

Deloitte.



Tracking the trends 2022

Redefining mining

Deloitte's Global Energy, Resources & Industrials specialists provide comprehensive, integrated solutions to all segments of the Oil, Gas & Chemicals, Power & Utilities, Mining & Metals, and Industrial Products & Construction sectors by offering clients deep industry knowledge and a global network.

Introduction

Redefining mining

What will successful mining and metals companies look like in a low-carbon, low-waste, purpose-driven future?

The beauty of this question is that there is no definitive answer. While the core objective of the mining industry remains unchanged going forward: to extract and provide metals and minerals to downstream sectors, many of the factors that have influenced how mining companies should look, feel, and act in the past, have shifted in recent years.

The way in which companies fulfil this mission is now open to interpretation. And today, there is a rare opportunity for leaders to reorganize, generate new value, and forge partnerships to create a more responsible and attractive future for the industry.

While some early movers saw the need for change coming 10, 15, even 20 years ago and have been redefining their organizations and operations accordingly, for many firms, the necessity for fundamental change only really hit home in 2020-21. The convergence of factors including the ongoing effects of the COVID-19 pandemic on the world of work, continued drive towards digitization, the growing need to integrate ESG commitments with central business functions, and the need to pivot in response to fast-moving business and operating environments, has opened many choices for companies.

Of course, the biggest underlying driver and opportunity for transformation lies in the green energy transition. The 2021 United Nations Climate Change Conference (COP26) held in Glasgow in November, highlighted the mining industry's integral role in supplying the metals and materials critical for a low-carbon future¹. The way in which mining companies position themselves today in preparation for this change, will determine their sustainability, and could make or break their competitive advantage over the next decade.

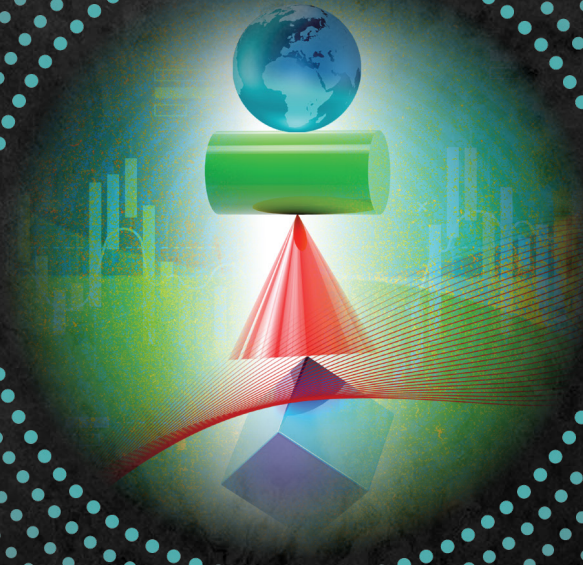
Change on this scale is undoubtedly daunting, which is why in this, its 14th year, Tracking the trends has focused on effecting transformation. The following 10 trends provide a toolkit to help mining companies start thinking through, and moving towards, their vision of future success.

In them, our global team of experts share insights and case studies designed to get ideas flowing. We explore how to evolve traditional mining and metals businesses through new business models, capital allocation, agile work practices, and data-driven technologies to create organizations fit for the 21st century; ones that can not only survive but profit from whatever the future might throw at them and leave a positive social impact in their wake.

The next decade will be one of the most exciting and transformative in the mining industry's history. We look forward to discussing the trends with you and supporting your company on its journey. Thank you for your ongoing support.

Endnote:

1. Judith Magyar, "COP26 Takeaways: Renewables Replace Fossil Fuels As Metals Become A Major Force", published 28 November 2021 <https://www.forbes.com/sites/sap/2021/11/29/cop26-takeaways-renewables-replace-fossil-fuels-as-metals-become-a-major-force/?sh=948a2f626763>, accessed 3 December 2021.



