GIC INSIGHTS 2023

Unlocking *New* Horizons

Summary Report

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Unlocking New Horizons

About GIC Insights

Established since 2016, GIC Insights is GIC's annual thought leadership event that gathers a select group of prominent business leaders each year to deliberate over long-term issues pertinent to the international business andinvestment community.

GIC Insights 2023

The world remains under immense strain as it contends with a mounting climate crisis and an evolving macroeconomic and geopolitical landscape. However, new horizons are coming into view. Despite their complex challenges, emerging markets are demonstrating resilience and the potential for long-term growth. Businesses are developing solutions that can accelerate the transition to a more sustainable future. Finally, opportunities abound even in a challenging investment environment.

At GIC Insights 2023, we explore the ongoing uncertainties facing policymakers, businesses, and investors, while making the 'bull case' — how unlocking the potential of emerging economies and nascent innovations can lead to profound global impact.

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Opening Remarks

Recent events, including the tragedy in the Middle East, were a stark reminder that we continue to live in uncertain times. From geopolitical tensions to macroeconomic headwinds and ever frequent climate disasters, we are grappling with crises on multiple fronts.

Despite these volatile times, or because of them, long-term investors must double down on hope and opportunity.

Hope is not a strategy, but without it, few solutions would be possible. Similarly, opportunity is nothing without ability. They motivate us to unlock new horizons. I will briefly touch on three of these new frontiers.

Restoration of asset yields

Volatility is where the first opportunity lies.

While the US economy has shown resilience, the prospect of interest rates moving higher for longer signals the end of 40 years of easy money in many developed economies. Higher costs of capital challenge both the real economy and financial markets. Emerging markets offer pockets of good growth, but in countries like China, deleveraging and the search for a new economic model are adding to global headwinds.

It is well-known that in investing, pricing matters a great deal. The eventual investment return depends on not just how the asset performs, but how the performance deviates from what has been discounted in the entry price. Fluctuations in asset prices can create opportunities.

The rapid rise in interest rates has dramatically shifted the pricing of many assets, especially in the case of bonds. In March this year, the resulting losses for bonds were a proximate cause of the crisis in US regional banks. These losses could be staggering.

One dramatic example of this is the 100-year bond issued by Austria in June 2020 at around par. As the yield of this bond rose by just 2% to 2.8%, its long duration resulted in a mark-to-market loss of over 60%.[1]

1 Bloomberg.

But the rise in interest rates has seeded future returns. Take the case of the US Treasury Inflation Protected Securities (TIPS), the inflation-indexed bonds issued by the US government. They have seen a similar, considerable jump in their real yield, inflicting losses initially. However, they now offer a potential risk-free real return of 2.7% per annum for the next 20 years.[2]

While entry yields are a good predictor of ex-post returns for high-quality government bonds with stable cash flows and low repayment risk, the prospects for other asset types are more uncertain. Nonetheless, higher asset yields, or better asset pricing, are generally favourable. Take credit as an example – it is now possible to find equity-like returns for assuming investment-grade credit risks.

Long-duration bond plummets in price

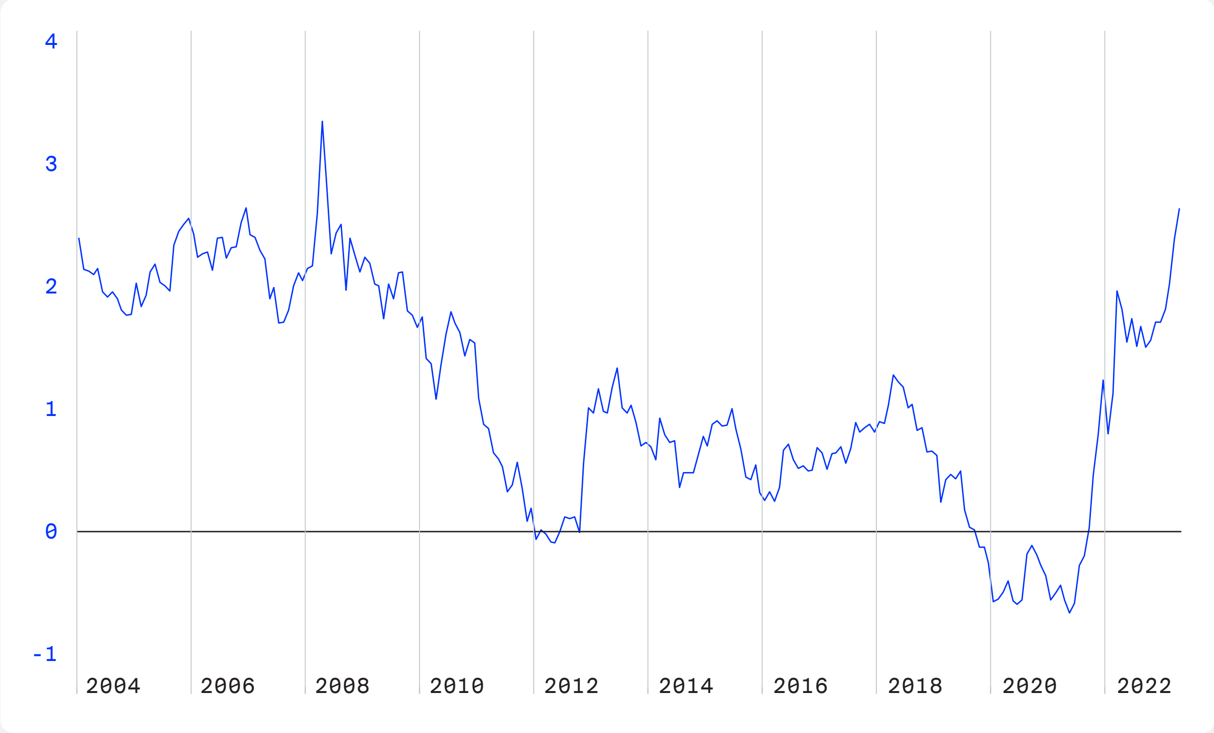
Price of the Austria 100-year Bond Issued in 2020

