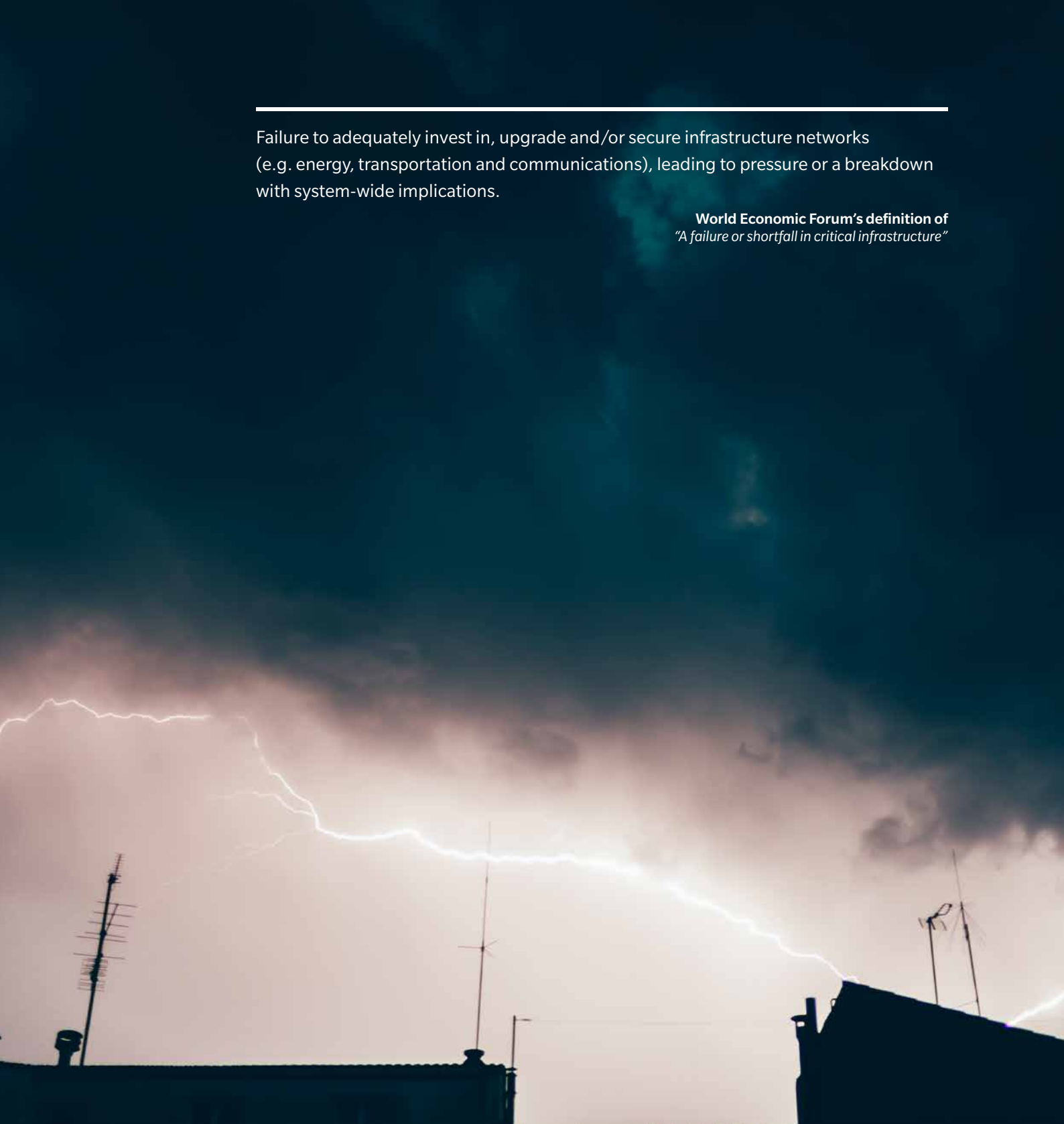


Source: Global Risk Perception Survey 2018

---

Failure to adequately invest in, upgrade and/or secure infrastructure networks (e.g. energy, transportation and communications), leading to pressure or a breakdown with system-wide implications.

**World Economic Forum's definition of**  
*"A failure or shortfall in critical infrastructure"*



# SAFEGUARDING DEVELOPMENT IN ASIA-PACIFIC: KEY RISKS TO THE PHYSICAL AND HUMAN INFRASTRUCTURE

The Asia-Pacific region is developing incredibly fast economically. The continuation of such growth will require matching developments in the region's physical infrastructure and human infrastructure. These are important development areas for both governments and businesses in Asia-Pacific.

It is thus important to address the risk of critical infrastructure failure or shortfall (a risk to the region's physical infrastructure), and the risk of talent shortages (a risk to the region's human infrastructure). These risks affect regional economic growth, and also carry significant societal implications, with inequality and social instability at the center. Underdeveloped critical infrastructures present a major barrier to poverty reduction and equitable development. On the other hand, a growing talent crunch implies a shrinking population of those possessing relevant

skills, or access to the training of such skills. This inequality of skills will translate into an unequal distribution of income and wealth, which can be deeply destabilizing for society.

This chapter is thus dedicated to discussing the risks of critical infrastructure failure or shortfall, and talent shortages in Asia-Pacific. It begins with an overview of these issues across the region and is followed by an analysis of how ongoing trends will influence them, and how businesses can respond to these threats. Building on the previous chapter, these two nexus of risks provide vivid illustrations of how independent risks continue to be enveloped in mega trends that significantly impact how they will evolve. While the discussion is primarily from a business perspective, it also carries relevance to governments and policymakers across Asia-Pacific.

## CRITICAL INFRASTRUCTURE FAILURE OR SHORTFALL

Infrastructure development in Asia-Pacific has historically faced a paucity of funds. There is a lack of private participation and governments finance more than 90 percent of infrastructure investment. However, most governments do not have the capacity and resources to meet their national infrastructure needs.<sup>74</sup> The effects of this shortfall have been widely felt as large pockets of the region suffer from poor connectivity, prolonged traffic congestions, power outages, or overload.

**Transportation infrastructure:** There is consensus that emerging economies are trailing significantly behind advanced economies in terms of transportation infrastructure quality, leading to substantial economic cost. Lost time and increased transportation costs due to road congestion are together estimated to cost Asian economies 2-5 percent of GDP every year.<sup>75</sup> Additionally, poor transportation infrastructure, especially port infrastructure, can also result in significant opportunity cost of unrealized economic growth.<sup>76</sup>

**Energy infrastructure:** According to the Energy Trilemma Index, which tracks countries/territories' performance in Energy Security, Energy Equity and Environmental Sustainability,<sup>a</sup> Asia overall is underperforming across all three pillars. As with transportation infrastructure, the substantial increase in energy demand from economic growth will require substantial additional development and improvement to the region's energy infrastructure. There are three key challenges the region faces in this regard:

- **The urban-rural divide in energy access** remains the key problem for energy equity in the region
- **The lack of energy security**, most discernible through high loss in transmission and distribution and unreliable energy supply, which lead to frequent outages that disrupt everyday life
- The **slow progress of the renewable energy agenda** needs to be addressed to ensure energy security while pursuing environmental sustainability

a. The three pillars of the Energy Trilemma Index are defined as followed:

- Energy security: Effective management of primary energy supply from domestic and external sources, reliability of energy infrastructure, and ability of energy providers to meet current and future demand
- Energy equity: Accessibility and affordability of energy supply across the population
- Environmental sustainability: Encompasses achievement of supply- and demand-side energy efficiencies and development of energy supply from renewable and other low-carbon sources

**Information and Communication Technology (ICT) infrastructure:** Limited access to ICT (notably in terms of the share of population with access to the Internet and broadband subscriptions) suggests a dearth in infrastructure despite more investment being dedicated to the sector. Failure to meet the growing demand for ICT infrastructure will significantly hamper growth in emerging countries, and will contribute to a widening digital

gap domestically and globally.<sup>77</sup> At the same time, more and improved ICT infrastructure are also needed from a cybersecurity perspective. Despite the rise in cyber dependency and the growth in the number and sophistication of cyber-attacks in recent years, there is a lack of investment in appropriate cybersecurity measures, leaving many critical infrastructures exposed.<sup>78</sup>

**Table 1:** Selected indicators for the state of transportation, energy and ICT infrastructure across different economies in Asia-Pacific

SECTOR	QUALITY OF TRANSPORTATION				ENERGY			ICT			
	Road	Rail-road	Port	Air transport	Quality of energy supply	Access to electricity	Loss from Transmission & Distribution	Mobile subscription	Individuals using the internet	Fixed broadband subscription	Secured internet servers
Unit	1-7, best	1-7, best	1-7, best	1-7, best	1-7, best	% of population	% of electricity consumption	Per 100 people <sup>*1</sup>	% of population	Per 100 people	Per one million people
Year	2017	2017	2017	2017	2017	2017	2017	2016	2016	2016	2016
<b>EMERGING ECONOMIES</b>											
<b>Indonesia</b>	4.1	4.2	4	4.8	4.4	97	9.8	148	25.3	2	1,284
<b>Malaysia</b>	5.3	5	5.4	5.7	5.9	100	6.1	141	78.8	8.7	4,837
<b>Philippines</b>	3.1	1.9	2.9	2.9	4.2	89	9.7	109	55.5	5.5	88
<b>Thailand</b>	4.3	2.6	4.3	5.2	5.2	100	5.9	174	48	10.5	580
<b>Vietnam</b>	3.4	3	3.7	3.8	4.3	99	9.2	128	47	9.6	1,335
<b>China</b>	4.6	4.8	4.6	4.9	5	100	5.8	97	53.2	23	209
<b>India</b>	4.3	4.4	4.6	4.6	4.7	79	19.9	85	29.5	1.4	123
<b>ADVANCED ECONOMIES</b>											
<b>Australia</b>	4.8	4.1	4.9	5.2	5.7	100	5.1	110	88.2	30.6	21,547
<b>New Zealand</b>	4.7	3.5	5.5	5.6	6.5	100	6.6	124.4	88.5	32.8	14,980
<b>Korea</b>	5.6	5.7	5.2	5.9	6.4	100	3.5	120.7	92.8	40.5	1,196
<b>Hong Kong</b>	6.2	6.3	6.5	6.6	6.8	100	9.4	240.8	87.5	36.0	10,484
<b>Japan</b>	6.1	6.6	5.3	5.6	6.7	100	4.6	131	93.1	31.2	5,980
<b>Singapore</b>	6.3	5.9	6.7	6.9	6.9	100	1.7	150	81	26	58,690

\*1 A subscription rate of more than 100 subscriptions per 100 people implies that on average, every person has more than one subscription

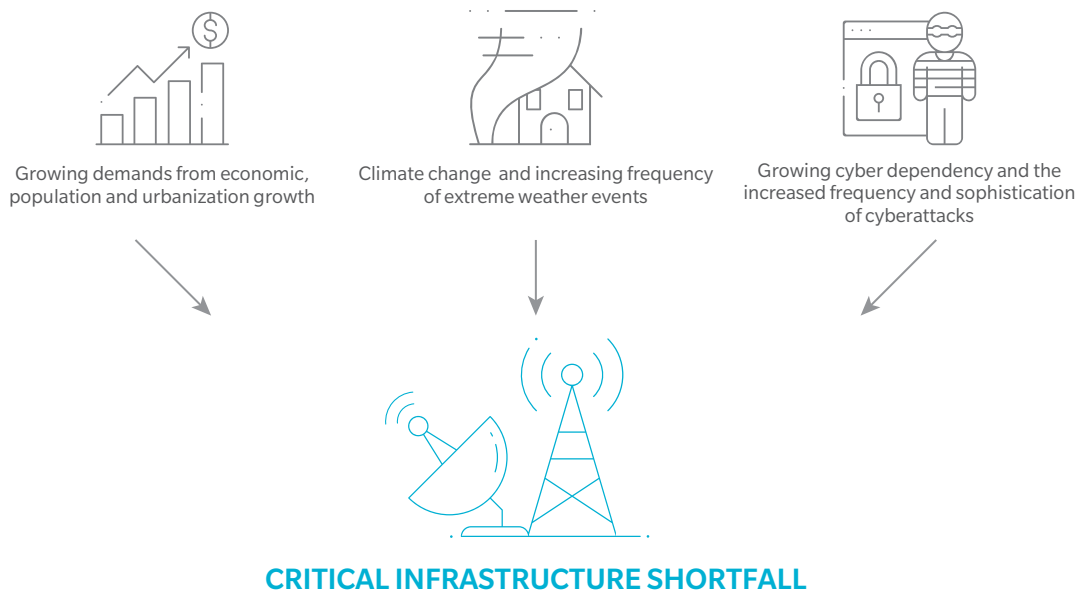
Source: Global Competitiveness Index 2017–2018, Energy Trilemma Index 2017, and the World Bank’s Development Indicators

## FUTURE COMPLICATIONS: HOW ONGOING TRENDS EXACERBATE INFRASTRUCTURE FAILURE OR SHORTFALL

The existing infrastructure failure or shortfall in Asia-Pacific will be exacerbated by three ongoing trends in the region (Exhibit 10). These trends heighten the **shortage** of infrastructure, the **vulnerability** of existing infrastructure, and highlight the need to bolster critical infrastructure quantity and quality in the region.

- First, as discussed in the previous section, the rapid economic growth in Asia-Pacific, which is accompanied with a rapid growth in population and urbanization, will create demand for new critical infrastructure in the transportation, energy and ICT sectors
- Second, the increasing frequency and unpredictability of climate change events will inflict significant damage on critical infrastructure and also heighten demand for the expansion and upgrade of old infrastructure. It will also necessitate the provision of new infrastructure that can contribute to climate change adaptation and mitigation
- Finally, the rise in cyber dependency has made physical infrastructure significantly more connected and thus more vulnerable to cyber-attacks. The increased frequency and sophistication of these attacks in recent years have highlighted the need to protect critical infrastructure from a cybersecurity perspective

**Exhibit 10:** Ongoing trends that will exacerbate infrastructure failure or shortfall



Source: APRC analysis

## GROWING DEMAND FROM ECONOMIC, POPULATION AND URBANIZATION GROWTH

Strong economic growth in the past 10 years in Asia-Pacific has pushed up the demand for new infrastructure, particularly in the region's emerging economies. There is additional pressure in this regard from continued urbanization,<sup>79</sup> the rate of which in East Asian and Southeast Asian countries has exceeded the global rate of urbanization (Exhibit 11A). Demographic changes will also likely increase the demand for infrastructure, both in countries where the population is expected to continue growing like in India, or in aging societies where there is an increasing demand for infrastructure that can accommodate an older population.

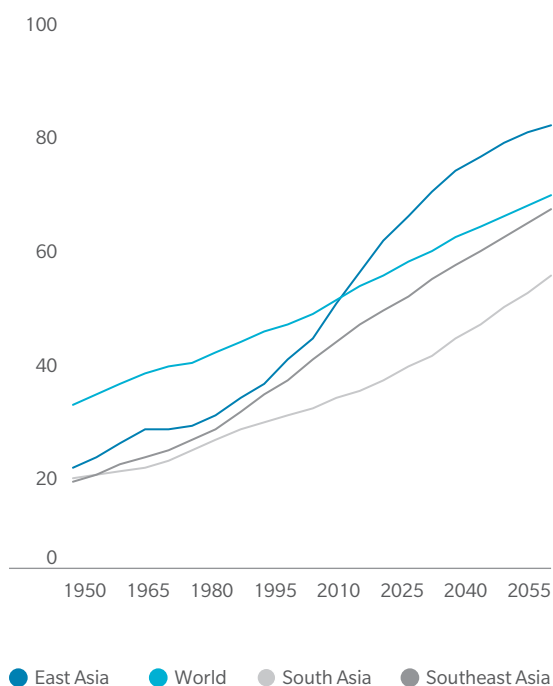
According a report by the Asian Development Bank (ADB), 45 developing countries in Asia (including Asia-Pacific and central Asia) will require an additional \$22 trillion for infrastructure development to maintain economic growth

and eradicate poverty between 2015 and 2030. As China has already been investing heavily in domestic infrastructure projects and the Belt and Road Initiative (BRI), the gap is presently a bigger concern in other countries in the region (Exhibit 11B).<sup>74</sup>

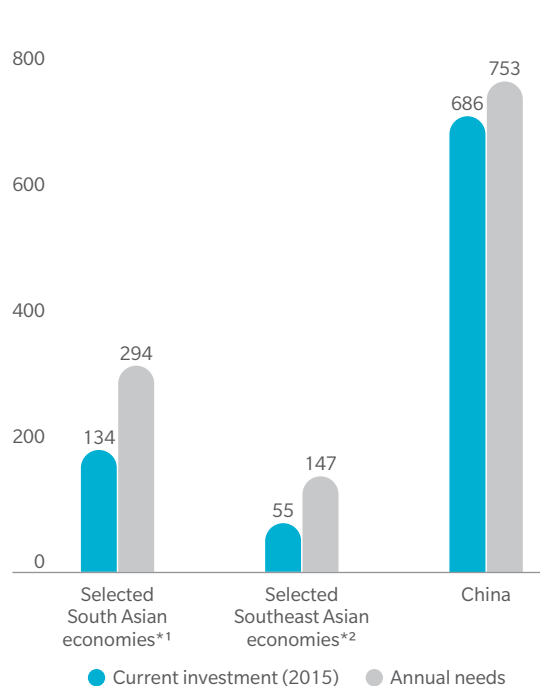
In terms of sectors, investment needs are the highest in energy and transportation infrastructure. Together, the investment gap in these sectors constitutes more than 86 percent of the total infrastructure gap in Asia-Pacific. This is consistent with a previous ADB estimation,<sup>80</sup> according to which, the largest infrastructure gap is in the electricity sector at 3.17 percent of estimated regional GDP, followed by transportation (2.3 percent) and telecommunications (0.82 percent). It should be noted, however, that the composition of this gap varies widely across regions and countries. For example, the transportation infrastructure gap is significantly more acute in South Asia than in East and Southeast Asia, where investment needs are more concentrated in electricity infrastructure.