Trend 10

Preparing operations for climate change

Managing physical risks through digital insights

John O'Brien, Partner, Financial Advisory, Deloitte Australia

Patricia Muricy, Mining & Metals Leader, Deloitte Brazil

While decarbonization has been the primary focus of most miner's climate change-related targets and investments thus far, mitigation is only one piece of the puzzle. Alongside these efforts, organizations need to be thinking ahead and building climate resilience across their businesses and operations.

Some tier one companies have begun to do this using United Nations climate models and digital risk-management tools to quantify both physical and transitional risks at new and existing mine sites. In some cases, these efforts even extend to scoping the exposure of their suppliers. But, for most mid-tier and junior miners, particularly those in geographical areas where climate impacts to date have been limited, this is uncharted territory.

However, in time, the effects of climate change will touch all businesses, across all sectors, regardless of their size and status. The level of transparency and integration of mining supply chains today means that organizations have the chance to prepare their own operations, and also help their suppliers and customers ready themselves for whatever operational effects a changing climate might bring.

Impacts of a warming climate

Physical risks resulting from climate change can be event-driven (acute) or longer-term shifts (chronic) in climate patterns. Both can carry financial implications for organizations, such as direct damage to assets and indirect impacts from supply chain disruption.

In certain geographies, extreme weather events such as droughts and flash floods pose a growing threat to mining activities as global temperatures rise. For example, BHP reported an 11% drop in output from one of its mines in New South Wales during 2019 due to poor air quality caused by bushfires.¹ Scientists estimate that, if global temperatures rise by 2C, the hot dry conditions that encourage bushfires would occur at least four times more often.²

Record heatwaves in North America during 2021 are another example. In June, temperatures in British

Columbia reached 49.6°C, breaking the country's highest recorded temperature, and wildfires triggered evacuations in California and northern Nevada.³ This clearly has a significant effect on workers in the field.⁴

Organizations' financial performance may also be affected by changes in water availability, sourcing, and quality, as well as issues around food security, and extreme temperature changes affecting premises, operations, and transport needs.

In their 2020 metals and mining survey, 'Emerging ESG Risks in the Metals and Mining Value Chain' Fitch Ratings and CRU named water scarcity as the greatest emerging risk to the mining and metals sector.⁵ The authors state: "Pressures such as localized water shortages and competition for water are likely to increase in the coming decades, causing increasing challenges for battery and low-carbon technology production."

Most mining operations are heavily reliant on water for various purposes, including dust control, cooling of machinery, and mineral processing. Nowhere is this risk more evident than in copper. The increasingly arid conditions seen in northern Chile and southern Peru (the world's largest copper-producing regions⁶) are forcing many large miners to invest in desalination plants. The Chilean Copper Commission (Cochilco) estimates that, by 2029, seawater will account for 43% of the water used in copper mining, up 230% on its expected level in 2018.⁷

In highly water-stressed areas, closed-loop extraction processes can help to lower abstraction requirements, and innovative tailings pond linings and coverings can reduce losses through seepage and evaporation. However, in areas where prolonged arid conditions are expected in the future, then dry processes and tailings storage solutions might be more sustainable in the long run.

Supply-chain vulnerability

For mining companies, the physical risks from climate change can extend much further than their own sites. For example, meteorological events have the potential to significantly disrupt key transport corridors.

In March 2021, heavy rain in Australia's New South Wales and Queensland impacted global thermal coal supplies. Glencore was forced to cut capacity at some of its mine sites, while Yancoal suspended production at two of its open-pit mines.⁸ The Australian Rail Track Corporation temporarily ceased operations through parts of the Hunter Valley network due to localized flooding, a key transport corridor to the Port of Newcastle.⁹

Meanwhile, ship loading at the port was suspended for two weeks to repair storm damage to key equipment.¹⁰ This, plus flooding, caused Australian coal miner Whitehaven to slash its 2020-21 June–July coal production, and the number of vessels grew around port limits.¹¹

Flooding and wet weather continued through the Australian summer, and supply issues saw thermal coal prices hit a record US\$244.11 per ton on 8 October 2021.¹² Floods were still affecting prime-production regions in November.¹³

While the cumulative effects of these disruptions are yet to be published, this example demonstrates why a collective and coordinated effort toward building climate resilience is required across the value chain.