Source: Bloomberg

2 Bloomberg.

Higher starting yields make high-quality bonds more attractive

Real Yield of the 20-Year US Treasury Inflation Protection Securities (TIPS)



Source: Bloomberg

Beyond fixed-income products, investors must observe how other assets adjust to a "higher-for-longer" environment. Higher refinancing costs, which affect businesses, households, and governments, require careful planning and adjustments.

The numerous business models built up during the prolonged period of low interest rates could be a cause for concern. Reliance on low financing costs may no longer be tenable. However, in the longer term, the return to a more appropriate cost of capital could reduce cases of capital misallocation.

Overall, while the move up in interest rates has been painful for investors with long positions in bonds, the restoration of asset yields is a much better starting point for investors, especially those who are long-term.

The great green transition

The next opportunity lies in problems, specifically climate problems.

A large quantum of investments must be mobilised to accelerate the low-carbon transition. Just in clean energy, US$4.3 trillion (S$5.83 trillion) is required per year by 2030, according to the International Energy Agency (IEA).[3]

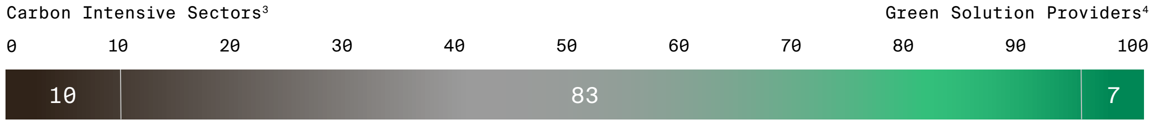
There remains a significant gap to meet that goal. The IEA has just published its latest World Energy Outlook: In 2023, annual clean energy investments are projected to amount to a record high of US$1.8 trillion, but this amount will still be less than half of what is needed.

The funding gap for emerging markets and developing economies is especially stark. Annual investments are estimated at almost US$0.8 trillion today, and this needs to triple by 2030.[4]

Climate investments can be thought of broadly in two categories: Climate solutions refer to innovative decarbonisation technologies, and transition finance supports presently carbon-intensive businesses in their shift towards more sustainable practices. Companies in the latter make up over

Transition finance is key

MSCI All Country World Index (ACWI), % by Market Capitalisation (As of 31 December 2022)



GIC's Approach

Manage risks from potential stranded assets

Support transition efforts by companies, through active engagement and strengthening the ecosystem for sustainability disclosures

Direct capital to green solutions and enablers

GIC has adopted 3 main strategies to enable the net-zero transition in the real economy. The proportion of the MSCI ACWI for which each of these strategies is relevant has been estimated for illustrative purposes only.

Carbon-intensive sectors
Sub-industries which are in the 95th percentile of Scope 1 and 2 carbon intensity; excludes companies that are identified as green solution providers.

Green solution providers
Companies with green revenues exceeding 30% of total revenues based on estimates from FTSE Russell's Green Revenues database. Free-float adjusted market cap and distribution based on MSCI ACWI as of 31 Dec 2022.

Source: S&P Trucost, FTSE Russell, MSCI, GIC analysis

3 International Energy Agency (IEA) (2023). *World Energy Outlook 2023.*

4 IEA (2023). *Scaling Up Private Finance for Clean Energy in Emerging and Developing Economies.*

80% of the investment universe, using the MSCI All Country World Index (ACWI), an index tracking nearly 3,000 stocks in almost 50 developed and emerging markets, as a proxy.[5]

Where are the greatest climate revenue drivers? Based on GIC research, sustainable vehicles, electricity networks, solar, wind, and hydrogen are among the solutions with the greatest incremental revenue potential.[6]

In transition finance, the work is usually more complicated. Here, investors are looking for businesses with credible plans to move to lower-carbon business models. As they do so, they become more resilient to climate risks, fetching better valuation. They may also find new revenue streams, further adding to their value.

But it is still challenging to find bankable deals. Commercial viability, data availability, the capital-intensive nature of the projects, market and regulatory risks, and trade-offs with other important goals are among the barriers to scaling transition finance.

"GIC is committed to financing both climate solutions and companies in their transition. A few years ago, we set up an experimental Sustainable Investment Fund (SIF) to explore such opportunities. The results were encouraging, so SIF has since evolved into three larger portfolios embedded in our asset departments, covering asset classes across public and private markets. Each portfolio has a dedicated team and significant capital to deploy."

5 S&P Trucost, FTSE Russell, MSCI, GIC analysis.

6 Vivid Economics, McKinsey, IEA, GIC analysis.

A word about AI

Before moving on to the third opportunity, one cannot ignore the topic of artificial intelligence (AI).

AI is the buzzword of the year, including on company earnings calls. Mentions of the technology have more than tripled in the past 12 months.[7]

AI has long been in the works, but it has only really burst onto the scene with generative AI. It's an "80-year overnight success", as a speaker at GIC's Bridge Forum said a few months ago.