**Exhibit 11:** More infrastructure is needed to support economic and population growth as well as ongoing urbanization

11A. PERCENTAGE OF URBAN POPULATION ACROSS REGIONS



11B. INFRASTRUCTURE GAP IN ASIA (2015 \$BILLION) 2016-2030



\*1 South Asian economies studied in the ADB report are Afghanistan, Bangladesh, Bhutan, India, Pakistan, Sri Lanka, Maldives, Nepal

\*2 Southeast Asian economies studied in the ADB report are Brunei, Indonesia, Cambodia, Laos, Myanmar, Malaysia, the Philippines, Singapore, Thailand, Vietnam

**Source:** Data from the UN World Urbanization Prospect 2018 and Asian Development Bank 2016, APRC analysis

## CLIMATE CHANGE AND INCREASING FREQUENCY OF EXTREME WEATHER EVENTS

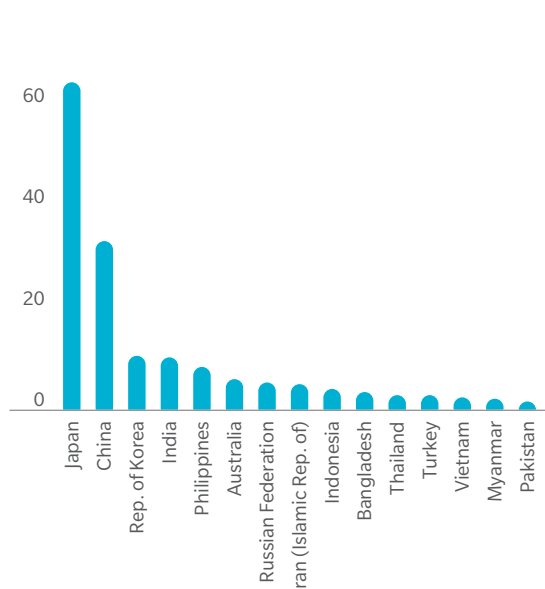
In the past few decades, we have witnessed a pronounced increase in the frequency of extreme weather events around the world. Economic losses from severe weather have been rising in tandem, and Asia-Pacific is perhaps most adversely affected – between 1997 and 2016, six of the 10 countries most affected by natural disasters were in the region.<sup>81</sup> From 2006-2015, economic losses from natural disasters in Asia amounted to \$126 million a day,<sup>82</sup> and this figure is projected to increase (Exhibit 12A).<sup>83</sup> Climate change is expected to severely impact all types of infrastructure and threatens the reliability and efficiency of energy, transport and water networks.<sup>84</sup> In July 2018, for instance, Typhoon Maria caused over 55,000 households in Taipei to be left without power for hours. In addition to direct losses, natural disasters also often delay repair and maintenance operations, hindering the emergency response needed for a prompt recovery. The In Focus section below lays out four key climate risks and their effects on infrastructure.

Climate change events will likely exacerbate the shortfall of critical infrastructure. The already substantial infrastructure gap increases

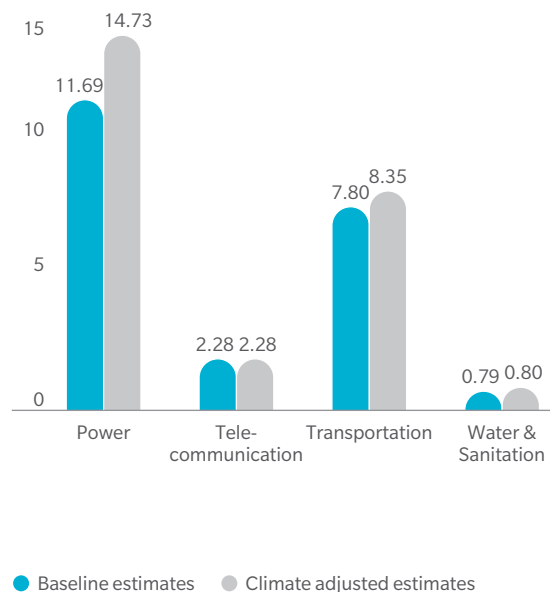
significantly when taking into account the investment needed to prepare new and existing infrastructure against the effects of climate change. Above the estimated baseline \$22 trillion addition investment needed, countries in Asia-Pacific will require an extra \$4 trillion over the next 15 years for this endeavor, mostly concentrated in the power sector, according to the ADB (Exhibit 12B). As indicated by the United Nations Development Programme, the development of climate-resilient infrastructure requires the deployment of both structural and non-structural risk mitigation strategies.<sup>85</sup> The former involves any physical intervention on infrastructure aiming at reducing or avoiding the impact of catastrophic events. A new class of “sustainable infrastructure” (SI), which entails the building of sustainable, low-carbon and climate resilient infrastructure, has recently received more attention, and efforts are underway to promote and support SI investment opportunities.<sup>86</sup> However, there are significant barriers to this endeavor, including a lack of regulatory frameworks, investor conviction and effective initiatives that investors can be on board with.<sup>87</sup> This is where non-structural measures, which encompass the adoption of policies and laws such as building codes and land use planning, and also training, education and public communication initiatives, are required.

### Exhibit 12: Ongoing climate change will demand more investment into infrastructure to bolster resilience

12A. ESTIMATED ANNUAL AVERAGE FUTURE LOSS<sup>1</sup>  
(2012 \$BILLION)



12B. INFRASTRUCTURE GAP IN ASIA (2015 \$TRILLION)  
2016-2030



<sup>1</sup> Average annual loss (AAL) refers to the estimated average loss annualized over a long time period considering the full range of loss scenarios relating to different return periods

Source: UNESCAP 2018 and Asian Development Bank 2016



## CLIMATE RISKS AND THEIR EFFECTS ON INFRASTRUCTURE

	HOW IT AFFECTS INFRASTRUCTURE	EXAMPLES
 <p><b>Floods</b> Floods are projected to increase globally under climate change.<sup>88</sup></p>	<p>Infrastructure in coastal areas will become prone to more frequent flooding and storm surges due to sea level rise, and many low-lying areas will require barriers to be protected from water.</p> <p>Flooding also increases the probability of landslides and mudslides, affecting transportation infrastructure and power lines.</p>	<p>Roads, bridges, railways and airport across India, Bangladesh and Nepal were damaged by severe floods in 2017, isolating many areas across the region.<sup>89</sup></p> <p>In Japan, which is considered a leader in earthquake planning, heavy rainfalls in July 2018 exposed how it had overlooked the importance of making key infrastructure flood-resilient.<sup>90</sup> Torrential rain has destroyed roads, derailed trains and disrupted many businesses and supply chains.<sup>91</sup></p>
 <p><b>Tropical cyclones</b> Among the costliest types of natural disaster, with climate model projections pointing at a future increase in extreme rainfall and winds associated to these events in East, Southeast and South Asia.<sup>92</sup></p>	<p>Tropical cyclones cause disruption to transportation, energy, and telecommunication infrastructure. In addition, tropical cyclones are responsible for coastal erosion, increasing the risk of assets along coastlines.</p> <p>Tropical cyclone losses have been increasing in the last decades. This is linked to population growth, especially in densely populated areas of high hazard, and to macroeconomic trends, with a pronounced increase in exposure value.</p>	<p>In August 2017 typhoon Hato struck South China with wind gusts reaching 224 km/h, producing along its path economic damage of over US\$6.82 billion. Insured losses in Hong Kong, Macau, China, and Vietnam amounted to over US\$1.1 billion, making Hato score among the top 20 most expensive events for the insurance sector in 2017.<sup>93</sup></p> <p>In September 2018, Japan's Kansai International Airport was completely shut down after high storm tides caused by Typhoon Jebi flooded the airport. Thousands were also left stranded because the only bridge linking the airport to the mainland via road and rail was severely damaged.<sup>94</sup></p>
 <p><b>Global warming and heat waves</b> Average temperatures around the world have been increasing but at an uneven pace. In South Asia, average annual temperatures in some areas, such as South-eastern India and western Sri Lanka have increased by 1 to 1.5 degree Celsius between 1950 to 2010. In other areas, such as south-western Pakistan, average temperatures have increased by 1 to 3 degrees Celsius over the same period.<sup>95</sup></p> <p>Climate change has caused the observed global increase in the frequency, intensity, and duration of heat waves, and such changes are expected to persist in the future.<sup>96</sup></p>	<p>A warmer climate will reduce the efficiency of energy infrastructure, as higher temperatures increase electric power losses in transmission and distribution network and reduce the efficiency of the cooling systems employed in energy production plants. On the demand side, heat waves are and increasingly will be responsible for steep surges in the energy demand of electricity used for cooling.</p> <p>Heat waves will increasingly cause thermal stress and buckling in steel infrastructure not designed to withstand prolonged period of high temperatures.<sup>97</sup></p> <p>Additionally, heat waves can cause asphalt to soften and expand, damaging roadways, and affect all types of infrastructure projects, as extreme temperatures limit construction labor productivity, especially in conditions of high humidity.<sup>98</sup></p> <p>A warmer climate will also increase the risk of droughts, with the consequent reduction in the amount of water available for hydropower production.<sup>99</sup></p>	<p>Railway failures caused by extreme temperatures have been one of the major causes of train service disruption in Australia.<sup>100</sup></p> <p>During the heat wave which affected Australia in early 2018, more than 50,000 households in Sydney did not have access to electricity because the surge in consumption caused distribution networks to overload and fail.<sup>101</sup></p>

## CYBER DEPENDENCY AND THE INCREASED FREQUENCY AND SOPHISTICATION OF CYBER-ATTACKS

Cities and businesses in Asia-Pacific are increasingly dependent on technology for their everyday operations. This growing cyber dependency has two major implications for infrastructure development. On the one hand, it will lead to a growing demand for ICT infrastructure that is currently already not being met. On the other, it also means that cities and businesses in the region are progressively under the threat of a systemic breakdown from a cyber-attack.

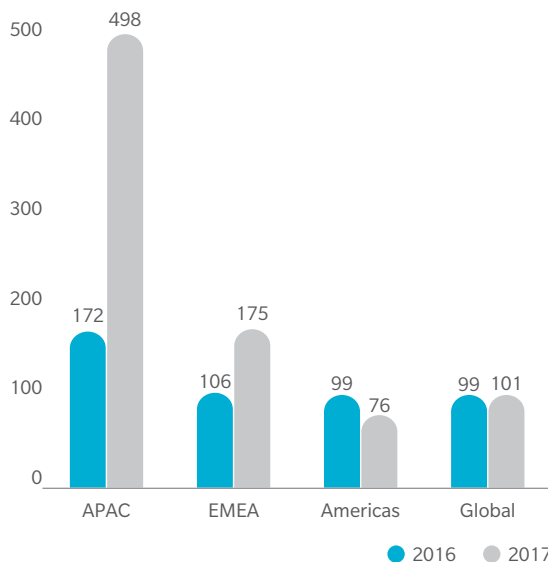
Countries across Asia-Pacific have similarly experienced cyber-attacks on what they considered critical infrastructure. For example, last year, reports in Australia showed a rise in cyber-attacks on the health, finance and transport sectors.<sup>102</sup> The government has responded by updating the sabotage law to include major critical infrastructure such as utilities, key transport facilities and healthcare facilities, among others.<sup>103</sup> The government has also passed the Critical

Infrastructure Bill to establish guidelines to better monitor critical infrastructure.<sup>104</sup> Similarly, Singapore also passed a Cybersecurity Act in early 2018, with the strengthening of critical infrastructure as one of its key priorities.<sup>105</sup>

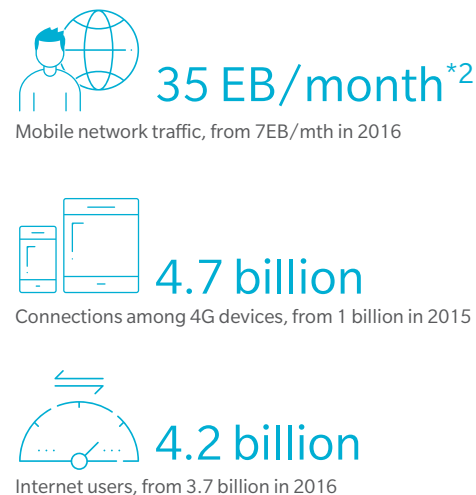
This dual effect of cyber dependency means that the shortfall in ICT infrastructure in the region should be considered not only in terms of infrastructure quantity but also in terms of security and resilience. There is already a serious dearth in investment in the security aspect of ICT infrastructure in Asia-Pacific, as exemplified by the lack of secured Internet servers in the region. FireEye's annual M-Trends reports have consistently found that dwell times are higher in Asia-Pacific than in any other region globally, suggesting that the cyber security architecture in the region is significantly slower to pick up breaches.<sup>53,78</sup> The increased frequency and sophistication of cyber-attacks in Asia-Pacific will only worsen the current shortfall, highlighting the need for governments and businesses alike to make new and existing infrastructure resilient against potential cyber threats.

**Exhibit 13:** Growth in global digital transformation by the year 2020 will be led by APAC, leading to higher threat potentials

MEDIAN DWELL TIME\*<sup>1</sup> (DAYS), BY REGION



GROWTH IN DIGITAL TRANSFORMATION GLOBALLY



\*<sup>1</sup> **Dwell time** is the time between an attacker compromising a secured network and the breach being detected

\*<sup>2</sup> Exabyte (EB) is equal to  $10^{12}$  megabytes

**Source:** Data from FireEye's M-Trends reports 2017-2018, APRC analysis

## BUSINESS IMPLICATION

Critical infrastructure failure or shortfall can have adverse effects that directly impact businesses' operations. Companies may see their operations disrupted due to sudden outages, while in the long run they may face a significant decrease in productivity and rising costs. While the studies cited below mostly reference the manufacturing sector, it is important to stress that the impact of critical infrastructure failure or shortfall extends to various areas. For instance, poor infrastructure was one of the key factors that contributed to the failure to contain Ebola in several African countries in 2014, according to the World Health Organization.<sup>106</sup>

### DAMAGES TO COMPANIES' OPERATIONS: CONGESTIONS, OUTAGES AND PRICE SHOCKS

**Potential business disruption due to critical infrastructure breakdown.** Electricity outage is a major source of disruption, particularly in South Asia where the average company experiences nearly one outage per day, each lasting 5.3 hours on average.<sup>107</sup> For businesses in these countries, the unreliable electricity supply results in loss in output when unanticipated outages happen, and results in them being forced to move away from investing in energy-intensive capital.

Separately, poor transportation and ICT infrastructure quality make these infrastructures more vulnerable to external disruption such as extreme weather events, cyber incidents, or terrorist attacks. In a recent report on the cost of cyber-attacks to the healthcare industry, APRC found that the potential loss from cyber-attacks for manufacturing, transportation and rail, and energy are among the highest across different industries.<sup>108</sup> For example, a cyber-attack on several ports run by Maersk in India in 2017, left the global supply chain heavily disrupted.<sup>109</sup>

**Rising operational costs.** Poor transportation infrastructure results in a substantial increase in companies' operational costs. The cost of moving goods in Indonesia, for example, was estimated at around a sizeable 27 percent of GDP.<sup>110</sup> Increased costs of moving are primarily a result of delays in shipments due to severe congestion. In some instances, such delays can also impact operating costs through wider market distortions. For example, severe congestion at key ports in China and Indonesia from late 2017 to early 2018 caused a short-term coal price spike and increased costs for related companies.<sup>111</sup>

Failure or shortfall of energy infrastructure have the same effects. For example, businesses in Australia experienced a near doubling of their electricity bills in 2017,<sup>69</sup> directly impacting their bottom line, threatening layoffs and business viability.<sup>112</sup> This was caused by an uncoordinated close-down of coal-fired plants even when renewable energy sources were not able to match adequate capacity, and exacerbated by high network costs, particularly in transmission and distribution.<sup>113</sup>

**Long-term decrease in productivity.** Research has pointed to the role played by transportation infrastructure in fostering market access and contributing to companies' productivity and production.<sup>114</sup> The effects of congestion on loss in productivity have also been well-documented.<sup>115</sup> ICT infrastructure is also playing an increasingly important role in company productivity and in facilitating trade. The dramatic growth of ICT in India, for instance, has significantly contributed to increase in total factor productivity in the manufacturing sector.<sup>116</sup> Conversely, the lack of ICT infrastructure can be a major barrier to productivity – slow Internet speed and the lack of affordable high-speed options have been quoted as among the key issues for businesses in Asia-Pacific, forcing them to develop separate offline/online options to get around the problem where telecom infrastructure is poor.<sup>117</sup>

## ADDRESSING CRITICAL INFRASTRUCTURE FAILURE OR SHORTFALL: OPERATIONAL AND STRATEGIC RESPONSES

Given the far-reaching impact of critical infrastructure failure or shortfall, how can companies realistically respond to this threat, particularly because infrastructure development traditionally falls outside the purview of the private sector in Asia-Pacific?