Once again, digital tools can offer insights to support. Deloitte is currently helping a tier-one mining company assess operational risks posed by climate change across its supply chain using its Illuminate solution.¹⁴ This provides transparency of complex procurement networks by leveraging augmented intelligence and machine-learning methodologies to enable rapid modeling and represent those suppliers systematically. Multi-tier networks can then be overlaid with exposures and opportunities, including those related to climate-change risks.

Assess and prepare for different scenarios

In order to mitigate physical risks at both current operations and those under development, a detailed assessment under a variety of future scenarios is necessary.

John O'Brien—Partner, Financial Advisory, Deloitte Australia, explains: "If you're building a mine today that's going to be operating for 10, 20 or 50 years, it's important to design the site, its infrastructure, and supply chain in a way that will mitigate the physical effects of climate change as far as possible."

Patricia Muricy—Mining & Metals Leader, Deloitte Brazil explains: "We know from global climate models what kind of changes will happen over the next 15 years under different scenarios ranging from 6°C to 1.5°C temperature rises. It's only after 2035 that the trajectory of these models starts to diverge. The trajectory beyond 2035 is uncertain and will be determined by the speed of global decarbonization. Miners therefore need to build a certain level of agility and optionality into their operating plans."

Why now?

Based on data from these types of solutions, mining companies should instigate conversations with their suppliers, make decisions around future capital and resource allocation, and, where necessary, diversify their own supply chains to lower operational risks.

It is reasonable to assume that consumers of critical minerals and metals, including electric-vehicle manufacturers and low-carbon energy technology providers, will soon be looking to do the same with their own supply chains. Mining companies play an important role in these both today and tomorrow. Where possible, miners should extend their climate risk-assessment exercises to the downstream portion of metal supply chains and encourage customers to ask questions about the future exposure and security of their suppliers. Security of supply is everyone's concern, and preparedness could offer miners a competitive advantage compared with their peers.

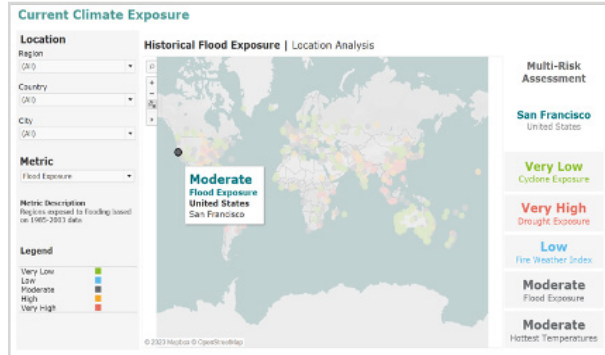
Ultimately, organizations that build climate resilience will also gain access to more attractive financing, stronger employee recruitment and retention, and cheaper energy costs to name a few benefits.

Quantify risks and opportunities

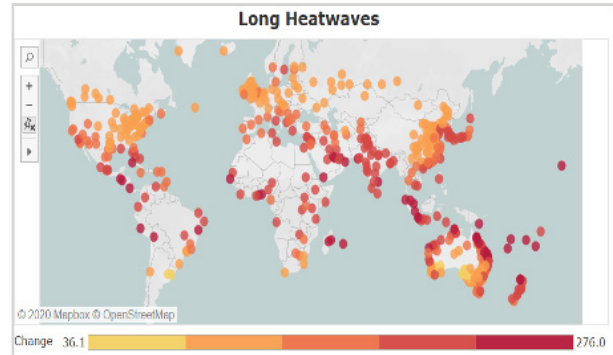
Deloitte Decarbonization Solutions™ include an Adaptation/Physical Climate Risk Module that can demonstrate mining companies' current and future exposure to various climate hazards for assets and portfolio locations. The module incorporates business and financial impacts and supports the translation of climate challenges along the value chain. It can also identify opportunities for investment and resilience and quantify climate thresholds for major disruptions. Alignment with Task Force on Climate-Related Financial Disclosures (TCFD) and other major climate risk frameworks helps to support climate risk disclosures, see figure 1.