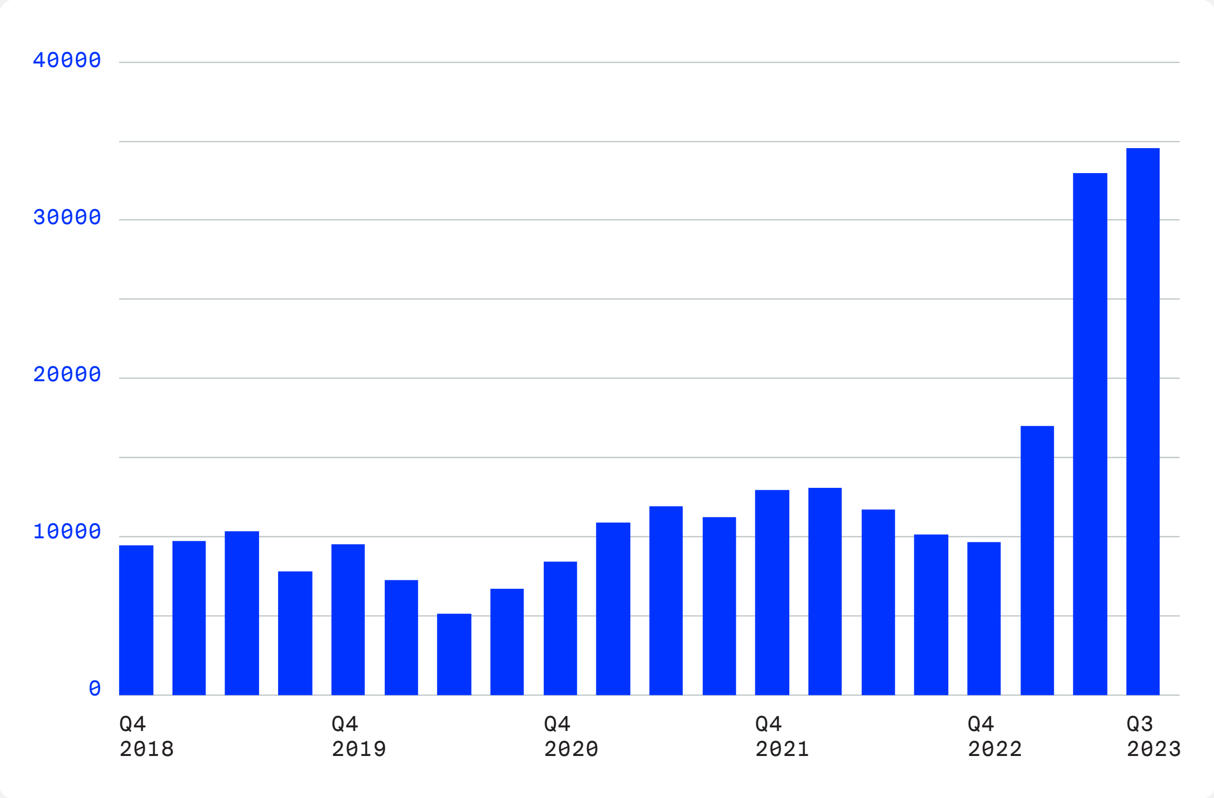
I consider the following three points when thinking about AI. First, it has the promise of transforming many, if not all, businesses. Yet it also raises many concerns around ethics, cybersecurity, job displacement and the environment, among others.

Second, AI is likely to go through a hype cycle, which means we should be mindful of short-term overestimation and then be even more careful about long-term inattention.

Third, investors must focus on value capture rather than just the advancement of the technology. It is one thing to be dazzled by the technology, but if the value is captured elsewhere, then it is likely not a good investment.

AI is the hot topic on earnings calls

AI Mentions on Earnings Calls (2018-2023)



Source: Bloomberg, GIC analysis

7 Bloomberg (2023). *AI Mentions on the Rise in Tech Earnings Calls as Recession Talk Fades.*

Partnership and fragmentation

The third opportunity lies in fragmentation, which is yet another buzzword.

I am not talking about profiting from supply chain reconfiguration, even though some countries and businesses clearly benefit and hence make good investments.

Instead, I am reaffirming the value of long-term partnerships, which are critical to capturing many of the high-potential opportunities that lie ahead.

Amidst growing uncertainty in the investment environment, some believe that we must outbid each other for every possible opportunity, leading to greater fragmentation. I disagree. Investing is not a zero-sum game, and there are ample opportunities for investors and businesses to co-create value and generate returns, even in highly fragmented markets. Indeed, considering the scale of investment needs, investors going it alone would not bring about the required capital and expertise.

In forging collaborations, GIC adopts a mindset of being fair, friendly, and firm to all our partners. It is an approach we take seriously, apply across all geographies and asset classes, and hope to pass down from generation to generation.

Overall, despite the daily drumbeat of depressing news, hope and opportunities can still be found amid financial volatility, the climate crisis, technological disruption, and broader global fragmentation. Importantly, investors and business leaders, have a responsibility to unlock these opportunities for a more sustainable world.

Lim Chow Kiat
CEO, GIC

"Overall, despite the daily drumbeat of depressing news, hope and opportunities can still be found amid financial volatility, the climate crisis, technological disruption, and broader global fragmentation. Importantly, investors and business leaders, have a responsibility to unlock these opportunities for a more sustainable world."