A longer-term, strategic approach is important. Here, the focus is on critical strategic decisions, such as where to locate a company's manufacturing center, or whether a company should take an active part in the development of infrastructure in the region to help close the infrastructure gap. Simultaneously, businesses will also have to consider the impact of critical infrastructure failure or shortfall at an operational level. This entails employing risk mitigation strategies such as risk transference through insurance, employing business continuity management solutions, and wider restructuring of their operations to bolster resilience.

### 1. Factoring in Infrastructure Failure or Shortfall in Strategic Considerations

Infrastructure is a major factor contributing to a country's competitiveness and constitutes the second pillar in the World Economic Forum's annual Global Competitiveness Index. Correspondingly, for companies and particularly international businesses, the state of critical infrastructure in the

country of operation features prominently in their strategic considerations. International businesses looking to set up operations in countries with less developed infrastructure must weigh between the potential trade-off from accessing these economies and the risks of disruption due to infrastructure failure or shortfall. Domestic companies in these countries, too, will have to factor inadequate infrastructure in their business development and risk management plans.

That said, governments in the region are investing heavily in infrastructure development, with some (such as China, India and Vietnam) spending a significant portion of their national budgets on this. In the long run, this will lessen the risks associated with inadequate infrastructure for companies in the region.

In the short- to medium-term, the current infrastructure investment wave led by Asia-Pacific governments also presents ample opportunities for businesses and other stakeholders to take an active part in infrastructure development. Apart from public-private partnership (PPP) ventures, governments in the region are also implementing other programs to attract private capital into infrastructure, such as asset recycling, notably in the case of Australia.<sup>118</sup> Public assets are privatized (sold or leased out long-term), with the proceeds reinvested in new infrastructure. Programs like this provide private businesses with the chance to take up and operate relatively low-risk brownfield assets, as opposed to taking on more risk when participating in a greenfield type deal.

**Exhibit 14:** Levers of infrastructure project bankability



**Source:** "Closing the financing gap: Infrastructure project bankability in Asia", Marsh & McLennan Companies' Asia-Pacific Risk Center 2017

In general, one of the key criteria for consideration from a private business and investor perspective when entering this space is whether projects are bankable. APRC's recent report on closing the financing gap for infrastructure projects in Asia-Pacific identified six levers for project bankability (Exhibit 14).<sup>119</sup>

Efforts to institutionalize these levers in Asia-Pacific are still relatively nascent. For example, findings from the World Bank's PPP Benchmark report showed that while South Asian countries are at par with the global average, countries in East Asia and the Pacific have largely fallen short in PPP preparation and procurement processes.<sup>120</sup> Despite the fact that risks are inevitable, businesses looking to enter this space will be supported by governments' continued efforts to improve institutional frameworks as well as incentives provided for PPP projects. These opportunities are also extended to other industries that are not directly tied to infrastructure development. For example, investment in infrastructure can be a stable source of cash yield for financial institutions such as commercial banks, insurance companies and investment funds.

## 2. Bolstering Operational Resilience

It is important that companies evaluate the role of critical infrastructure failure or shortfall in relation to climate change events as well as cyber-attacks. These events not only directly impact company facilities and operations which the company has control over, they can also lead to the breakdown of critical infrastructure such as outages and damaged bridges that are not under the companies' purview, but nevertheless have an impact on its operations. For example, even when a company's production lines are not affected by a climate event (such as a flood), the supply chain may still be disrupted from transport infrastructure being damaged or rendered unusable.

Where critical infrastructure is not built to be resilient against such threats, damages to businesses can be greatly exacerbated. For instance, the lack of investment and planning

in urban infrastructure has greatly amplified the risk and damage of floods in cities in India.<sup>121</sup> In this case, companies located in urban areas with poor drainage and sanitation may suffer the same substantial damages as those with operations located on low-lying flood plains.<sup>122</sup> Solely focusing on the direct damage to companies' properties from weather events and cyber incidents can lead to second order damage due to infrastructure failure being overlooked and total damage being underestimated.

Addressing the problem of critical infrastructure failure or shortfall with a mind for climate change and cyber-attacks may require companies to rethink the organization as a whole. Possible solutions such as operational reengineering, or the establishment of spare capacity/backup production capabilities can also be considered as longer-term strategic responses.

An example of this latter approach is the shift from "consumers" to "prosumers" of energy. In this arrangement, organizations take an active part in the production, consumption, and management of energy (Exhibit 15). Prosumer-driven organizations also go beyond ensuring redundancy and resilience and aim to harness new technology and analytics to more efficiently use energy, saving substantial operational costs in the process.<sup>123</sup>

In practice, some companies have been investing in off-grid distributed energy systems,<sup>124</sup> using renewable energy to bolster operational resilience in the face of frequent outages. Major airports have been among the leaders in implementing this solution in India. For instance, in 2016, Delhi International Airport announced a plan to expand its solar power capacity from 7.8 MW to 20 MW by 2020 to reduce the electricity it draws from the grid.<sup>125</sup> Elsewhere, Cochin International Airport has already achieved self-sufficiency on solar power since 2015. These successful cases provide a viable model for businesses in India and across the region.

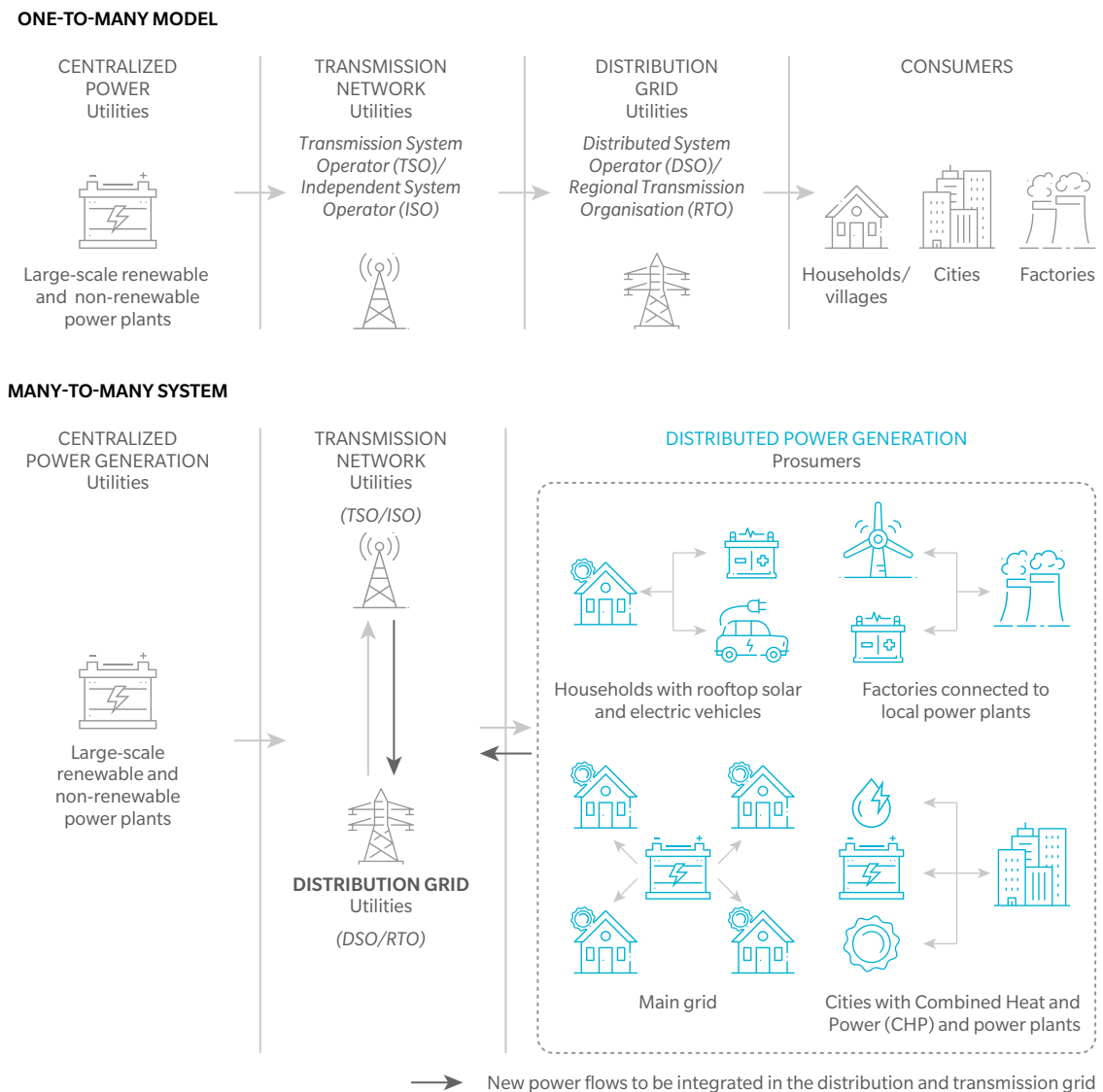
Finally, an important consideration for companies is to insure against loss associated with critical infrastructure failure or shortfall. For example,

disruptions can be considered as Business Interruption (BI) incidents,<sup>b</sup> and can thus be covered by traditional BI risk transfer approaches. However, it is important to note that traditional transactional insurance is not always enough to maintain shareholder value, prevent loss of market share, or protect against other adverse risks in the case of BIs. There are a variety of additional solutions that companies can employ in this regard, including:<sup>126</sup>

- Business recovery planning
- Introduction of backup single suppliers
- Outsourcing of critical functions to spread the risk
- Adjustment of inventory control strategies

Ultimately, companies will need to employ a combination of strategies to adequately bolster resilience against the risk of critical infrastructure failure or shortfall.

**Exhibit 15: From the One-to-Many model to Many-to-Many model**



**Source:** "World Energy Trilemma 2017: Changing Dynamics – Using Distributed Energy Resources to Meet the Trilemma Challenge", Oliver Wyman and World Energy Council, 2017

<sup>b</sup> It should be noted that not all BI type losses can be insured, and companies will typically need to be insured for physical damages first

# TALENT SHORTAGE

**Exhibit 16:** Polling results for the 5 most important risks for doing business in the next 10 years across New Zealand, Hong Kong, Singapore and the Philippines



**Note:** For our presentation of the Global Risk Report 2018 in New Zealand, Hong Kong, Singapore and the Philippines attended by business executives, including risk managers, the APRC asked participants the open question: “What do you think are the top risks for business in your country in the next 10 years?”. The polling is not meant to be analyzed quantitatively and is aimed at soliciting responses outside the designated risk list identified in the EOS

A future talent shortage is a major concern for organizations operating in Asia-Pacific, and this plays out in APRC’s discussions and surveys with business leaders across the region (Exhibit 16).

Talent shortages occur when companies are unable to recruit or retain people with the talent/skillsets needed to maintain business operations and competitiveness. This is both a short-term and a long-term concern, as executives not only need to recruit talent to meet their businesses’ immediate priorities, but must also constantly consider how their businesses will be shaped by long-term market and societal trends, how their organizations should change accordingly, what the skills required to achieve these goals are, and where they can acquire these skills.

The World Economic Forum’s Global Talent Competitiveness Index has looked into a broad range of macro and structural factors to assess the overall capacity of a country to both nurture its own talent as well as to attract global talent.<sup>127</sup> An overview of the country ranking shows that emerging countries are significantly less talent-competitive than their advanced counterparts,

suggesting that talent shortages will be more serious in these economies. However, there are important variations among groups. For example, Japan and Korea are among the developed countries expected to be hit with severe talent shortages due to their rapidly aging populations. Japan is already facing an extremely tight labor market, and the problem had been exacerbated by the government’s restrictive foreign labor laws which only recently have started to being eased.<sup>128</sup>

Among the institutional pillars assessed, the efficacy of a country’s education system stands out as a key factor in determining the talent competitiveness in both advanced and emerging economies. For example, executives in highly competitive economies for talent such as Singapore and Hong Kong still cited an “inadequate educated workforce” as one of the key challenging factors for doing business. Similarly, high youth unemployment rates continue to be referenced by business leaders in New Zealand and Australia as emblematic of the inadequacy of the education system in equipping graduates with the right skills.<sup>129,130</sup>

“Talent shortages occur when companies are unable to recruit or retain people with the talent/skill sets needed to maintain business operations and competitiveness.”

The role of education is particularly heightened in emerging economies. A recent report by the Workforce Analytics Institute examined education attainment and technological endowment levels across major emerging economies in Asia to divide them into four distinct groups based on countries’ workforces’ current level of preparedness, and their workforces’ readiness for the future.<sup>131</sup> This analysis shows a worrying trend of worsening talent shortages. Several major growth economies in the region, notably India and Indonesia, are lagging behind both in current preparedness as well as future development, while others such as Vietnam and China are heading in the wrong direction with regards to future skill development.

In these emerging economies, the problem of talent shortage has arguably sat at the core of concerns over unemployment, which ranked as one of the most important risk for doing business in the Asia-Pacific regions in the next 10 years according to the Executive Opinion Survey data. In this context, the fear of rising unemployment is not induced by slowed economic growth, but rather by the unemployability of the labor force either due to inadequate education and training systems, or due to automation increasingly replacing lower-skilled jobs and creating a large surplus of low-skilled labor. Vietnam is an example of the former, where despite the decrease in overall unemployment, unemployment among those with bachelor’s degree has increased significantly.<sup>132</sup> A similar situation has also been observed in Malaysia, where many graduates have resorted to becoming drivers for Grab, a Singapore-based ride hailing company, in the absence of other employment.<sup>133</sup>

## FUTURE COMPLICATIONS: HOW TALENT SHORTAGE WILL CONTINUE TO BE A TOP CONCERN

There are two major ongoing trends that have driven the talent shortage problem in Asia-Pacific, and will continue to do so going forward (Exhibit 17):

- Asia-Pacific continues to be at the forefront of technological advances. Technology is reshaping all aspects of work, not only with regards to how tasks are accomplished, but also the very definition and skill requirement of “jobs” and how they are organized
- Asia-Pacific is also the world’s most rapidly aging region, and this carries wide-ranging implications for the region’s future labor market. It is, however, important to note that while the region is aging as a whole; different societies have divergent trajectories which will consequently affect how the talent shortage problem plays out in different contexts

**Exhibit 17:** Ongoing trends that will complicate the problem of talent shortage in Asia-Pacific



### TECHNOLOGICAL ADVANCEMENTS

Emerging tech is continually reshaping work and existing business models, and leading to growing demand for talent



### AGING SOCIETIES

Uneven aging trends and levels of economic growth across the region means that the labor force is shrinking in some countries, while there is a surplus of low-skill workers in others

Source: APCR analysis



## THE IMPACT OF RAPID TECHNOLOGICAL CHANGE

Technological advances and their applications in work have necessitated the acquisition of new technical skills with which education systems have struggled to keep pace. For example, businesses' day-to-day operations now not only require basic computer literacy, but also a general competence in ICT; and other higher-level skills such as those in the fields of data science and analytics too are increasingly becoming a crucial requirement for organizations.<sup>134</sup> The supply of these skills, however, remains limited in Asia-Pacific.<sup>135</sup>

While the lack of technical skill is a serious problem, it is but a small aspect among other wide-ranging effects of continued fast-paced technological advancement. Hyper-connectivity and emerging technologies brought about by the Fourth Industrial Revolution (4IR) are disrupting old business models and fundamentally changing how businesses are conducted. Key examples include the rise of the "gig economy", the emergence of fintech, and potential applications of blockchain technology.

As traditional business models break down, the conceptualization of "employment" and "jobs" has also changed. According to recent research from Mercer and Oliver Wyman, the role-based conceptualization of "jobs" which once entailed

a fixed role with predesignated accountability and output tied to a fixed set of skills in a hierarchical organization, is increasingly making way for a new arrangement. In this new arrangement, the focus is on harnessing diverse skills and knowledge in a project-based setting. Accordingly, businesses' talent demands have also changed. The emphasis is no longer on filling a role, but on finding the right "skills" (Table 2).<sup>136</sup>

Two other effects of technological advancement are worth noting here. The first is how technological platforms have augmented the connection between employers and candidates, enabling them to access a wider talent pool outside traditional work arrangements – such as gig-employees and crowd sourcing. In this manner, technology is indeed not just performing work, but is broadening access to it as well.

Second, the injection of technology into work, as evidenced by the ongoing digitization of the workplace, will not only necessitate an upskilling of the workforce, but also a more comprehensive job redesign to facilitate this integration. Consider, for example, the increasing application of automation and AI technology across different industries. As many tasks are now automatable, jobs will correspondingly need to be designed around higher-valued work, where machines are enabled to augment human decisions.<sup>137</sup>

**Table 2:** Change in the conceptualization of jobs

	PAST JOBS	FUTURE JOBS
<b>Setting</b>	Hierarchical organizations	Project-based work
<b>Focus</b>	A specific role in the organization, tied to a set of outputs and accountabilities	Skills and knowledge that add value to a project
<b>Skill Requirement</b>	<ul style="list-style-type: none"> <li>• A specific set of skills</li> <li>• Largely applicable to similar roles across other organizations</li> </ul>	<ul style="list-style-type: none"> <li>• A diverse set of skills and knowledge</li> <li>• Idiosyncratic to specific type of projects, contexts or settings</li> </ul>
<b>Example</b>	The traditional accountant that differs little across different companies	The data scientist whose work will differ vastly if she/he works in marketing versus in finance

**Source:** Adapted from "Delivering the Workforce of the Future", Oliver Wyman and Mercer 2018

## POPULATION AGING IN ASIA-PACIFIC

Businesses operating in Asia-Pacific face a serious population aging challenge that is unique to the region. While Asia-Pacific is the fastest aging region globally, the pace of population aging varies significantly across the region, with some economies expected to encounter the problem of an older workforce sooner than others. Analysis from APRC,<sup>138</sup> which considered different levels of economic development across countries, identified three analytical country groups in Asia-Pacific. This distinction is important because each group of countries (and the businesses operating within them) will face a different set of problems related to talent shortage based on how fast they are aging (Table 3).