Figure 1: Physical Climate Risk Module: Providing quantification of physical risks globally

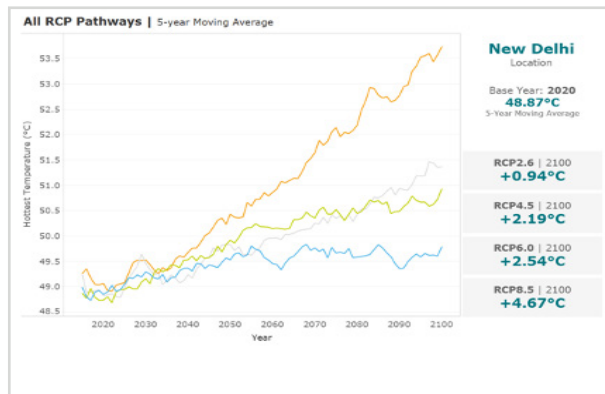
Multi-risk assessment – Assessment of current exposures to cyclones, droughts, fire, flood and heat



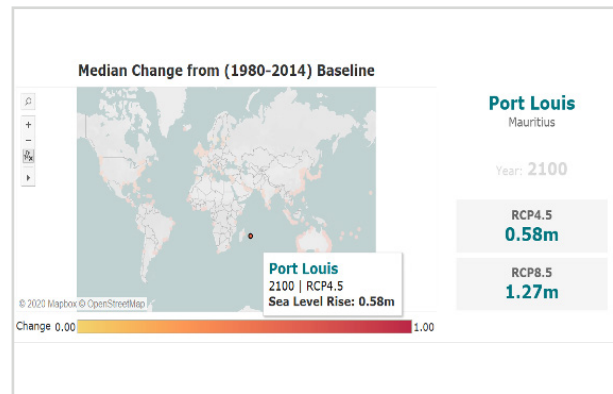
Future scenario analysis – Increase in long heatwaves under a high emission (RCP8.5) future



Local sea level rise – Increase in sea level for 2100 for RCP4.5 versus RCP8.5



Comparing future RCPs – Hottest annual temperature under four Representative Concentration Pathways (RCPs)



Source: Deloitte Decarbonization Solutions™

Building climate-resilient mining and metals businesses

- **Foster leaders for tomorrow:** Building climate resilience across a business requires solid leadership. Leaders who steer resilient organizations share common traits: they are prepared, adaptable, collaborative, trustworthy and responsible.¹⁵ Companies should actively seek out individuals who exhibit these traits and build in measures to help train and retain them.
- **Collaborate to accelerate:** For all mining organizations, but, in particular, smaller and mid-cap miners, collaboration and sharing of experiences between peers can accelerate progress. Everyone is grappling with the same climate-related challenges and will benefit from shared experiences and solutions.
- **Invest in business-wide capability:** To lower operational risk from climate change requires greater awareness throughout organizations regarding the effects of climate change, and how basic decisions today could potentially set the business up for the future. Making physical climate risks a key talking point in the organization and site briefings will help to ensure continued visibility.
- **Talk to your suppliers:** Where possible, this awareness and commitment to lowering physical-risk exposure should also be extended to suppliers. This could be through formal communication or discussions with key personnel. Suppliers may even have measures in place already that could help mining companies lower their overall risk exposure.
- **Question the value chain:** It is important that mining companies challenge the physical resilience of supply chains they are involved in, both up and downstream. Consider how exposed off-takers and end consumers are, and also how the business and operations compare to peers and competitors in terms of readiness for a changing climate. As with any change, opportunities and threats will emerge. How miners prepare for disruption and communicate this to the markets could prove critical to their competitiveness and social license going forward.