3

Unlocking Growth in Emerging Markets

This section summarises a panel discussion with Karen Karniol-Tambour, Co-Chief Investment Officer of Bridgewater Associates, Andre Esteves, Chairman and Senior Partner of BTG Pactual, and Uday Kotak, Founder and Director of Kotak Mahindra Bank.

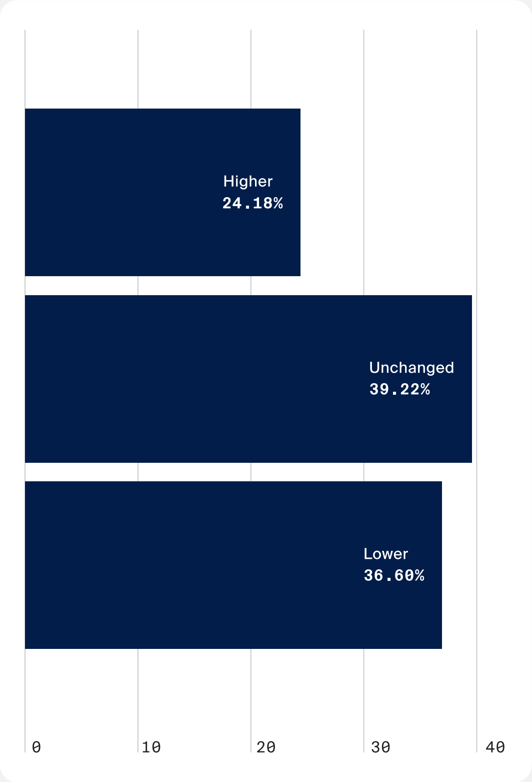
Moderated by Liew Tzu Mi, GIC's Chief Investment Officer for Fixed Income & Multi Asset, the panel discussed how investors and businesses can best navigate the opportunities and risks presented by emerging markets in today's uncertain investment environment.

Emerging markets have been known to play an important role in investment portfolios. They often offer greater growth opportunities when compared to their developed-market peers[8]; boast growing, favourable demographics; and hold significant socioeconomic development potential arising from structural reforms.

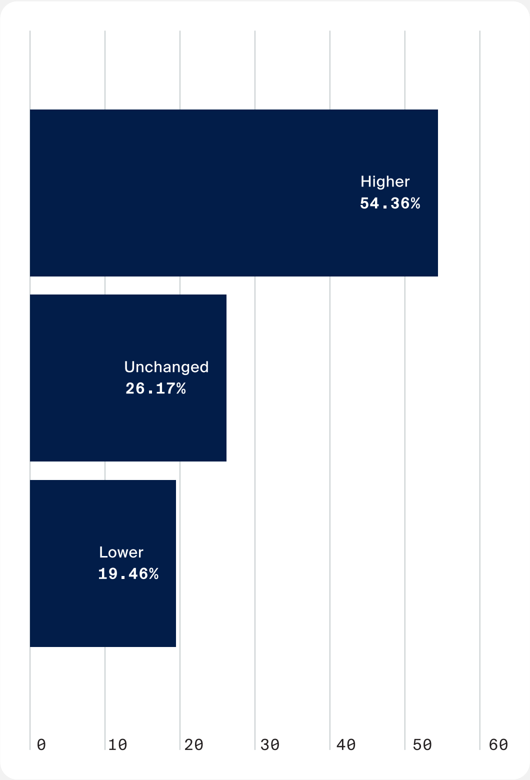
Although asset prices in emerging markets across equities, fixed income, and private markets have been underperforming over the past decade or so, many investors remain optimistic about their long-term prospects.

In a poll conducted at GIC Insights 2023, almost 40% of delegates shared that their allocation to emerging markets in the next two years would remain unchanged, while over half of them anticipated it to increase over the next five to 10 years.

How will your allocation to emerging markets change over the next two years?



How will your allocation to emerging markets change over the next 5-10 years?