It is important to note that these categorizations are only broad groupings. The actual dynamics between economic development and composition,

and the state of the education system pose a complexity that companies need to understand and adapt to. For example,<sup>139</sup> while in terms of demographics and economic development, the Philippines belongs to group 3, the country has a significantly higher tertiary education attainment rate and high-skilled labor compared to other countries with the same income level, such as Vietnam. Despite this, several sectors, such as the Business Process Outsourcing (BPO) industry in the Philippines, continue to struggle with serious talent shortage,<sup>140</sup> which suggests a continual need for the education system in the country to upgrade graduates' skillsets.

The combination of aging and technological advances, most notably in the field of automation, will greatly complicate not only the talent shortage problem in Asia-Pacific, but also wider societal problems – most prominently an increase in inequality. The following In Focus section explains these links.

**Table 3:** Talent shortage problem in country groups in APAC, by level of economic development and demographic profile

COUNTRY GROUP	DESCRIPTION	TALENT SHORTAGE PROBLEM
<b>1. Money rich, time-poor</b>	<ul style="list-style-type: none"> <li>High-income economies with a high percentage of skilled labour and developed education system</li> <li>Already benefited from past demographic dividend but now facing the challenge of an already aged population</li> </ul>	<ul style="list-style-type: none"> <li>Businesses face significant talent shortage due to a rapidly shrinking labour force and managing an older workforce</li> </ul>
<b>2. Golden-present, grey-future</b>	<ul style="list-style-type: none"> <li>Middle to high-income economies with differing levels of projected economic growth, percentage of skilled-labour and quality of education</li> <li>Enjoying the demographic dividend, but is ageing rapidly</li> </ul>	<ul style="list-style-type: none"> <li>Businesses face significant talent shortage due to a rapidly shrinking labour force and preparing for an older workforce</li> <li>At the same time, current labour force falls short of meeting businesses' demands</li> </ul>
<b>3. Young, need to grow rich before growing old</b>	<ul style="list-style-type: none"> <li>Mostly lower-income economies that are still relatively young with less developed education system</li> <li>Need to take full advantage of the upcoming demographic dividend to grow rich before growing old</li> </ul>	<ul style="list-style-type: none"> <li>Businesses must manage an abundant, but potentially unemployable labour force</li> </ul>

Source: Adapted from "Advancing into the Golden Years", Marsh & McLennan Companies' Asia Pacific Risk Center 2016

## THE BROADER RISKS OF AUTOMATION, AGING AND TALENT SHORTAGES

The confluence of rising societal aging and the increased automation of work have important implications for labor markets, regulations and economies in Asia-Pacific. A recent APRC report highlighted that the region faces some of the highest levels of risks from these two key trends. Not only are nations in this region projected to have some of the highest rates of aging in the world going into 2030, but the region is also home to large proportions of older worker populations in low, basic-skilled – and therefore automatable – work.

Global supply chain shifts will further complicate things. The International Labour Organization has estimated that 137 million salaried employees across age groups are at risk of losing their jobs to automation in Southeast Asia's emerging economies. Nations that are heavily dependent on manufacturing exports – such as Thailand, Indonesia and Vietnam – are likely to be especially affected by these shifts. Basic-skilled work in service industries in the region is also under threat, such as BPO jobs and clerical work. Automation is allowing multinational companies to shrink their Asian outfits and re-shore large sections of their supply chains.

Intensifying automation therefore has a twin-effect on employment in Asia-Pacific. Economies in the region are at risk of widespread job displacement across low and basic-skill workplaces in the coming years. At the same time, the deployment of automation will create new demand for higher-skilled technical jobs that is unlikely to be met. These simultaneous effects are likely to widen the labor and skill supply-demand mismatch, thus exacerbating the talent shortage problem in Asia-Pacific.

Job displacement from automation will be especially harmful for older employees, who tend to find it more difficult than younger employees to find new jobs after becoming unemployed.

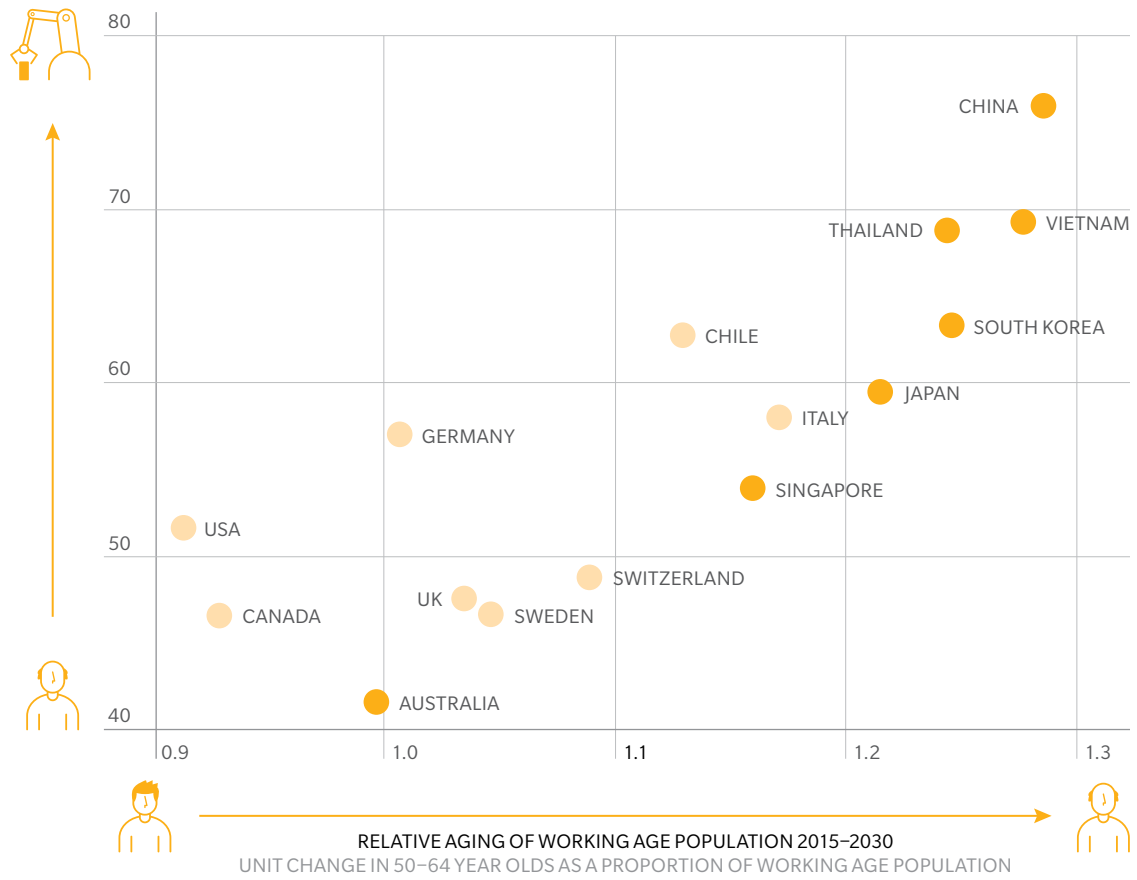
In many countries in Asia, older employees are disproportionately found in low-skill, highly automatable work (Exhibit 18).<sup>141</sup> Older employees also tend to lack ICT skills and are therefore often overlooked or discriminated against in hiring processes. Without concerted action on the part of companies and governments to ensure the redeployment of employees displaced by re-shoring and automation, inequality and stagnating growth will exacerbate across the region.

At the same time, evidence from advanced economies in the OECD has shown that it is possible to leverage technology to take advantage of the “longevity dividend”.<sup>142</sup> Analysis points to three main roles that technology can play to achieve this goal.<sup>47</sup> First, the application of technology in the field of medical science and biotechnology can facilitate a healthier and more productive workforce. Second, automation has been able to replace more manual and physically demanding tasks, enabling older employees to participate in sectors previously unsuitable for them. And third, the rise of job-matching and training platforms have made it easier to source for suitable seniors for open positions.

In the end, the key lies in how technology, and more specifically automation, is being applied in the workplace, and how governments and companies are preparing their older employees for the coming technological wave. One crucial step will be developing capabilities for rehabilitating employees affected by these rapid shifts. Companies will need to redesign their brands and outputs to service higher-skill needs in order to continue to attract investment and adapt to the rising tide of automation. As such, business leaders will need to invest both in new technologies and new talent. Particularly in fast-aging economies, companies will likely need to incorporate a targeted older-worker angle into their strategies for the future. Finally, close collaboration between companies and governments will be crucial to upskilling employees in the region and redeploying them to new, higher-level work and in overcoming Asia-Pacific's widening talent gap.

### Exhibit 18: Risk of Aging and Automation

AVERAGE RISK OF AUTOMATION TO OLDER WORKERS  
WEIGHTED AVERAGE BASED ON PROPORTION OF OLDER WORKERS IN LOW SKILL WORK



Source: "The twin threats of Aging and Automation", Mercer and Oliver Wyman 2018

# BUSINESS IMPLICATIONS

Executives have expressed concerns that talent shortages will adversely impact their businesses operationally and financially. For example, more than 61 percent of C-suites executives across

various industries in the region expect the lack of talent to impact business prospect in the next three years.<sup>143</sup>

## THE STRUGGLE FOR TALENT

According to a recent Manpower Outlook survey, employers in Asia-Pacific continue to expect strong growth in payroll between the second and third quarters of 2018 (Exhibit 19). However, the trend in talent supply does not seem to support this growth. For example, in a recent survey,<sup>144</sup> 34 percent of employers in Asia said that they were either not very or at all confident that they will acquire the talent needed for their business goals in the upcoming year. In Singapore, the talent shortage problem is reported to be at its highest since 2008, with 56 percent of employers having difficulties filling vacancies.<sup>145</sup>

The shortage of talent is reported to be most serious in six areas, namely Sales, Accountancy & Finance, Information Technology, Marketing & Digital, Engineering, and Operations. Notably, across all seniority levels, the dearth in sales positions has been reported to be the most serious. The sales function is also the position that is hardest to retain talent once hired.<sup>146</sup>

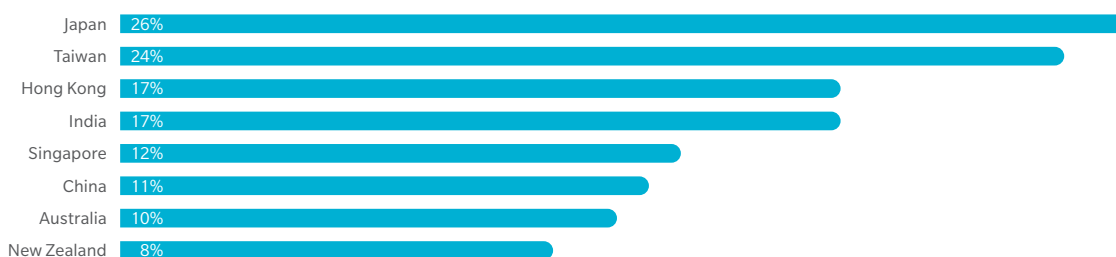
Apart from difficulties in skill acquisition, businesses will need to prepare for three other challenges pertaining to talent:

- Businesses in already aged or rapidly aging countries such as Japan, South Korea and Singapore will find themselves managing a shrinking and aging workforce. They will have to compete in increasingly tightened labor markets, and will have to manage increasing cost and productivity challenges of ill-health associated to an older workforce. According to a recent report from the APRC, in the Singapore context, these costs will increase significantly in the next 15 years.<sup>147</sup> While these challenges are not directly related to talent shortage, they exacerbate its impact on business
- Another issue related to a rapidly aging population and the associated labor crunch is that of regulatory limitations surrounding immigration. Expanding the talent pool beyond the domestic market is one of the ways governments or businesses can help alleviate a tight labor market, but this option is not always politically viable. For example, even as the Japanese government is trying to ease visa rules for skilled foreign employees to address the country's severe labor shortage,<sup>128</sup> it has signaled no intentions to change longer-term immigration policies (for permanent residency and citizenship) given the politically sensitive nature of the issue

---

### Exhibit 19: Employment outlook in Asia-Pacific 2018 Q3

EXPECTED PAYROLL GROWTH FROM 2018 Q2 TO Q3  
2018 Q3



Source: Data from Manpower Group

---

- Finally, companies are also concerned over how they can retain talent. Apart from compensation and a fair reward system,<sup>146</sup> which remains a pertinent factor in Asia-Pacific, research has also pointed to the importance of employee value proposition, which employers need to provide by offering a

compelling work experience where employees can thrive.<sup>148</sup> While career development and learning opportunities are the most important drivers for employees in Asia-Pacific, flexible work, well-being, purpose and technological augmentation have also been identified as significant factors<sup>149</sup>

## A STRUCTURED APPROACH TO TACKLING TALENT SHORTAGE

Tackling talent shortage in Asia-Pacific is challenging and will likely require a comprehensive, long-term strategy that is tailored to each organization. Businesses have begun building the framework for these strategies. A recent paper on the future of work from Mercer and Oliver Wyman, for example, laid out a four-step process (Exhibit 20).

In the following discussion, we focus on two key issues that every business should examine, and provide some high-level directional suggestions on how they can respond.

The first issue concerns the first and second steps laid out in the above framework: **what changes businesses should expect to impact**

**their workforce, and what these impacts are.**

There is no short answer to these questions, but as suggested in previous discussions on the key trends that will affect talent shortages in Asia-Pacific, businesses will have to factor in how technology and an aging workforce will change their organization as well as the talent market. Organizational/job redesign and workforce planning will be key in projecting and preparing for these changes.

The second issue concerns the specific strategies business leaders can employ to meet the company's talent needs to achieve their vision. The two main areas executives will need to focus on are **talent sourcing** and **skill building and development**.

**Exhibit 20:** A four step process to prepare for the workforce of the future

### 1. Set the vision and prepare change

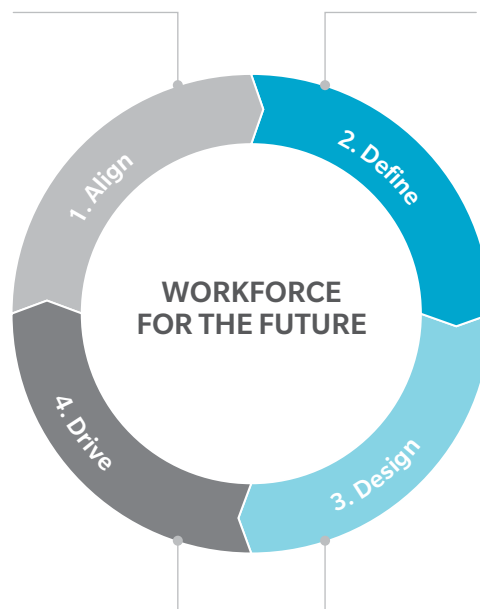
What changes are impacting my workforce?

- Identify the trends impacting the workforce
- Assess the impacts across the value chain
- Align leadership around the future workforce vision

### 4. Deliver the transformation

How do we deliver the workforce transformation?

- Establish transformation governance
- Roll out enabling technical platforms
- Manage the transformation



### 2. Map the current and forecast the future workforce

What will my future workforce look like?

- Model and project the size and shape of the future workforce under different scenarios
- Identify future talent gaps
- Evaluate and select the options for addressing the gaps

### 3. Determine and design workforce strategies

What strategies are needed to bridge from current to the future?

- Specify the strategies for delivering the future workforce
- Implement technology platforms to enable the automation of work and access to external talent pools

**Source:** Adapted from "Delivering the workforce of the future", Mercer and Oliver Wyman 2018

## CHANGES IMPACTING THE WORKFORCE

### 1. Organizational and Job Redesign as a Starting Point

One potential starting point for businesses is organizational and job redesign, taking into account the two major trends that will likely impact the talent and skill market, namely technological advances and the Asia-Pacific region's aging population. While redesigning does not directly address the difficulties in talent acquisition, the reorganization of work and functions based on long-term trends will lay the groundwork for workforce planning and strategies.