Endnotes:

1. Ben Chapman, "Australia wildfires: Mining firm BHP complains smoke is slowing down coal production," Independent, published 21 January 2020 <https://www.independent.co.uk/climate-change/news/australia-wildfires-smoke-bhp-coal-mining-new-south-wales-a9295151.html>, accessed 15 November 2021.
2. Pallab Ghosh, "Climate change boosted Australia bushfire risk by at least 30%," BBC News, published 4 March 2020 <https://www.bbc.co.uk/news/science-environment-51742646>, accessed 15 November 2021.
3. "US heatwave: California and Nevada brace for record-breaking temperatures," BBC, published 10 July 2021 <https://www.bbc.co.uk/news/world-us-canada-57788118>, accessed 14 December 2021.
4. "Heat stress," United States Department of Labor Mine Safety and Health Administration website <https://www.msha.gov/sites/default/files/Alerts%20and%20Hazards/Heat%20Stress.pdf> accessed 14 December 2021.
5. "Water Scarcity Is Greatest Risk to Metals and Mining," Fitch Ratings, published 8 July 2020 <https://www.fitchratings.com/research/infrastructure-project-finance/water-scarcity-is-greatest-risk-to-metals-mining-08-07-2020>, accessed 14 December 2021.
6. "Major countries in copper mine production worldwide in 2020," Statista, published 2021 <https://www.statista.com/statistics/264626/copper-production-by-country/>, accessed 14 December 2021.
7. Camila Montes and Jorge Cantallop, "Forecast for water consumption in the copper mining industry, 2018-2029," Comisión Chilena del Cobre, published December 2018 <https://www.cochilco.cl/Research/Forecast%20for%20water%20consumption%20in%20the%20copper%20industry.%202018-2029.pdf>, accessed 14 December 2021.
8. Nathan Richardson and Eric Yep, "Floods in eastern Australia hit coal mining operations, supply chains," S&P Global Platts, published 23 March 2021 <https://www.spglobal.com/platts/en/market-insights/latest-news/coal/032321-floods-in-eastern-australia-hit-coal-mining-operations-supply-chains>, accessed 14 December 2021
9. Nathan Richardson and Eric Yep, "Floods in eastern Australia hit coal mining operations, supply chains," S&P Global Platts, published 23 March 2021 <https://www.spglobal.com/platts/en/market-insights/latest-news/coal/032321-floods-in-eastern-australia-hit-coal-mining-operations-supply-chains> accessed 14 December 2021
10. Peter Ker, "Floods add to coal industry's year of disruption," Australian Financial Review, published 28 November 2021 <https://www.afr.com/companies/mining/floods-add-to-coal-industry-s-year-of-disruption-20211128-p59cvg> accessed 14 December 2021.
11. Nathan Richardson and Eric Yep, "Floods in eastern Australia hit coal mining operations, supply chains," S&P Global Platts, published 23 March 2021 <https://www.spglobal.com/platts/en/market-insights/latest-news/coal/032321-floods-in-eastern-australia-hit-coal-mining-operations-supply-chains> accessed 14 December 2021
12. Peter Ker, "Floods add to coal industry's year of disruption," Australian Financial Review, published 28 November 2021 <https://www.afr.com/companies/mining/floods-add-to-coal-industry-s-year-of-disruption-20211128-p59cvg> accessed 14 December 2021.
13. Peter Ker, "Floods add to coal industry's year of disruption," Australian Financial Review, published 28 November 2021 <https://www.afr.com/companies/mining/floods-add-to-coal-industry-s-year-of-disruption-20211128-p59cvg> accessed 14 December 2021.
14. "Illuminate," Deloitte website, 2021 <https://www2.deloitte.com/au/en/pages/technology/solutions/illuminate.html> accessed 14 December 2021.
15. "Building climate capability for a resilient mining sector," Deloitte, 2021 <https://www2.deloitte.com/au/en/pages/energy-and-resources/articles/building-climate-capability-resilient-mining-sector.html> accessed 14 December 2021.