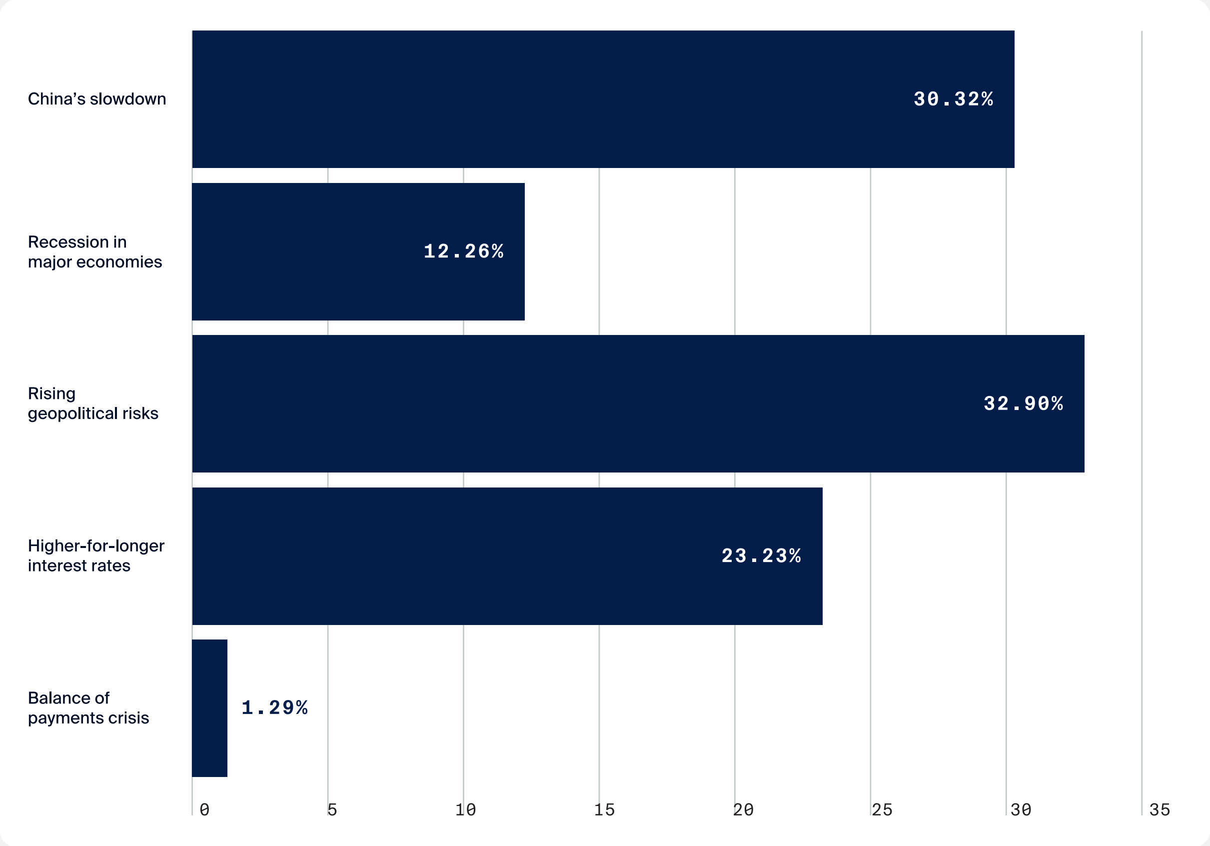
8 The Economist. (2022) *Emerging markets: will the economic catch-up continue?*

Not a one-size-fits-all approach

Until recently, emerging markets have typically been viewed through a single lens due to certain shared characteristics, such as low-to-middle income per capita relative to developed markets,[9] expanding economic bases driven by resource extraction,[10] and strong economic growth,[11] among other traits.

The panel shared that today, however, the asset class is less monolithic. Most are progressing socioeconomically at their own distinct pace and their growth trajectory does not correlate to other emerging markets. In fact, many of them have moved from being low-cost production hubs to thriving consumer markets. Even so, these economies are still exposed to the same market risks as the rest of the world, which include inflation, rising interest rates, and geopolitical and trade tensions. The cost of capital can be likewise high in certain emerging markets.

Which of the following poses the biggest risk to emerging markets?



9 International Monetary Fund (IMF) (2004). *What Is an Emerging Market?*

10 Organisation for Economic Co-operation and Development (OECD) (2022). *Business Insights on Emerging Markets 2022.*

11 IMF (2021). *Miles to go.*

Despite these challenges, the panel highlighted that emerging markets have remained resilient in recent years and in some cases, have navigated the uncertain investment environment more successfully than some of their developed market peers.

One reason for this resiliency stems from less reliance on the US dollar when issuing debt. On top of that, there is greater usage of local currencies, which are in less demand globally, making them less volatile and vulnerable to market swings.

Another driver of their resilience is the accumulation of foreign exchange reserves. These reserves have helped to insulate many emerging economies against market shocks, while maintaining fiscal stability. In fact, International Monetary Fund data shows that in 2001, emerging markets held US$793.3 billion in foreign exchange reserves[12] and by 2021, these had amassed to US$5.29 trillion,[13] growing almost sevenfold within two decades.

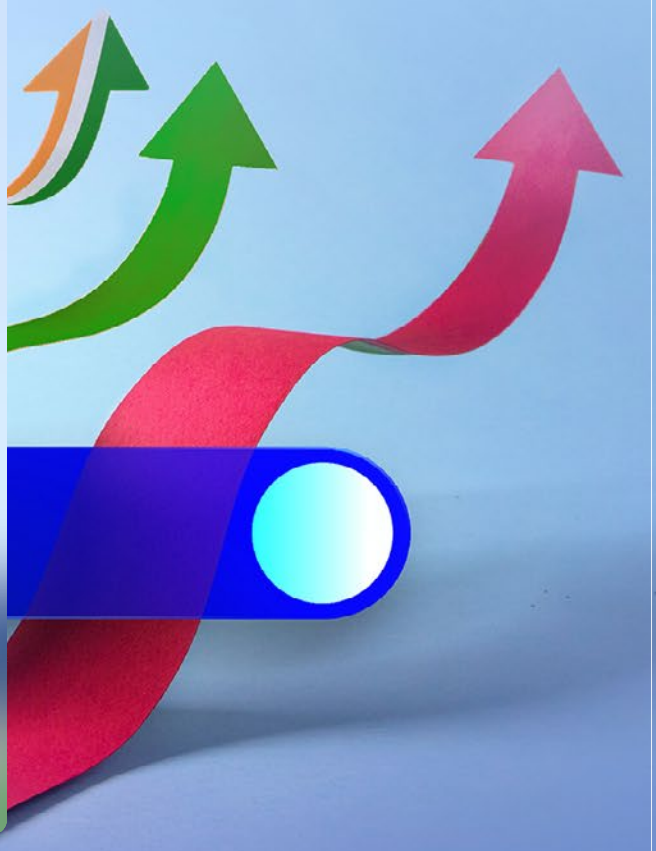
Market focus: India

India continues to play a vital role in global markets. The South Asian nation is a key trade partner to the US, Europe, Russia, and the Middle East, and is positioning itself as a leader in the Global South.