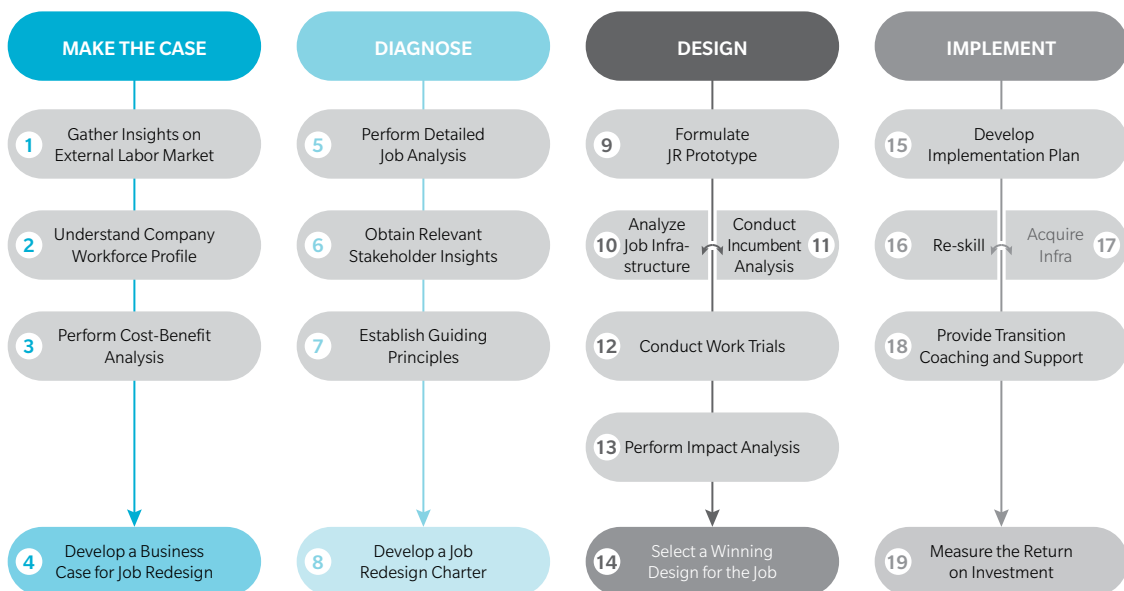
Companies will benefit from a structured approach supplemented by fact-based and data-driven analysis in organizational and job redesign. For example, job functions can be broken down to multiple different specific tasks to be assessed for automatability. The most transactional tasks can be automated, while other tasks can be repackaged to make best use of the workforce's skills/talents. Data-driven analysis may be able to pinpoint the optimal job rearrangement where human input is dedicated to higher value work, supported by automated processes.

Businesses in Asia-Pacific have recognized that in already aged or rapidly aging societies, an older workforce is a reality they will have to prepare for. Accordingly, work must be redesigned with the aging employee at the center (Exhibit 21).

The challenge is to meaningfully engage older employees to stay productive and competitive, and also to ensure their well-being. This can be achieved by the help of technology, supplemented by continued reskilling and redeployment. The application of technology can significantly aid older employees in a wide range of physical, lower-value tasks so they can dedicate their wealth of experience on higher-value work. Other elements, such as adjustments to physical working space and introducing flexible working hours, have also proven to be crucial to the job redesigning process.

The application of job redesign has yielded concrete successes. In Singapore, for example, two success stories of job redesign for an older workforce are Lawry's The Prime Rib restaurant and the Central Providence Fund Board (Exhibit 22). In the first case, a combination of leveraging technology to automate the ordering process, as well as facilitating flexible hours and mixed age tasks, led to a 30 percent improvement in workflow efficiency and high satisfaction among employees. Similarly, the Central Provident Fund Board has

**Exhibit 21:** Key steps in job redesign for older employees



**Source:** Adapted from "The twin trends of aging and automation", Mercer and Oliver 2018

enjoyed increased improvement in the services it offers as older employees brought with them a wealth of experience and skillsets.

Other companies are following suit. Saudi Aramco, a major oil and gas company, has recently announced new refineries in Southeast Asia in partnership with Malaysian oil major Petronas. The company is actively targeting retirees from the oil and gas industry and positioning itself as an employer of choice for a multigenerational workforce with the company's advertisements showing images of senior citizens leveraging technology and working in highly automated refineries.

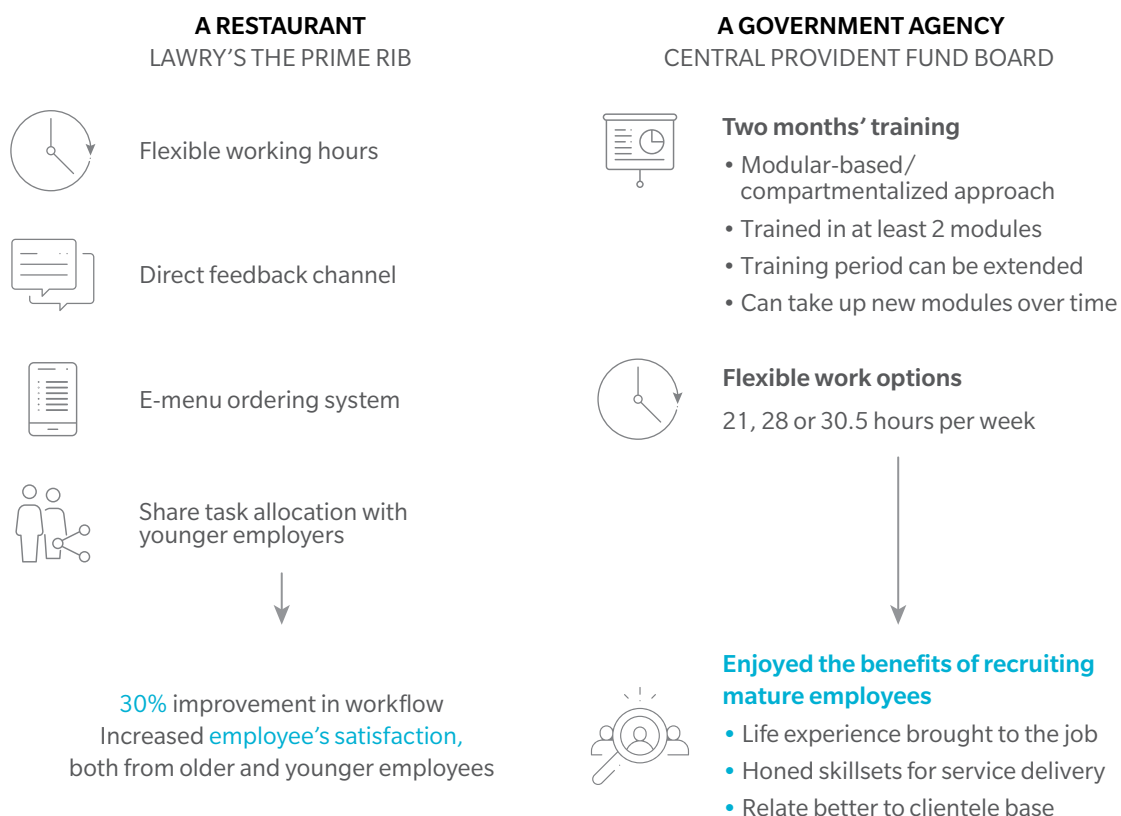
## 2. Workforce Planning

As businesses examine all the trends impacting their workforce across the value chain and put forward plans for redesign, executives can start their workforce planning.

In simple terms, workforce planning constitutes a talent/skills market projection. First, businesses will need to assess how the labor market – specifically talent and skills supply – will change given ongoing trends. This is accompanied by a second process of demand assessment, where companies evaluate what their workforce should look like in the future, not only in terms of “jobs” or “roles” but also knowledge, skills, and abilities, given the companies' aspirations. This supply-demand analysis allows companies to identify areas where there is a substantial talent gap in the company, the likely available options to fill these gaps and the risks and benefits associated with each.

The next step is to build a coherent set of **talent strategies** to achieve the company's vision of its future workforce. This typically covers how the company can source talent, engage and reward talent, develop talent, and also cover talent outplacement. The following discussion focuses specifically on **talent sourcing** and **skill building and development**.

**Exhibit 22:** Examples of job redesign success



Source: APRC analysis



## TALENT STRATEGIES

The applications of technological advancements are rapidly reshaping the concept of “work”, and companies’ talent strategies should also evolve accordingly; they should not only address the new realities of how work is conceptualized and organized, but also leverage technologies for more efficient processes.

### 1. Talent Sourcing: Technology Driving Major Changes

There are four major technology-driven directional changes that businesses should take note of.

**Businesses should source for potential, and not just competencies.** Businesses usually examine the pool of available talent and look for the right qualification, skillsets and experience. They sometimes also look for the right type of personality and value fit for the organization. However, this is no longer enough. With technology rapidly changing how jobs are performed, organizations will take on human capital risks if they only look for static roles and skills. Rather, they should look for candidates with the potential to grow and adapt quickly to shifting sands.<sup>150</sup>

**Businesses can benefit from access to an extended talent pool.** Organizations in Asia-Pacific should keep in mind that while the region is expecting a talent crunch, they are increasingly gaining access to an extended pool of talent through the rise of technological platforms

that help better connect job seekers with work, and enable new forms of work arrangements. Businesses are no longer restricted to “buying” talent with full-time contracts; they also have the option to “borrow” talent. Uber and Grab are the quintessential examples of this shift which has facilitated the rise of the “gig-economy”. The extended talent pool that companies can access not only includes contractors and freelancers, but also includes other arrangements such as partnerships and crowdsourcing (Table 4).

While this extended net for sourcing talent offers companies significant benefits in terms of cost efficiency, flexibility and agility, there are substantial challenges involved in moving to these types of work arrangements. Central to this is the question of how to guarantee labor rights and benefits for non-traditional employees.<sup>151</sup> For example, analysis by the Central Provident Fund on Singapore, where the number of gig-employees is expected to grow substantially, showed that this group of employees will suffer a significant deficit in their retirement savings.<sup>152</sup> Elsewhere, there have been increasing regulations to address the rights of gig-employees.<sup>153</sup> At the same time, permanent full-time employment remains the dominant form of employment, but with increasing political pressure in Asia-Pacific to improve working conditions, such as through the implementation of or increase in minimum wage.<sup>154</sup> Therefore, there are significant considerations for businesses to make if they plan to take advantage of this new kind of talent.

**Table 4:** The extended talent pool

TALENT POOL	DESCRIPTION	EXAMPLE
Internal workforce	Directly employing permanent talent will continue to provide the majority of the workforce, but will be supplemented by members from extended talent pools	Project-based work
Partnerships	Sourcing talent through partnerships will increase in importance, as industries and capability barriers blur and organizations seek a broader set of capabilities to stay competitive	A company-owned diagnostics center co-locating within and jointly run by a hospital, which encourages cross-pollination of talent across partners
Freelance	Sourcing talent through the freelance market will increase, as social trends like individualization impact the perception of work and large segments of the workforce prefer to work more flexibly and on projects that align to their skills and interests	The ever-increasing use of freelance application developers by companies competing in the fast-evolving mobile-first marketplace
Crowdsources	Crowdsourcing talent will increase, especially where the “wisdom of the crowd” generates more creative, innovative, and faster solutions	Crowdsourced testing is an emerging trend in software testing, replacing hired professionals or consultants

**Source:** Adapted from “Delivering the workforce of the future”, Mercer and Oliver Wyman 2018

**Talent sourcing should account for the rise of bots.** Traditionally, talent sourcing has mainly covered the process of finding and hiring full-time talent – that is, “buying” talent. Over time, the framework has extended to “building”, where businesses invest in training and development to build talent from within, as well as “borrowing” talent through the gig-economy or from partnerships. However, businesses will increasingly consider not only humans, but also bots. Businesses should therefore take into account their automation plans in the process of recruitment, and source their talent with intensifying tech-human collaboration in mind.

#### **Businesses can implement “smart recruitment”.**

Technology has enabled new and more effective processes for recruiting talent. Companies have increasingly digitized the process and made use of powerful data analytics to optimize recruitment – cutting time and costs while improving on the recruitment experience for both candidates and recruiters. Unilever’s new acquisition model,<sup>155</sup> for example, is widely regarded as a successful case study in recruitment process digitization (Exhibit 23).

Companies will also likely increase recruitment through social media, which is now not only used for job posting and advertisement, but increasingly also for screening potential candidate experiences, skills, and personality. For example, a 2016 survey shows 68 percent of HR managers in India<sup>156</sup> reported looking into LinkedIn, Facebook or Twitter for more information on potential recruits. With the advent of data analytics, however, there is potential for a much more systematic way of employing social media for recruitment.<sup>157</sup> Here, social media is not only used as a “first impression” tool; rather, candidate metadata can be used to build a holistic profile of potential candidates and enable effective targeted recruiting at less cost.

## **2. Talent Building and Development: Digitization in the Spotlight**

Arguably, one of the most important areas of business development in future will be the digital transformation of the organization – many of the redesign, talent sourcing and recruitment solutions described above will not be possible without digitization. As such, engaging their workforces in digital transformation should be a key priority for businesses. This will require the building, developing and reskilling of companies’ internal workforce and talent.

---

### **Exhibit 23: Acquiring talent in the digital age – The case of Unilever new talent acquisition model**

Unilever’s goal to become a more digital organization led them to develop a new talent acquisition model.

After a series of pilot programs, Unilever new recruits through an automated screening platform using video interviews, where interviewees upload a self-filmed video. After the video is evaluated by machine-learning software, successful candidates are referred to in-person interviews. New recruits sign contracts on smart devices, and tailored applications enable the initial onboarding process.

Unilever is not only hiring the digital talent it is looking for but has significantly reduced recruiting time and marketing costs while enhancing its brand image in the digital space. At the same time, it delivers a new employee experience before the employee even joins the company, setting the stage for what is to come.

#### **UNILEVER’S NEW TALENT ACQUISITION MODEL HAS RESULTED IN:**



#### **Improved candidate experience**

80%+ positive feedback from candidates



#### **Decreased marketing expenditure**

3%+ decrease in 2016, down to €7.731 million



#### **Optimized recruiting time**

75% reduction in recruiting time

90% reduction in time-to-hire



#### **Optimized candidate selection**

Offer rate up from 63% to 80%

Acceptance rate up from 64% to 82%

**Source:** “Open-source talent”, Mercer and Oliver Wyman 2018

---

## SKILLSFUTURE SINGAPORE

As a small island-state that faces a scarcity of both natural and human capital, the Singapore government has consistently been trying to improve the productivity of its resources. However, despite efforts to restructure the economy to raise national productivity by 2 to 3 percent annually since 2010, productivity growth has consistently fallen short of expectations: labor productivity growth was stagnant at less than 1 percent on average between 2010 and 2015.

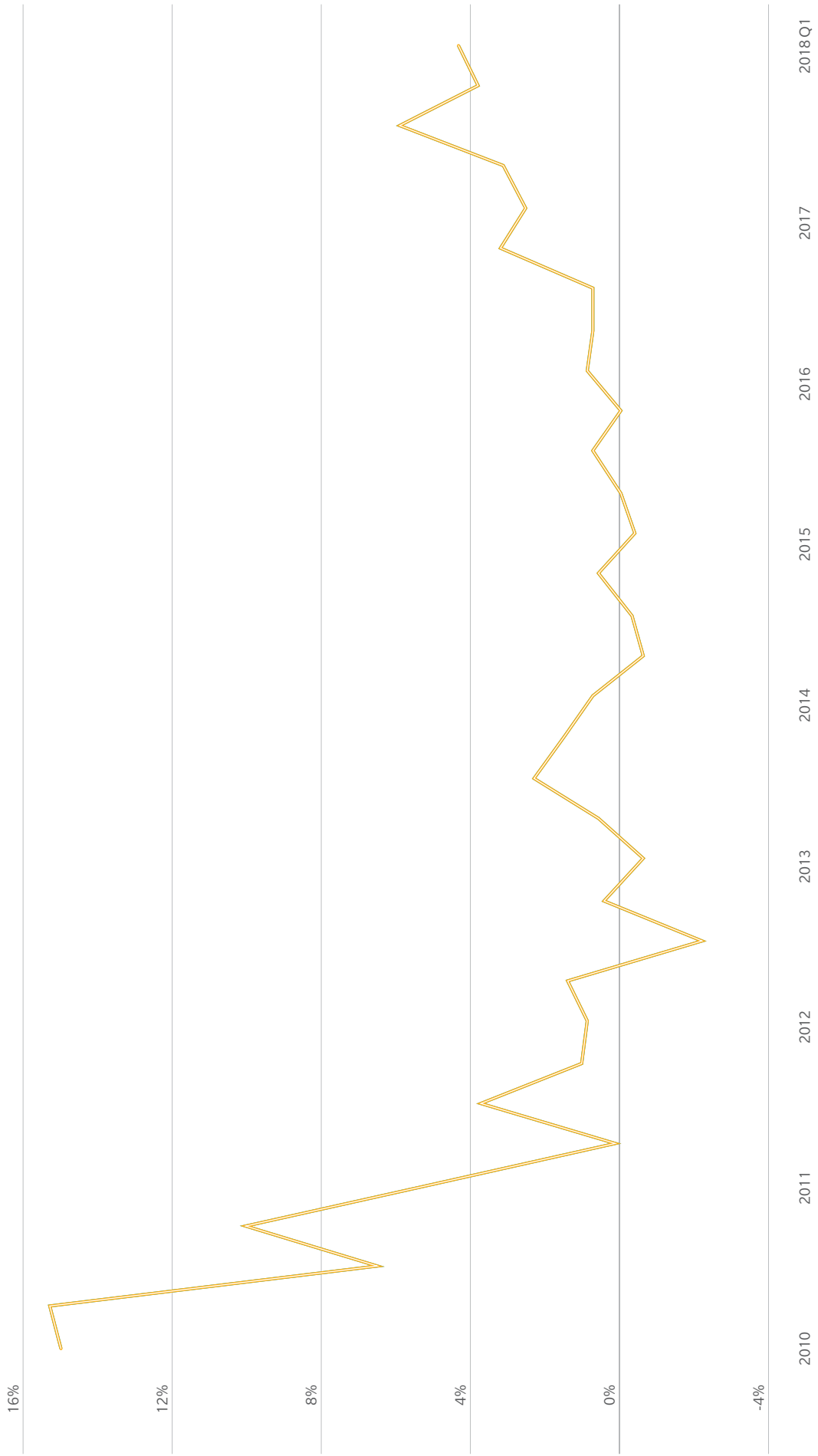
In 2016, the government launched a more systematic and integrated approach, the Industry Transformation Programme, to focus on developing and integrating industry-specific measures in 23 key sectors through partnerships between industry and government. To support the restructuring of the various sectors, the government also introduced SkillsFuture, a framework to improve the skills and capabilities of employees in Singapore. The approach taken by SkillsFuture is two-pronged: first, the government identifies and subsidizes the provision of trainings; and second, it provides incentives such as credit, internships and awards for individuals to take on these trainings. By targeting individuals across different life stages, the SkillsFuture framework aims to address the challenges of a skills mismatch and talent shortage through continual skills upgrading.