Global contacts

Rajeev Chopra

Global Leader—Energy, Resources & Industrials

Deloitte Touche Tohmatsu Limited

+44 20 7007 2933

r Chopra@deloitte.co.uk

Andrew Swart

Global Sector Leader—Global Mining & Metals

Deloitte Touche Tohmatsu Limited

+1 416 813 2335

aswart@deloitte.ca

Regional/Country Mining & Metals Leaders

Africa

Andrew Lane

+27 11 517 4221

alane@deloitte.co.za

Ecuador

Jorge Brito

+59 32 381 5100

jorgebrito@deloitte.com

Argentina

Alejandro Jaceniuk

+54 11 4320 2700 ext. 4923

ajaceniuk@deloitte.com

France

Veronique Laurent

+33 1 5561 6109

vlaurent@deloitte.fr

Australia

Steven Walsh

+61 8 9365 7097

swalsh@deloitte.com.au

Francophone Africa

Damien Jacquart

+33 1 55 61 64 89

djacquart@deloitte.fr

Brazil

Patricia Muricy

+55 21 3981 0490

pmuricy@deloitte.com

India

Rakesh Surana

+91 22 6122 8160

rvsurana@deloitte.com

Canada

Andrew Swart

+1 416 813 2335

aswart@deloitte.ca

Indonesia

Ali Henry

+62 21 2992 3100

ahery@deloitte.com

Chile

Dominic Collins

+5 622 729 8089

dcollins@deloitte.com

Japan

Yuichi Shibata

+81 80 9087 4406

yuishibata@tohatsu.co.jp

China

Kevin Bin Xu

+86 10 8520 7147

kxu@deloitte.com.cn

Mexico

Valeria Vazquez

+52.55.50807548; ext 548

vavazquez@deloittemx.com

Colombia

Andres Roa

+57 1 426 2008

andresroa@deloitte.com

Peru

Karla Velásquez

+51 1 211 8559

kvelasquez@deloitte.com

Poland

Zbig Majtyka

+48 32 508 0333

zmajtyka@deloittece.com

Russia – CIS

Andrei Shvetsov

+74957870600; ext 5188

ashvetsov@deloitte.ru

Southeast Asia

Jiak See Ng

+65 93 877 958

jsng@deloitte.com

Switzerland

Geoff Pinnock

+41 58 279 6066

gmpinnock@deloitte.ch

Turkey

Elif Dusmez Tek

+90 312 295 47 00

etek@deloitte.com

United Arab Emirates

Bart Cornelissen

+971 4 376 8888

bpcornelissen@deloitte.com

United Kingdom

Roman Webber

+44 20 7007 1806

rwebber@deloitte.co.uk

United States

Amy Chronis

+1 713 982 4315

achronis@deloitte.com

Authors

Trend 1: Aligning capital allocation to ESG

Andrew Swart | Global Mining & Metals Leader, Deloitte Touche Tohmatsu Limited | aswart@deloitte.ca

Andrew Lane | Energy, Resources & Industrials Leader, Deloitte Africa | alane@deloitte.co.za

Trend 2: Reshaping traditional value chains

Andrew Lane | Energy, Resources & Industrials Leader, Deloitte Africa | alane@deloitte.co.za

John O'Brien | Partner, Financial advisory, Deloitte Australia | johnobrien@deloitte.com.au

Trend 3: Operating in the new super-cycle

Roman Webber | Mining & Metals Leader, Deloitte North South Europe: UK | rwebber@deloitte.co.uk