The panel highlighted that in recent years, India has managed to insulate itself from oil shocks, and government spending during the global pandemic has not led to a dramatic increase in fiscal deficit. Inflation is also under control, and improving economics have helped lower the risk premium on Indian Treasuries.

Looking ahead, the country is likely to maintain its fiscal and political stability, according to the panel. Opening up certain industries to overseas investments would greatly benefit the economy, with the most promising growth opportunities likely to be found in the start-up space, infrastructure, and manufacturing.

The panel also agreed that India's unique investment profile could soon elevate it to the status of a standalone investment destination, rather than being viewed as part of the broader emerging markets pack.



12 IMF (2022). *Currency Composition of Official Foreign Exchange Reserves.*

13 IMF (2023). *International Reserves.*

Market focus: China

The slowing of China's economy has been one of the focal points of discussions in the past year.

However, the panel noted that underneath the many headlines on China are numerous developments that continue to make the country an attractive investment destination. The deleveraging of sectors, such as real estate, will likely cause some shorter-term volatility, but it can also make them more sustainable in the long term.

Additionally, they pointed out that China's economy remains well-diversified and that the country's asset valuations are well-priced too. The market also holds a significant trade surplus with its overseas partners.

The speakers cautioned investors to beware of the challenges that remain as well, noting in particular that commodities demand and capital flows to and from neighbouring markets remain uncertain for China. Productivity is likewise lower compared to 20 years ago.[14]

Market focus: Brazil

After years of volatility and uncertainty, the market outlook for Brazil is once again positive. The country is delivering higher-than-expected market growth, supported by reforms across multiple industries. In fact, in 2022, the Brazilian economy grew by 2.9%;[15] which is a noteworthy improvement on the pre-pandemic economic contractions experienced in 2015 and 2016 when the Brazilian economy contracted by 3.5% and 3.3% respectively.[16]

Currently, the nation's central bank, Banco Central do Brasil (BCB), is also in a good position to cut interest rates. Inflation fell from 12.13% in April 2022 to 3.94% in May 2023 and BCB expects inflation to cool further to 3.6% by November 2025.[17]

Moreover, the panel discussed the benefits of the South American nation's democratic consolidation, including the ability to operate within a free market and maintain independent institutions. This allows investors to invest with little interference from other agencies, such as Brazil's congress, judiciary, and media. In addition, the country has become a pioneer in industries critical to the global economy, such as agriculture and clean energy.

However, the speakers also noted that Brazil remains vulnerable to cycles, especially political election cycles, where pro-investment policies could be reversed upon a new government coming into power.

A diversified and resilient global portfolio

The panel concluded that as emerging markets are becoming more idiosyncratic and less correlated to their peers, investors are finding this asset class more and more attractive. Similarly, with increasingly less separation between emerging markets and developed markets, investors have a broader range of investment opportunities than before.

By leveraging different asset classes, varying exposures, and contrasting rates of inflation, not only will emerging markets provide investors with the opportunity to further diversify their global portfolios, they also stand to make these portfolios more resilient and robust.

14 World Bank (2020). *China's Productivity Slowdown and Future Growth Potential*

15 World Bank *GDP growth (annual %) - Brazil.*

16 World Bank (2022). *GDP growth (annual %) - Brazil.*

17 Banco Central do Brasil. *Estatísticas.*

4

Unlocking the Climate Solutions of the Future

This article presents the key takeaways from the inaugural climate-focused innovation showcase at GIC Insights 2023.

Moderated by GIC's Weylin Liew, Portfolio Manager and Head of Active Engagement, Public Equities, and Matthew Lim, Co-Head of the Sustainability Solutions Group, Private Equity, the session focused on what it takes to scale emerging climate technologies, accelerate transition pathways, and address common pitfalls encountered along the way.

Speakers for the showcase included:

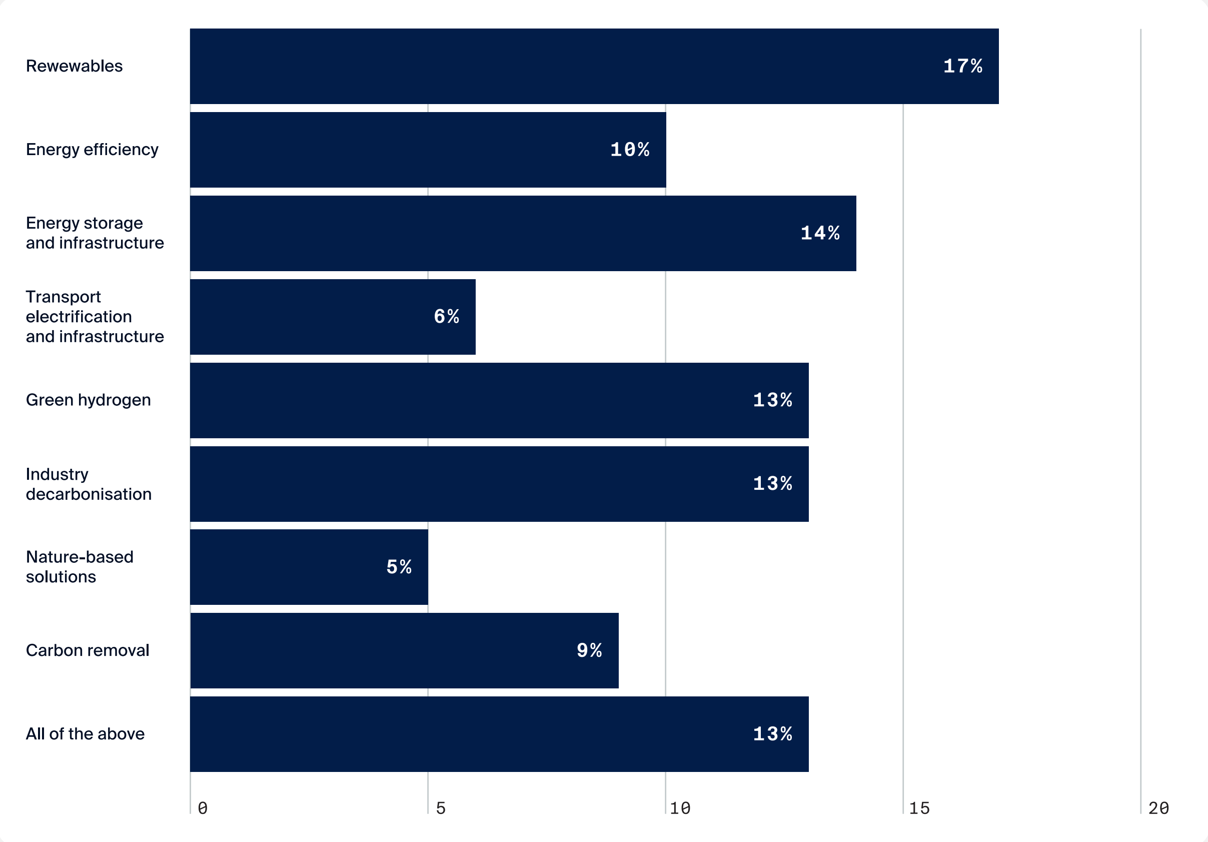
- Tarun Mehta, Co-Founder and CEO, Ather Energy
- Mateo Jaramillo, Co-Founder and CEO, Form Energy
- Mahesh Kolli, Founder, President & Joint Managing Director, Greenko Group
- John O'Donnell, CEO, Rondo Energy
- Jason Tu, Co-Founder and CEO, MioTech
- Judy Marks, Chair, CEO & President, Otis Worldwide Corporation
- Torsten Lehnert, CEO, Railpool

Climate change is widely recognised as the existential crisis of our time. The World Meteorological Organization (WMO)[18] predicts that 2023 will be the warmest year in history, while carbon emissions and sea level rise have also reached record highs in 2022.

The devastating socioeconomic impact of climate change is already being felt around the world, especially in developing economies. In Asia alone, the WMO recorded 81 weather-, climate-, and water-related disasters in 2022, with over 50 million people directly affected, including more than 5,000 fatalities. These events cost the region US$36 billion in economic damages.[19]

Decarbonising the global economy will be critical to combating the climate crisis and will require a wide range of solutions. These span mature and increasingly cost-competitive solutions such as renewables or electric vehicles (EVs) and emerging technologies such as green hydrogen, which has the potential to decarbonise some of the most hard-to-abate sectors but has yet to scale.

Which solution has the highest potential in terms of both climate impact and returns?



18 World Meteorological Organization (WMO) (2023). *2023 shatters climate records, with major impacts.*

19 WMO (2023). *Climate change impacts increase in Asia.*

The opportunity is enormous for solution developers, investors, as well as companies that will use these technologies to accelerate their own sustainability transition. Research by GIC estimates that the incremental investment value of the climate solutions supply chain will reach between US$5-11 trillion by 2030.[20] As the costs of conventional wind and solar continue to drop, the economic tailwinds for these new technologies will likewise continue to grow.

At the GIC Insights climate innovation showcase, entrepreneurs and industry leaders discussed some of the most promising decarbonisation solutions and how to overcome common challenges related to access to capital, industrialisation, regulation, as well as data and impact measurement.

Prioritise industrialisation over innovation

Despite the rapid pace of technological innovation in the climate space, many emerging solutions face challenges in scaling up. The showcase speakers noted that climate tech founders must shift their focus from innovating alone to industrialising their processes, which is crucial to driving down costs and achieving scale.

Rather than attempting to overcome each new technical or business challenge alone, founders should consider forging partnerships with industry incumbents. Whether through investment dollars or joint development agreements, creating these relationships with players that have decades of experience can both speed up product development timelines and provide a commercial backbone for early deployments.

Two pioneering solutions in long-duration energy storage, heat batteries[21] and iron-air batteries,[22] for example, are based on technologies that have been in use for over a century. While the technical innovations open new markets, the key competitive advantage for these companies will be their ability to scale to high-volume, high-quality, and low-cost operations. In the process, these firms must transform from research and development ventures to manufacturing companies capable of engineering and delivering products in a standardised, speedy, and cost-effective manner.

Developing standardised products which require minimal localisation or customisation is equally important in other capital-intensive industries, such as heavy transport. For example, shifting freight transport from road to rail is a key priority to mitigate transport-related carbon emissions in Europe.

Standardising the assets and offering them as a ‘locomotive-as-a-service’ model to freight operators lowers barriers to entry for new train services, shared a showcase speaker. In addition, such an offering enables a more seamless reuse and refurbishment of spare parts, which help to further reduce waste and costs.