The HR industry, for example, has benefitted from the efforts to improve HR capabilities. By partnering with industry and the labor union, the government established the Institute for

Human Resources Professionals (IHRP) in 2017. To position the HR industry for the future, the IHRP identifies and benchmarks the core competencies necessary for HR professionals throughout their careers. HR professionals can then acquire and deepen the necessary skills through SkillsFuture grants and awards such as the SkillsFuture Study Award. To incentivize employers to invest in the training of their employees, employers who send their employees for training are also given financial support for both salary and training fees. Beyond assisting employees and employers, the SkillsFuture initiative also provides credit and guidance, such as career matching services, for individuals interested in entering the HR industry.

SkillsFuture has benefitted many individuals: more than 400,000 individuals participated in subsidized training courses in 2016. However, the implementation of the novel initiative has also been a policy learning and fine-tuning process for the government. It was revealed earlier this year that the SkillsFuture initiative suffered about S\$40 million in fraudulent claims by a criminal syndicate, the largest case of defrauding a public institution in Singapore to date. In response, the government has been reviewing and strengthening its fraud detection system through data analytics. Another unresolved challenge is establishing indicators to evaluate the progress and outcomes of the various incentives provided to individuals under the SkillsFuture framework. Nonetheless, SkillsFuture remains an integral component of Singapore's effort to improve labor productivity and overcome its talent gap through lifelong learning.

**Exhibit 24:** Changes in value added per worker at 2010 market prices



Source: Data.gov.sg

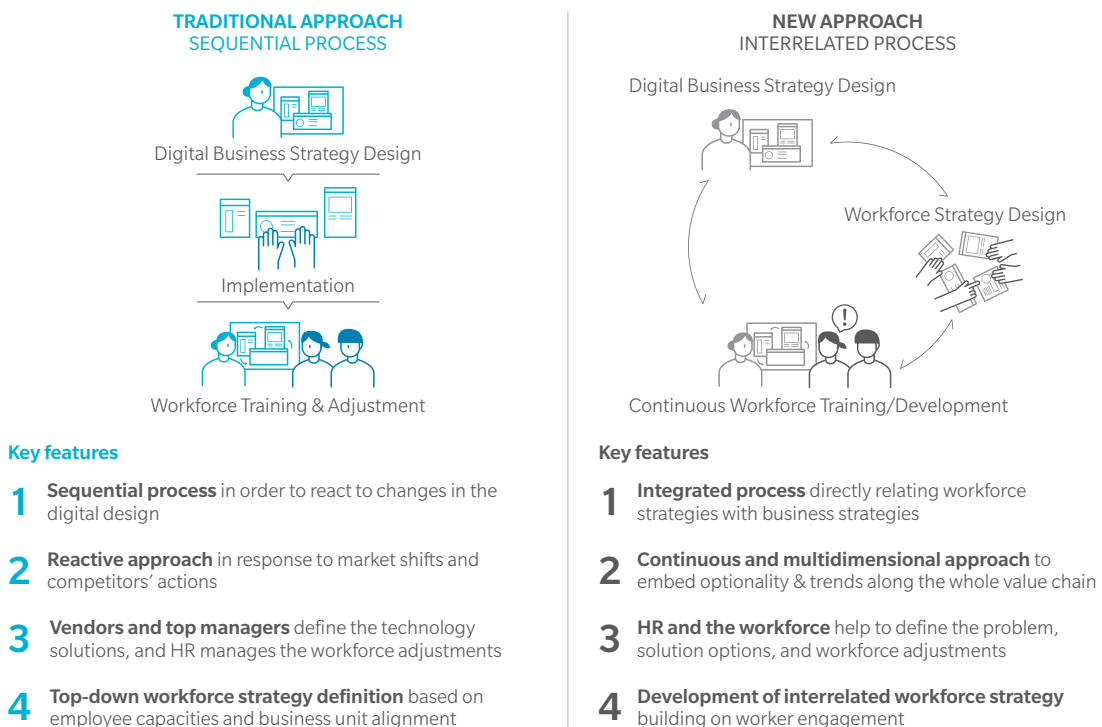
Given talent scarcity and skill shortage concerns, it is concerning that only 15 percent of C-suite leaders believe that upskilling and reskilling employees for new/changed roles will make a sizable difference to business performance. So far, only one in five have begun implementing strategies to develop the workforce of tomorrow, with a focus on upskilling digital competence (42 percent), increasing access to online learning courses (40 percent), and deploying rapid internal skills training (38 percent).

It is worth noting that this endeavor is important across all areas of business and not just digitization. Rather, digital transformation here is used as a case study to show how talent building and development should be organized. The most important takeaway is that businesses should move from a **sequential approach**,<sup>158</sup> where training and adjustment happen only at the end of a long designing and deploying process, to an **integrated approach**, in which design, development and training processes happen simultaneously and continuously (Exhibit 25). Continuous feedback from employees will greatly inform the designing process and enable a seamless rollout of the digital strategy.

Training and development are also not necessarily confined to the company. Businesses can take a more proactive and long-term view by partnering with educational institutions to equip the future workforce with the necessary skills to thrive. One key skill that has been highlighted is the ability to “learn how to learn”,<sup>159</sup> which enables employees to acquire a combination of technical, social and collaborative skills. Correspondingly, top down rote learning in schools must be replaced with a more project-based approach that provides more experiential opportunities. This approach can only be achieved through a close partnership between educational institutions and the industry, where the latter can deliver the practical experience often lacking in the classroom.

One country that may serve as a model for other countries in the region for talent cultivation through forward-looking training development programs in partnership with the business community, is Singapore. The In Focus section explicates how the Singapore government has adopted a long-term view on workforce development, and how companies can take an active part in this effort with the SkillsFuture Singapore initiative.

**Exhibit 25:** Moving from a sequential workforce strategy development process to a circular integrated process



Source: "Engaging the workforce in digital transformation", Mercer and Oliver Wyman 2018

# CONCLUSION

In this third edition of the Evolving Risk Concerns in Asia-Pacific, we have provided an overview of the risk landscape in the region across key risk areas that were covered by the *Global Risks Report*. The discussion yielded three relevant observations for businesses operating in the region.

First, **global and regional geopolitical shifts** are increasingly permeating to risks in other areas, notably technological and economic developments. **Geopolitics continues to be the wild card** for businesses, and sudden changes in this regard can catch executives off guard.

Second, Asia-Pacific will continue to be one of the key sites for **technological innovation**. However, **the frameworks to address new operational, security and ethical risks that arise from these advancements are not necessarily in place yet**, which means businesses may need to put in place mitigation systems of their own. On the other hand, executives will also need to pay attention to changes in the regulatory landscape in anticipation of policy responses by governments to these threats.

Third, it is important for businesses to realize that the rapid pace of change in the region – especially in the areas of geopolitics and technology – is happening against the **backdrop of persisting socioeconomic and environmental vulnerabilities**. This presents an extra layer of consideration for executives as they plan their businesses' future development.

From this broad overview of the Asia-Pacific risk landscape, we focused specifically on two risks, namely **critical infrastructure failure or shortfall**, and **talent shortage**, and their potential impact on businesses. They represent various threats to the two key developmental pillars for the region – physical infrastructure and human infrastructure.

These are analyzed within the megatrends that will shape regional development in the long term. We would here like to stress on two key observations on the back of the discussion:

1. These **risks are crystalizing** in Asia-Pacific, and have **manifested in various forms** across economies in the region with businesses already feeling the impact
2. Megatrends in the region, notably **technological advancements and increasing cyber dependency, climate change, and a rapidly aging population**, will significantly complicate these risks. In some cases, such as critical infrastructure, for example, the risks of shortfall and failure will be exacerbated; in others such as talent shortage, these trends may have mixed implications that are presently hard to decipher and act upon

It is clear that businesses will have to **react swiftly** in response to these risks. To aid business leaders in this endeavor, we have suggested some directional changes companies can take as the first step towards a comprehensive response. Looking forward, however, businesses will need to look deeper into their own organizations to devise suitable and workable strategies.

Lastly, while we have mainly examined risks through the lens of businesses in this report, much of the risk insights presented in this report is also applicable to governments and policymakers. To observe and prepare for the evolving risk landscape in the region is a crucial first step to build effective risk management and greater resilience not only at the individual company level but also on the industry and national levels. It is our hope that this report can serve as a useful roadmap both for businesses as well as policymakers and other keen observers of the region, propelling them towards change, concrete actions and greater resilience.

# APPENDIX: THE WORLD ECONOMIC FORUM SURVEYS

## GLOBAL RISK PERCEPTION SURVEY OVERVIEW

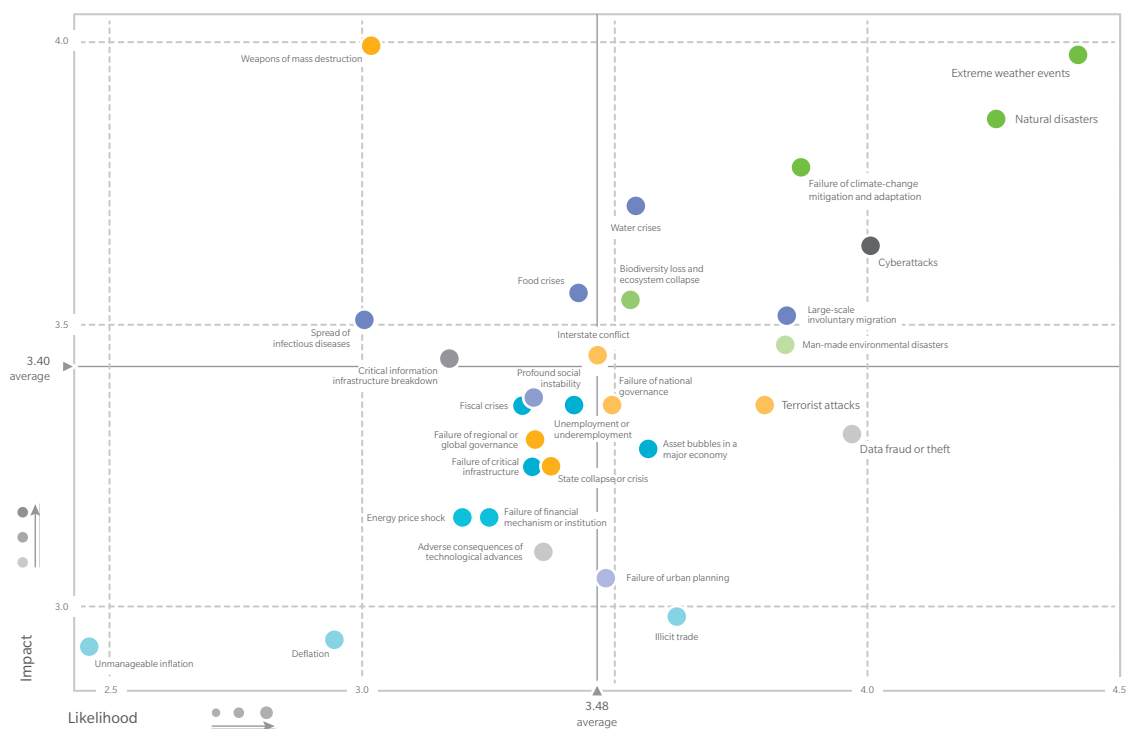
The *Global Risk Perception Survey* is the main instrument used to assess global risks in the *Global Risks Report*. The 2017 survey was conducted between early September and mid-October 2017, bringing together diverse perspectives from risk experts around the world from business, academia, civil society and government. Every year, risk experts are asked about the perceived impact and likelihood of risks over a 10-year time horizon. Almost 880 risk experts participated in the 2017 survey.

One of the key insights of the survey findings is the risk likelihood/impact map (Exhibit 26).

## EXECUTIVE OPINION SURVEY OVERVIEW

The Executive Opinion Survey is conducted annually and provides risk perceptions, but from a different angle – recognizing risk management priorities from decision-makers themselves. Respondents are asked to choose up to five risks which they view as being most important for doing business in their country. Approximately 12,400 responses were collected for the Executive Opinion Survey, of which about 2,500 responses were from Asia-Pacific.

**Exhibit 26:** The 2018 global risk landscape



Source: Global Risks Report 2018

**Exhibit 27: The Evolving Risks Landscapes, 2008–2018**

**TOP 5 GLOBAL RISKS IN TERMS OF LIKELIHOOD**

2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
Asset price collapse	Asset price collapse	Asset price collapse	Storms and cyclones	Severe income disparity	Severe income disparity	Income disparity	Interstate conflict with regional consequences	Large-scale involuntary migration	Extreme weather events	Extreme weather events
Middle East instability	Slowing Chinese economy (<6%)	Slowing Chinese economy (<6%)	Flooding	Chronic fiscal imbalances	Chronic fiscal imbalances	Extreme weather events	Extreme weather events	Extreme weather events	Large-scale involuntary migration	Natural disasters
Failed and falling states	Chronic disease	Chronic disease	Corruption	Rising greenhouse gas emissions	Rising greenhouse gas emissions	Unemployment and underemployment	Failure of national governance	Failure of climate-change mitigation and adaptation	Major natural disasters	Cyberattacks
Oil and gas price spike	Global governance gaps	Fiscal crises	Biodiversity loss	Water supply crises	Water supply crises	Climate change	State collapse or crisis	Interstate conflict with regional consequences	Large-scale terrorist attacks	Data fraud/theft
Chronic disease, developed world	Retrenchment from globalization (emerging)	Global governance gaps	Climate change	Water supply crises	Mismanagement of population ageing	Cyberattacks	High structural unemployment or underemployment	Major natural catastrophes	Massive incident of data fraud/theft	Failure of climate change mitigation and adaptation

**TOP 5 GLOBAL RISKS IN TERMS OF IMPACT**

2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
Asset price collapse	Asset price collapse	Asset price collapse	Fiscal crises	Major systemic financial failure	Major systemic financial failure	Fiscal crises	Water crises	Failure of climate-change mitigation and adaptation	Weapons of mass destruction	Weapons of mass destruction
Retrenchment from globalization (developed)	Retrenchment from globalization (developed)	Retrenchment from globalization (developed)	Climate change	Water supply crises	Water supply crises	Climate change	Rapid and massive spread of infectious diseases	Weapons of mass destruction	Extreme weather events	Extreme weather events
Slowing Chinese economy (<6%)	Oil and gas price spike	Oil price spike	Geopolitical conflict	Food shortage crises	Chronic fiscal imbalances	Water crises	Weapons of mass destruction	Water crises	Water crises	Natural disasters
Oil and gas price spike	Chronic disease	Chronic disease	Asset price collapse	Chronic fiscal imbalances	Diffusion of weapons of mass destruction	Unemployment and underemployment	Interstate conflict with regional consequences	Large-scale involuntary migration	Major natural disasters	Failure of climate-change mitigation and adaptation
Pandemics	Fiscal crises	Fiscal crises	Extreme energy price volatility	Extreme volatility in energy and agriculture prices	Failure of climate-change mitigation and adaptation	Critical information infrastructure breakdown	Failure of climate-change mitigation and adaptation	Severe energy price shock	Failure of climate-change mitigation and adaptation	Water crises

● Economic ● Environmental ● Geopolitical ● Societal ● Technological

**Source:** World Economic Forum 2008–2018, Global Risks Reports

**Note:** Global risks may not be strictly comparable across years, as definitions and the set of global risks have evolved with new issues emerging on the 10-year horizon. For example, cyberattacks, income disparity and unemployment entered the set of global risks in 2012. Some global risks were reclassified: water crises and rising income disparity were re-categorized first as societal risks and then as a trend in the 2015 and 2016 Global Risks Reports, respectively.