Valeria Vazquez | Mining & Metals Leader, Deloitte Mexico | vavazquez@deloittemx.com

Trend 4: Embedding ESG into organizations

Henry Stoch | Sustainability Leader, Deloitte Canada | hstoch@deloitte.ca

Harsha Desai | Associate Director, Consulting, Deloitte Africa | hardesai@deloitte.co.za

Trend 5: Evolving mining's world of work

Janine Nel | Partner, Consulting, Deloitte Canada | jnel@deloitte.ca

Marcello Cordova Alvestegui | Director, Consulting, Deloitte Chile | macordova@DELOITTE.com

Trend 6: Establishing a new paradigm for Indigenous relations

Professor Deen Sanders OAM | Lead Partner, Integrity, Deloitte Australia | deensanders@deloitte.com.au

Joe Hedger | Partner, Indigenous Services Group, Deloitte Australia | jhedger@deloitte.com.au

Jason Rasevych | Partner, National Indigenous Services Leader, Deloitte Canada | jrasevych@deloitte.ca

Trend 7: Continuing the journey toward innovation-led organizations

Steven Walsh | Mining & Metals Leader, Deloitte Australia | swalsh@deloitte.com.au

Roland Labuhn | Partner, Consulting, Deloitte Canada | rlabuhn@deloitte.ca

Trend 8: Unlocking value through integrated operations

Eamonn Treacy | Director, Consulting, Deloitte Canada | etreacy@deloitte.ca

Dominic Collins | Energy, Resources & Industrials Leader, Deloitte Chile | dcollins@deloitte.com

Trend 9: Closing the IT-OT vulnerability gap

René Waslo | Global Risk Advisory Leader, Energy, Resources & Industrials, Deloitte US | rwaslo@deloitte.com

Andrew Kwong | Partner, Risk Advisory, Deloitte Canada | akwong@deloitte.ca

Trend 10: Preparing operations for climate change

John O'Brien | Partner, Financial Advisory, Deloitte Australia | johnobrien@deloitte.com.au

Patricia Muricy | Mining & Metals Leader, Deloitte Brazil | pmuricy@deloitte.com



Deloitte refers to one or more of Deloitte Touche Tohmatsu Limited (“DTTL”), its global network of member firms, and their related entities (collectively, the “Deloitte organization”). DTTL (also referred to as “Deloitte Global”) and each of its member firms and related entities are legally separate and independent entities, which cannot obligate or bind each other in respect of third parties. DTTL and each DTTL member firm and related entity is liable only for its own acts and omissions, and not those of each other. DTTL does not provide services to clients. Please see www.deloitte.com/about to learn more.

Deloitte provides industry-leading audit and assurance, tax and legal, consulting, financial advisory, and risk advisory services to nearly 90% of the Fortune Global 500® and thousands of private companies. Our professionals deliver measurable and lasting results that help reinforce public trust in capital markets, enable clients to transform and thrive, and lead the way toward a stronger economy, a more equitable society and a sustainable world. Building on its 175-plus year history, Deloitte spans more than 150 countries and territories. Learn how Deloitte’s more than 345,000 people worldwide make an impact that matters at www.deloitte.com.

This communication contains general information only, and none of Deloitte Touche Tohmatsu Limited (“DTTL”), its global network of member firms or their related entities (collectively, the “Deloitte organization”) is, by means of this communication, rendering professional advice or services. Before making any decision or taking any action that may affect your finances or your business, you should consult a qualified professional adviser.

No representations, warranties or undertakings (express or implied) are given as to the accuracy or completeness of the information in this communication, and none of DTTL, its member firms, related entities, employees or agents shall be liable or responsible for any loss or damage whatsoever arising directly or indirectly in connection with any person relying on this communication. DTTL and each of its member firms, and their related entities, are legally separate and independent entities.