# BIBLIOGRAPHY

1. World Economic Forum. The Global Risks Report 2018. (World Economic Forum, 2018)
2. Johnson, D. Is This the Worst Hurricane Season Ever? Here's How it Compares. Time (2017)
3. Mundy, S. Heavy flooding kills more than 1,000 in South Asia. Financial Times (FT.Com) (2017)
4. Sevastopulo, D., Jopson, B. & Clark, P. Trump takes US out of Paris climate deal. Financial Times (FT.Com) (2017)
5. Raphelson, S. In Africa, War Over Water Looms As Ethiopia Nears Completion Of Nile River Dam. National Public Radio (2018)
6. Jones, S. Timeline: How the WannaCry cyber attack spread. Financial Times (FT.Com) (2017)
7. Tham, I. Personal info of 1.5m SingHealth patients, including PM Lee, stolen in Singapore's worst cyber attack. The Straits Times (2018)
8. Clover, C. & Jung-a, S. Korean summit breaks ice but falls short on nuclear issue. Financial Times (FT.Com) (2018)
9. International Monetary Fund. World Economic Outlook Update, October 2018: Challenges to Steady Growth. (International Monetary Fund, 2018)
10. International Monetary Fund. Statement by the IMF's Managing Director on the G20 Finance Ministers and Central Bank Governors meeting in Argentina. International Monetary Fund (2018). Available at: <https://www.imf.org/en/News/Articles/2018/07/22/pr18302-argentina-statement-by-the-imf-managing-director-on-the-g20-meetings>. (Accessed: 3<sup>rd</sup> August 2018)
11. Lagarde, C. Christine Lagarde: global economic growth can fight inequality. Financial Times (FT.Com) (2018)
12. International Monetary Fund. Regional Economic Outlook: Asia Pacific. (International Monetary Fund, 2018)
13. Mbaye, S., Badia, M. M. & Chae, K. Global Debt Database: Methodology and Sources. (2018)
14. Kim, N. S&P Warns High Corporate Debt Could Trigger Next Default Cycle. Bloomberg.com (2018)
15. Chen, Y. & Yao, K. China corporate debt levels excessively high, no quick fix: central bank governor. Reuters (2017)
16. Klein, M. China's household debt problem. Financial Times (FT.Com) (2018)
17. Sterland, B. Economic Risk and Resilience in East Asia. (Brookings Institution, 2017)
18. Tu, L. \$210 billion of Indian Bad Debt Lures Funds Seeking Returns. Bloomberg.com (2018)
19. Marandi, R. India's bad loans dwarf bank recapitalization plans. Nikkei Report (2018)
20. Cox, W. & Pavletich, H. 14<sup>th</sup> Annual Demographia International Housing Affordability Survey 2018 Rating Middle-Income Housing Affordability. (Demographia, 2018)
21. Ying, M. Hong Kong Property Is Near Its Peak. Bloomberg.com (2017)
22. IMF Global Housing Watch. (2017). Available at: <http://www.imf.org/external/research/housing/>. (Accessed: 3<sup>rd</sup> August 2018)
23. Mundy, S. India's property slowdown puts developers in crosshairs. Financial Times (FT.Com) (2018)
24. Cox, H. Sky-high Hong Kong. Financial Times 8, 9 (2018)
25. Chau, D. Property prices drop for ninth straight month, as regional markets outpace the capitals. Australian Broadcasting Corporation News (2018)
26. Prices drift back to 2016. The New Zealand Herald G002 (2018)
27. Edmunds, S. NZ house prices outstrip world - but don't worry. Stuff (2017)
28. Bourke, C. Australia faces housing hangover twice the size of the GFC subprime era. The Sydney Morning Herald (2017)
29. Cliff, V. ASEAN to cut non-tariff measures 10% by 2020. Nikkei Report (2017)

30. Yamazaki, J. & Yasoshima, R. 'TPP 11' emerges as bulwark against American protectionism. Nikkei Report (2018)
31. International Monetary Fund. IMF World Economic Outlook, October 2016: Subdued Demand: Symptoms and Remedies. (International Monetary Fund, 2016)
32. Zaharia, M. How trade war with U.S. can hurt growth in China and beyond. Reuters (2018)
33. China's supply chains: Collateral damage. The Economist 33 (2018)
34. Japan faces significant impact from U.S.-China trade war: BOJ's Kuroda. Reuters (2018)
35. Yap, K. Philippines Most at Risk in Asean From China-U.S. Trade War. Bloomberg.com (2018)
36. FT Confidential Research. South-east Asia faces trade war fallout. Financial Times (FT. Com) (2018)
37. Hlasny, V. Different Faces of Inequality across Asia: Decomposition of Income Gaps across Demographic Groups. (Asian Development Bank, 2017)
38. Yang, Y. Rust-belt decline poses threat to Chinese growth. Financial Times (FT. Com) (2018)
39. Marsh & BMI Research. Marsh Political Risk Map 2018. Marsh Political Risk Map (2018). Available at: <https://www.marsh.com/content/marsh/political-risk-map-d3/prm-2018.html>. (Accessed: 3<sup>rd</sup> August 2018)
40. Pedersen, C., Taliente, D. & Hedrich, W. Is the Golden Age for MNCs Over: How can MNCs Thrive in an Inward-looking World? (Oliver Wyman, 2018)
41. Bley, B. & Lemahieu, H. The Global Power Balance Shifts Toward Asia. Brink – The Edge of Risk (2018)
42. Reed, J. Cambodia's embrace of China stirs local tension. Financial Times (FT.Com) (2018)
43. Ono, Y. Thailand plans regional infrastructure fund to reduce China dependence. Nikkei Report (2018)
44. Murray, L. & Grigg, A. New Belt and a second Road option. The Australian Financial Review 6 (2017)
45. Holland, T. Why China and others seem intent on building roads to nowhere. South China Morning Post 17 (2018)
46. Smart Nation Initiatives: Singapore's Efforts to Improve Living. Available at: <http://www.smartnation.sg/initiatives>. (Accessed: 3<sup>rd</sup> August 2018)
47. Park, C.-Y. & Takenaka, K. A. Can Technology Address Asia's Aging Dilemma? Brink – The Edge of Risk (2018)
48. Robitzsky, D. Japan is replacing its ageing construction workers with robots. World Economic Forum Agenda (2018)
49. Rosemain, M. & Rose, M. France to spend \$1.8 billion on AI to compete with U.S., China. Reuters (2018)
50. Obe, M. & Sugiura, E. Five things to know about 'Made in China 2025'. Nikkei Report (2018)
51. Marsh & McLennan Companies' Asia-Pacific Risk Center. Evolving Risk Concerns in Asia-Pacific 2017. (Marsh & McLennan Asia-Pacific Risk Center, 2017)
52. Marsh & McLennan Asia-Pacific Risk Center. Cyber Risk in Asia-Pacific: The Case for Greater Transparency. (Marsh & McLennan Companies, 2017)
53. Fireeye. M-Trends 2018. (Fireeye, 2018)
54. The National Cyber Security Centre. 2016-17 Unclassified Cyber Threat Report. (The National Cyber Security Centre, New Zealand, 2017)
55. Park, J. & Pearson, J. Exclusive: North Korea's Unit 180, the cyber warfare cell that worries the West Reuters (2017)
56. Yang, Y. China's cyber security law rattles multinationals. Financial Times (FT. Com) (2017)
57. Nguyen. Vietnam lawmakers approve cyber law clamping down on tech firms, dissent Reuters (2018)
58. Foroohar, R. 'Splinternet' to herald a trade war for the ages. Financial Times (FT.Com) (2018)
59. Srivastava, S. et al. Leave no one behind: Disaster resilience for sustainable development. (2018)
60. Climate change 2014: impacts, adaptation, and vulnerability: Working Group II contribution to the fifth assessment report of the Intergovernmental Panel on Climate Change. (Cambridge University Press, 2014)

61. Thai floods crimp global supply chains. Reuters (2011)
62. Schmitz, R. China Shuts Down Tens Of Thousands Of Factories In Unprecedented Pollution Crackdown. National Public Radio (2017)
63. Dockrill, P. China has shut down up to 40% of its factories in an unprecedented move to curb pollution. Business Insider (2017)
64. Tang, F. & Lau, M. Chinas environmental clean-up campaign hasnt cost jobs or hit economy, minister says. scmp.com (2017)
65. Dancel, R. Philippines to close Boracay to tourists for six months from April 26. The Straits Times (2018)
66. World Energy Council. World Energy Trilemma Index 2017 : Monitoring the Sustainability of National Energy Systems. (World Energy Council, 2017)
67. Preece, G. Coal-Fired Generation Faces a Changing Market. Brink – The Edge of Risk (2018)
68. Bridle, R. et al. Missing the 23 Per Cent Target: Roadblocks to the development of renewable energy in Indonesia. (International Institute for Sustainable Development, 2018)
69. Macdonald-Smith, A., Ludlow, M. & Potter, B. High power costs floor business. The Australian Financial Review 1 (2017)
70. Murphy, K. Tony Abbott warns against low emissions target ahead of Finkel review. The Guardian (2017)
71. Shaikh, S. & Tunio, S. Cooperation to curb Asia’s climate risks still too rare: scientists. Reuters (2018)
72. Khadka, N. S. China and India now in water ‘dispute’. BBC News (2017)
73. Ono, Y. Mekong River nations face the hidden costs of China’s dams. Nikkei Report (2018)
74. Asian Development Bank. Meeting Asia’s Infrastructure Needs. (Asian Development Bank, 2017). doi:10.22617/FLS168388-2
75. Asian Development Bank. Urban Transport. Asian Development Bank (2014). Available at: <https://www.adb.org/sectors/transport/key-priorities/urban-transport>. (Accessed: 3<sup>rd</sup> August 2018)
76. Ismail, N. W. & Mahyideen, J. M. The Impact of Infrastructure on Trade and Economic Growth in Selected Economies in Asia. Asian Dev. Bank Inst. (2015). doi:10.2139/ssrn.2709294
77. United Nations ESCAP. State of ICT in Asia and the Pacific 2016: Uncovering the Widening Broadband Divide. (United Nations ESCAP, 2016)
78. Marsh & McLennan Companies’ Asia Pacific Risk Center & FireEye. Cyber Evolution: En Route to Strengthening Resilience in Asia Pacific. (Marsh & McLennan Companies, 2018)
79. United Nations. World Population Prospect 2017. (2017). Available at: <https://esa.un.org/unpd/wup/>. (Accessed: 3<sup>rd</sup> August 2018)
80. Bhattacharyay, B. Estimating Demand for Infrastructure in Energy, Transport, Telecommunications, Water, and Sanitation in Asia and the Pacific: 2010-2020. (2010)
81. Eckstein, D., Künzel, V. & Schäfer, L. Global Climate Risk Index 2018. (Germanwatch, 2017)
82. Asian Development Bank. Disaster Risk in Asia and the Pacific: Assessment, Management, and Finance. (Asian Development Bank, 2016)
83. Guy Carpenter. Asia-Pacific Catastrophe Report 2017. (Guy Carpenter, 2017)
84. Vallejo, L. & Mullan, M. Climate-resilient infrastructure: Getting the policies right. 74 (2017)
85. United Nations Development Programme. Paving the Way for Climate-resilient Infrastructure: Guidance for Practioners and Planners. (United Nations Development Programme, 2011)
86. Mercer & Inter-American Development Bank (IDB). Building a Bridge to Sustainable Infrastructure Investing. (2017)
87. Mercer & Inter-American Development Bank (IDB). Crossing the Bridge to Sustainable Infrastructure Investing. (2017)
88. Hirabayashi, Y. et al. Global flood risk under climate change. Nat. Clim. Change 3, 816 (2013)

89. Farand, C. While the West watches Texas, 41 million people are being affected by floods in south Asia. *The Independent* (2017). Available at: <http://www.independent.co.uk/news/world/asia/india-floods-bangladesh-nepal-millions-affected-says-un-a7920721.html>. (Accessed: 3<sup>rd</sup> August 2018)
90. Nikkei Asian Review. Flood exposes blind spots in Japan's disaster preparations. *Nikkei Asian Review* (2018)
91. The Japan Times. Scenes of chaos after floods and landslides wreak havoc in western Japan. *The Japan Times Online* (2018)
92. Intergovernmental Panel on Climate Change. Contribution of Working Group I to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change. (2007)
93. Swiss Re. Sigma No 1/2018: Natural catastrophes and man-made disasters in 2017: a year of record breaking losses. (Swiss Re, 2018)
94. The Japan Times. Typhoon Jebi highlights vulnerability of offshore Kansai airport. *The Japan Times Online* (2018)
95. Mani, M., Bandyopadhyay, S., Chonabayashi, S., Markandya, A. & Mosier, T. South Asia's Hotspots: The Impact of Temperature and Precipitation Changes on Living Standards. (The World Bank, 2018). doi:10.1596/978-1-4648-1155-5
96. Intergovernmental Panel on Climate Change. Contribution of Working Group II to the Third Assessment Report of the Intergovernmental Panel on Climate Change. (2001)
97. Nguyen, M., Wang, X. & Chen, D. An investigation of extreme heatwave events and their effects on building and infrastructure. 122 (2011)
98. Coffel, E. D., Horton, R. M. & Sherbinin, A. de. Temperature and humidity based projections of a rapid rise in global heat stress exposure during the 21<sup>st</sup> century. *Environ. Res. Lett.* 13, (2017)
99. Wetherald, R. T. Simulation of hydrologic changes associated with global warming. *J. Geophys. Res.* 107, (2002)
100. Nguyen, M., Wang, X. & Wang, C.-H. A reliability assessment of railway track buckling during an extreme heatwave. 226, (Part F: *Journal of Rail and Rapid Transit*, 2012)
101. Sonali, P. & Gloystein, H. Heat wave leaves thousands of Australian homes without power. *Reuters* (2018)
102. Chester, R. Hackers break deep into Australia's vital cyber networks. *news.com.au* (2017)
103. Wroe, D. New sabotage laws for cyber attacks on Australia's critical infrastructure. *The Sydney Morning Herald* (2017)
104. Parliament of Australia. Security of Critical Infrastructure Bill 2018. (2018)
105. Cyber Security Agency of Singapore. Cybersecurity Act. Cyber Security Agency (2018). Available at: <http://www.csa.gov.sg/legislation/cybersecurity-act>. (Accessed: 6<sup>th</sup> August 2018)
106. World Health Organisation. Factors that contributed to undetected spread of the Ebola virus and impeded rapid containment. (2015). Available at: <http://www.who.int/entity/csr/disease/ebola/one-year-report/factors/en/index.html>. (Accessed: 6<sup>th</sup> August 2018)
107. Upadhyay, A. & Singh, R. K. India's Power Surplus Might Not Be a Good Thing. *Bloomberg* (2017)
108. Marsh & McLennan Companies' Asia Pacific Risk Center. Holding healthcare to ransom: Industry perspectives on cyber risks. 20 (Marsh & McLennan Companies, 2018)
109. Saul, J. Global shipping feels fallout from Maersk cyber attack. *Reuters* (2017)
110. Danubrata, E. & Silviana, C. Touted sea change in Indonesia shipping network may hit choppy waters. *Reuters* (2017)
111. Gloystein, H. Asian coal prices hit late 2016 high amid huge shipping congestion. *Reuters* (2018)
112. SBS NEWS. Power prices 'put jobs at risk': AiGroup. *SBS News* (2018)
113. Verrender, I. The truth about soaring power prices: wind and solar not to blame. *ABC News* (2017)

114. Huang, Y. & Xiong, W. Geographic Distribution of Firm Productivity and Production: A 'Market Access' Approach (Job Market Paper). Harvard Univ. 58 (2018)
115. Nambiar, R. Traffic congestion costs Australian firms more than \$2.6 billion annually, report says. CNBC (2017)
116. Mitra, A., Sharma, C. & Veganzones-Varoudakis, M.-A. Infrastructure, ICT and Firms' Productivity and Efficiency: An Application to the Indian Manufacturing. (HAL, 2015)
117. Roberts, F. Poor IT infrastructure impacts business in Southeast Asia. (2017). Available at: <https://asia.businesschief.com/technology/593/Poor-IT-infrastructure-impacts-business-in-Southeast-Asia>. (Accessed: 6<sup>th</sup> August 2018)
118. Marsh & McLennan Companies' Asia Pacific Risk Center. Infrastructure Asset Recycling: Insights for governments and investors. 33 (Marsh & McLennan Companies, 2018)
119. Marsh & McLennan Companies' Asia Pacific Risk Center. Closing the financing gap: Infrastructure project bankability in Asia. 60 (Marsh & McLennan Companies, 2017)
120. The World Bank. Procuring infrastructure public-private partnerships report 2018: Assessing government capability to prepare, procure, and manage PPPs. (World Bank, 2018)
121. Biswas, A., Saklani, U. & Tortajada, C. India's rising problem: Urban floods. The Straits Times (2017)
122. Chaudhary, A. & Pradhan, B. Floods May Cost South Asia \$215 billion a Year by 2030. Bloomberg (2017)
123. Mouat, S. A New Paradigm for Utilities: The Rise of the Prosumer - Schneider Electric Blog. Schneider Electric (2016). Available at: <https://blog.schneider-electric.com/energy-management-energy-efficiency/2016/11/17/new-paradigm-utilities-rise-prosumer/>. (Accessed: 6<sup>th</sup> August 2018)
124. Han, P. Electrifying emerging ASEAN through off-grid distributed renewable energy systems. Asian Development Blog (2017)
125. Shaw, N. Energy 'prosumers' helping India's Modi harness the sun. Nikkei Asian Review (2016)
126. Marsh. Business Interruption Services. Marsh Risk Consulting (2018). Available at: <https://www.marsh.com/us/services/marsh-risk-consulting/business-interruption.html>. (Accessed: 6<sup>th</sup> August 2018)
127. The Global Talent Competitiveness Index 2018: Diversity for Competitiveness. (INSEAD, 2018)
128. Harding, R. Japan plans to ease visa rules for skilled workers. Financial Times (FT.Com) (2018)
129. Penn, J. Swiss vocational model impresses chiefs. The New Zealand Herald (2017)
130. Irvine, J. Young and out: Australia's hidden scourge of youth unemployment. The Sydney Morning Herald 4 (2018)
131. Caitlin, P. Deciphering Labor and Skill Shortages in Asia with Workforce Analytics. (The Workforce Analytics Institute, 2016)
132. HR in Asia. Higher Percentage of Unemployed Workers with Bachelor's Degree. HR in Asia (2018)
133. HR in Asia. Poor Command of English among Major Reasons for Graduates Unemployment in Malaysia. HR in Asia (2018)
134. Asia-Pacific Economic Cooperation. Data Science and Analytics Skills Shortage: Equipping the APEC Workforce with the Competencies Demanded by Employers. (Asia-Pacific Economic Cooperation, 2017)
135. Tan, K. S. & Tang, J. New Skills at Work: Managing Skill Challenges in ASEAN-5. (Singapore Management University & J.P. Morgan, 2016)
136. Mercer & Oliver Wyman. Delivering the Workforce for the Future. (Mercer & Oliver Wyman, 2017)
137. International Federation of Robotics. Executive Summary: World Robotics 2017 Industrial Robots. (International Federation of Robotics, 2017)
138. Marsh & McLennan Companies' Asia-Pacific Risk Center. Advancing into the Golden Years: Cost of Healthcare for Asia-Pacific's Elderly. (Marsh & McLennan Companies, 2016)

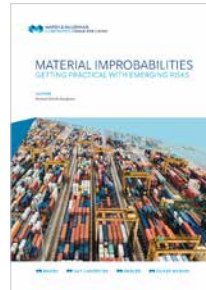
139. World Economic Forum. The Global Human Capital Report 2017. (World Economic Forum, 2017)
140. Gamboa, R. Upgrading BPO workforce skills is key. *The Philippine Star* (2018)
141. Marsh & McLennan Companies' Global Risk Center. The Twin Threats of Aging and Automation. (Marsh & McLennan Companies, 2018)
142. Asian Development Bank. Tapping Technology to Maximize the Longevity Dividend in Asia. (Asian Development Bank, 2018). doi:10.22617/TCS189330-2
143. Shiao, V. In the Asia-Pacific, talent shortages will bite hardest in S'pore. *Business Times Singapore* (2017)
144. Gilchrist, K. Job openings and hiring: Asia's most in demand professions. *CNBC* (2018)
145. Ang, J. Singapore's talent shortage is at its highest since 2008. *Human Resources Online* (2018)
146. Swani, P. Total Rewards Strategies to Drive Talent Engagement in Asia Pacific. *Brink – The Edge of Risk* (2017)
147. Marsh & McLennan Companies' Asia-Pacific Risk Center. Aging Workforce: Cost and Productivity Challenges of Ill Health in Singapore. (Marsh & McLennan Companies, 2017)
148. Bravery, K. & Swani, P. Empowering Talent in Emerging Markets To Thrive Amidst Disruption. *Brink – The Edge of Risk* (2018)
149. Mercer. Global Talent Trends Study 2018: Unlocking Growth in the Human Age. (Mercer, 2018)
150. HR in Asia. Solving Skills Shortage with Talent Engagement in 2018. *HR in ASIA* (2018)
151. Mercer. Will the Gig Workforce Drive New Normal for Benefits? (2016). Available at: <https://www.mercer.us/our-thinking/healthcare/will-the-gig-workforce-drive-new-normal-for-benefits.html>. (Accessed: 6<sup>th</sup> August 2018)
152. Yi, S. B. Freelance jobs on the rise. *The Straits Times* (2017)
153. Bevan, M. Gig economy threatened by increasing regulation to ensure workers' rights. *Australian Broadcasting Corporation News* (2017)
154. Tomiyama, A. Southeast Asian workers press for big minimum wage hikes. *Nikkei Report* (2017)
155. Mercer & Oliver Wyman. Delivering the Workforce for the Future: Open-Source Talent. (Mercer & Oliver Wyman, 2018)
156. HR in Asia. Recruiters and Hiring Managers Turn to Social Media Recruitment in India. *HR in ASIA* (2016)
157. Forbes Agency Council. Eight Ways To Leverage Social Media As A Hiring Tool. *Forbes* (2018)
158. Mercer & Oliver Wyman. Engaging the Workforce in Digital Transformation: A New Model to Enable Your Digital Strategy. (Mercer & Oliver Wyman, 2018)
159. Duchatellier, C. Public-Private Partnerships Can Power Future of Work in Asia. *Brink – The Edge of Risk* (2017)

# RECENT PUBLICATIONS FROM THE GLOBAL RISK CENTER



## THE GLOBAL RISKS REPORT 2018

The World Economic Forum highlights the issue that will exacerbate volatility and uncertainty in the next decade – while also presenting opportunities for government and businesses to build resilience and deliver sustainable growth. Marsh and McLennan Companies has been a strategic partner of the report since 2006.



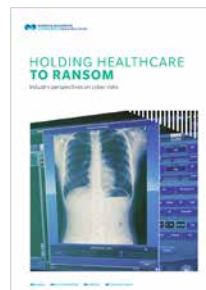
## MATERIAL IMPROBABILITIES

This publication from Global Risk Center sets out how firms can move from generalized concerns to analyses, discussions and actions in response to specific threats that may most disrupt their ambitions and operations, and erode most value. It concludes by reflecting on the opportunities for Risk leaders to reframe the function to meet the needs of the new era.



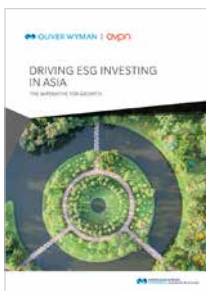
## INFRASTRUCTURE ASSET RECYCLING

This report explores how the asset recycling concept has been practically implemented in the context of Australia. From the Australian experience, it discusses the key takeaways for governments that are considering implementing asset recycling schemes. In particular, the report highlights the importance of accounting for public perception in a successful asset recycling program.



## HOLDING HEALTHCARE TO RANSOM

This paper highlights some examples of best practices across industries in cyber risk management, and several key areas for healthcare organizations to start focusing on, such as preparedness, prevention, detection, response, and recovery, including the use of cyber risk insurance as a risk-transfer tool.



## DRIVING ESG INVESTING IN ASIA

A partnership between AVPN, OW and APRC, the report highlights the existing ESG Investing landscape in Asia and illustrates key observations and common challenges faced by early adopters. It also outlines six practical steps investors can take to initiate their journey into ESG Investing, and provides key learnings and recommendations for those aiming to embark on similar journeys.



## THE TWIN THREATS OF AGING AND AUTOMATION

The report examines and quantifies the risks of rapid societal aging, and of older workers' susceptibility to automation in fifteen major markets. Older workers today face significant risks of displacement at the hands of emerging technologies, and are often overlooked as viable sources of renewed productivity. It is therefore incumbent on employers to redeploy the unique abilities of older workers as part and parcel of any digital transformation strategy.



## CYBER EVOLUTION: EN ROUTE TO STRENGTHENING RESILIENCE IN APAC

The cyber threat landscape is morphing constantly and dramatically. Around the world, cyber dependency grows as increasing digital interconnection among people, things, and organizations expand. Asia-Pacific (APAC) is no different. A collaboration between FireEye and APRC, this white paper aims to help organizations across APAC build and strengthen their enterprise cyber resilience.



## TARGETING A TECHNOLOGY DIVIDEND IN RISK MANAGEMENT

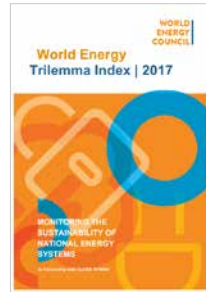
A collaboration between APRC and PARIMA, the report analyses results from The Emerging Tech in Risk Management Survey of 2017, providing insights into how businesses plan to deploy technology in corporate risk management. It contains case studies and perspectives from across Marsh & McLennan Companies' operating companies as well as from our external partners.

# RECENT PUBLICATIONS FROM MARSH & MCLENNAN OPERATING COMPANIES



## IS THE GOLDEN AGE FOR MNCs OVER?

The report by OW, presented at the Singapore Summit 2018, explores how the current political shift impacts MNCs on various perspectives and how MNCs should fundamentally rethink their business models and governance principles in order to successfully navigate against these headwinds.



## WORLD ENERGY TRILEMMA INDEX 2017

A partnership between WEC and OW, the 2017 Energy Trilemma Index tracks the development of the three pillars of the energy sustainability, namely energy security, energy equity, and environmental sustainability across 125 countries. Balancing these three goals constitutes a 'trilemma' and is the basis for prosperity and competitiveness of individual countries.



## FINANCIAL CRIME RISK MANAGEMENT IN APAC

The point of view from OW looks into the major issue of financial crime in APAC to stress the substantial cost it can entail for financial institutions and society at large. The report suggests crucial steps to managing financial crimes from communication, culture, compliance, to coverage, computation and cooperation.



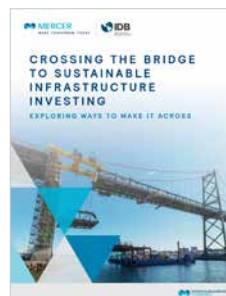
## THE NEW IMPERATIVES FOR FINANCIAL SECURITY

Part of the Healthy, Wealthy and Work-Wise program, Mercer's latest report examines why smart companies are using technology to deliver an employee experience that empowers the workforce and improves the physical and financial well-being of individual employees and their families.



## DELIVERING THE WORKFORCE FOR THE FUTURE

For many companies, the path toward this future will require a fundamental transformation in the way they think about strategy, business models, HR, and their most critical resource – their staff. This report shares Mercer's point of view relating to skills, size, and shape, and provides an outline to guide business leaders as they progress from envisioning to delivering their future workforce.



## CROSSING THE BRIDGE TO SUSTAINABLE INFRASTRUCTURE INVESTING

To better understand what is happening on the ground, review the barriers and identify tangible next steps to address the funding gap for sustainable infrastructure, the Inter-American Development Bank (IDB) commissioned Mercer to undertake a multiphase project beginning in mid-2016.



## EXCELLENCE IN RISK MANAGEMENT XV

Technology is embedded in nearly every aspect of our lives, including in many businesses' critical functions and risk professionals are tasked with answering critical questions about the risks these new technologies present. A collaboration between Marsh and RIMS, this year's Excellence in Risk Management survey looks into risk professionals' views on their role in innovation as well as their companies' digital approach.



## CYBER RISK MANAGEMENT: RESPONSE AND RECOVERY

In the event of a debilitating attack, cyber insurance and associated services can limit an organization's financial losses and help accelerate its recovery. This report from Marsh & McLennan's Global Risk Center and Women Corporate Directors outlines what directors need to know to position cyber insurance within a comprehensive risk management framework.



## ACKNOWLEDGEMENTS

To read the **digital version** of Evolving Risks Concerns in Asia-Pacific 2018, please visit [www.mmc/asia-pacific-risk-center.html](http://www.mmc/asia-pacific-risk-center.html)

## AUTHORS

### WOLFRAM HEDRICH

Executive Director  
Marsh & McLennan Companies' Asia-Pacific Risk Center  
[wolfram.hedrich@mmc.com](mailto:wolfram.hedrich@mmc.com)

### BLAIR CHALMERS

Director  
Marsh & McLennan Companies' Asia-Pacific Risk Center  
[blair.chalmers@mmc.com](mailto:blair.chalmers@mmc.com)

### PHAN HOANG VIET

Research Analyst  
Marsh & McLennan Companies' Asia-Pacific Risk Center  
[viethoang.phan@oliverwyman.com](mailto:viethoang.phan@oliverwyman.com)

### JESSICA KOH

Research Analyst  
Marsh & McLennan Companies' Asia-Pacific Risk Center  
[jessica.koh@oliverwyman.com](mailto:jessica.koh@oliverwyman.com)

## MARSH & McLENNAN COMPANIES CONTRIBUTORS

**Marsh & McLennan Companies' Global Risk Center:** Leslie Chacko, Lucy Nottingham, Richard Smith-Bingham, Alex Wittenberg; **Marsh:** James Addington-Smith, Rohan Bhappu, Shimoyama Hirofumi, Jonathan James, Larry Liu, Lionel Mintz, Svein Tyldum, Douglas Ure, Paul Wilkins; **Mercer:** Liana Attard, Lewis Garrad, Vidisha Mehta, Rahul Mudgal; **Guy Carpenter:** Andre Eisele, Edward Fenton, Tony Gallagher, David Lightfoot, James Nash, Michael Owen, Claudio Saffioti; **Oliver Wyman:** Abhimanyu Bhuchar, Timothy Colyer, Edward Emanuel, David Howard-Jones, Aarti Nihalani, Christian Pedersen, Peter Reynolds, Sumit Sharma, Seo Young Lee; **Marsh & McLennan Companies' Asia-Pacific Risk Center:** Meghna Basu, Jaclyn Yeo

The design work of this report was led by Vladica Stanojevic and Muhammad Shahroum, Oliver Wyman.

## ABOUT MARSH & McLENNAN COMPANIES

MARSH & McLENNAN COMPANIES (NYSE: MMC) is a global professional services firm offering clients advice and solutions in the areas of risk, strategy and people. Marsh is a leader in insurance broking and risk management; Guy Carpenter is a leader in providing risk and reinsurance intermediary services; Mercer is a leader in talent, health, retirement and investment consulting; and Oliver Wyman is a leader in management consulting. With annual revenue of \$13 billion and approximately 60,000 colleagues worldwide, Marsh & McLennan Companies provides analysis, advice and transactional capabilities to clients in more than 130 countries. The Company is committed to being a responsible corporate citizen and making a positive impact in the communities in which it operates.

Visit [www.mmc.com](http://www.mmc.com) for more information and follow us on LinkedIn and Twitter @MMC\_Global.




Economy • Environment • Geopolitics •  
Society • Technology



“ *BRINK Asia is a digital news platform that provides regional perspectives from leading experts on issues related to emerging risks, growth and innovation.* ”

 [contact@brinkasia.com](mailto:contact@brinkasia.com)

 [www.brinknews.com/asia](http://www.brinknews.com/asia)

 Follow BRINK Asia on Twitter

 Follow BRINK Asia on LinkedIn

*This is made possible by Marsh & McLennan Companies and managed by Atlantic Media Strategies*

## **ABOUT MARSH & McLENNAN COMPANIES' ASIA PACIFIC RISK CENTER**

MARSH & McLENNAN COMPANIES' Asia Pacific Risk Center addresses the major threats facing industries, governments, and societies in the Asia Pacific Region and serves as the regional hub for our Global Risk Center. Our research staff in Singapore draws on the resources of Marsh, Guy Carpenter, Mercer, Oliver Wyman, and leading independent research partners around the world. We gather leaders from different sectors around critical challenges to stimulate new thinking and solutions vital to Asian markets. Our digital news service, [BRINK Asia](#), keeps decision makers current on developing risk issues in the region.

For more information, visit [www.mmc.com/asia-pacific-risk-center.html](http://www.mmc.com/asia-pacific-risk-center.html) or email the team at [contactaprc@mmc.com](mailto:contactaprc@mmc.com).

Copyright © 2018 Marsh & McLennan Companies, Inc. All rights reserved.

This report may not be sold, reproduced or redistributed, in whole or in part, without the prior written permission of Marsh & McLennan Companies, Inc.

This report and any recommendations, analysis or advice provided herein (i) are based on our experience as insurance and reinsurance brokers or as consultants, as applicable, (ii) are not intended to be taken as advice or recommendations regarding any individual situation, (iii) should not be relied upon as investment, tax, accounting, actuarial, regulatory or legal advice regarding any individual situation or as a substitute for consultation with professional consultants or accountants or with professional tax, legal, actuarial or financial advisors, and (iv) do not provide an opinion regarding the fairness of any transaction to any party. The opinions expressed herein are valid only for the purpose stated herein and as of the date hereof. We are not responsible for the consequences of any unauthorized use of this report. Its content may not be modified or incorporated into or used in other material, or sold or otherwise provided, in whole or in part, to any other person or entity, without our written permission. No obligation is assumed to revise this report to reflect changes, events or conditions, which occur subsequent to the date hereof. Information furnished by others, as well as public information and industry and statistical data, upon which all or portions of this report may be based, are believed to be reliable but have not been verified. Any modeling, analytics or projections are subject to inherent uncertainty, and any opinions, recommendations, analysis or advice provided herein could be materially affected if any underlying assumptions, conditions, information, or factors are inaccurate or incomplete or should change. We have used what we believe are reliable, up-to-date and comprehensive information and analysis, but all information is provided without warranty of any kind, express or implied, and we disclaim any responsibility for such information or analysis or to update the information or analysis in this report. We accept no liability for any loss arising from any action taken or refrained from, or any decision made, as a result of or reliance upon anything contained in this report or any reports or sources of information referred to herein, or for actual results or future events or any damages of any kind, including without limitation direct, indirect, consequential, exemplary, special or other damages, even if advised of the possibility of such damages. This report is not an offer to buy or sell securities or a solicitation of an offer to buy or sell securities. No responsibility is taken for changes in market conditions or laws or regulations which occur subsequent to the date hereof.