Meanwhile, legacy industries often view innovation as a means of increasing the efficiency of existing products while maintaining their proven business models. One example highlighted by a showcase presenter is the regenerative drive for elevators, which captures waste heat generated during braking and feeds it back to the building’s internal electric grid. The technology offers significant energy, emission, and cost savings to building owners and can be installed for new or existing lifts, without requiring large capital expenditures or a change in business model.

20 GIC (2023). *Beyond Financing Gaps: Sizing the Decarbonisation Investment Opportunity.*

21 Rondo Energy. *How it works.*

22 Form Energy. *Battery technology.*

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Demonstrate market demand and project bankability

Industrialising these new technologies requires deployment at scale and capital is a key hurdle. A considerable gap remains between early-stage venture capital that can accept the risks associated with nascent technologies and low-cost project finance that funds conventional infrastructure. The returns expected by venture capital typically make energy projects uneconomical, while early-stage energy transition technologies tend to lack the track record required for infrastructure finance.

The panellists acknowledged that to bridge this financing gap, technology providers must demonstrate tangible customer demand and work with capital providers to create project bankability. Such projects must address ordinary project-related commercial risks, by securing offtake agreements such as take-or-pay contracts, to give an example, and find approaches to mitigate possible residual technology risks. Showcasing certainty of production, product reliability, and repeat execution, together with building long-term partnerships, are also important when sourcing capital.

Capital providers, in turn, need to adopt the creativity and technical capabilities that venture teams have to avoid taking risks with unproven technologies, as well as the structuring and financial strengths of infrastructure investors.

Engage policymakers proactively

Navigating complex regulatory frameworks can be equally difficult, especially in markets where electoral cycles are short and abrupt changes in policy direction could either favour or impede the development of climate solutions.

While many climate solution providers and end users benefit from the manufacturing and investment tax credits offered by the US Inflation Reduction Act (IRA), others chose not to rely on government subsidy programmes and focus on creating value for customers that is not contingent on policy incentives.

In India, producers of wind, solar, or hydro had to demonstrate that renewables could achieve cost parity with coal, the country's primary source of energy,[23] even without subsidies, shared one of the showcase speakers. This cost-related challenge is even more pronounced for those seeking to move beyond clean electrons to develop low-carbon molecules, such as green hydrogen or ammonia, because they involve higher-risk, more nascent

23 International Energy Agency (IEA). *India.*

technologies which require integration with existing infrastructure and industrial assets.

Transport electrification remains equally challenging in India, where two-wheelers make up the majority of road vehicles.[24] The absence of a versatile charging system and lack of standards for light electric vehicles (LEVs) have hindered the country's transition from internal combustion engines (ICEs) to EVs, according to another presenter. Collaboration between the Indian government and industry stakeholders has thus been crucial in launching the Light Electric Combined Charging System (LECCS), an AC-DC charging system tailored for LEVs. This model could also be replicated in Southeast Asia, parts of Europe and Africa and South America where the shift to EVs is driven by two- and three-wheelers.

Regardless of the industry or market these firms serve, proactive engagement with regulators and an in-depth understanding of the country's policy direction are essential to the success of climate innovators.

Be transparent about your social impact

To gain more stakeholder buy-in, businesses should also demonstrate the societal impact of their ventures, such as the employment opportunities and other economic benefits a new manufacturing facility would create in the local community. Conversely, companies must be equally transparent about any potential adverse impact, including the effects on local biodiversity, for example, and outline how they plan to mitigate these risks.

Some climate tech companies have even expanded to provide tertiary education on a range of sustainability issues, from photovoltaic technology to sustainable mobility.[25] Skills-based training could help build more awareness on the importance of climate solutions while developing a wider pool of talent for these ventures.

Improve your climate disclosures

By measuring their climate data consistently, companies are able to set more informed emission reduction targets and roadmaps and fulfil their regulatory or investor reporting requirements more effectively.

However, access to quality, comparable, and financially material ESG data remains challenging, particularly in regions such as Asia with relatively less developed sustainability reporting frameworks, according to one of the speakers. Data scarcity is especially prevalent in private markets which are not subject to the same level of disclosure requirements as listed companies. Additionally, standardisation remains challenging, even as we see increased convergence in reporting frameworks. Climate data providers that can help companies and investors to address these data and quality gaps stand to gain significantly.

Collaboration is key

The speakers offered some practical advice to conclude, including giving more credit to and listening to customers, moving and executing at speed, and focusing on bankability and scale rather than excessive innovation. Most importantly, unlocking the climate solutions of the future requires collaboration among all actors in the climate ecosystem, including technology firms, companies undergoing their own transition, investors, regulators, and local communities.

24 McKinsey (2023). *Inside Indian consumers' embrace of electric two-wheelers.*

25 Greenko School of Sustainability. *Programs.*

5

Unlocking the Value of Artificial Intelligence

This section summarises a fireside chat with Garry Tan, President and CEO of Y Combinator.

Moderated by Choo Yong Cheen, GIC's Chief Investment Officer for Private Equity, the conversation explored key considerations for AI-focused companies and non-tech companies that are seeking to capitalise on the benefits of AI, by commercialising and scaling its usage. They also examined potential risks, and discussed what the future might hold for generative AI.

2022 was a tipping point in the evolution of artificial intelligence (AI). The technology has been around for many years, but the widespread adoption of generative AI tools only occurred in recent years across different industries, academia, and the broader general public.

In particular, large language models (LLMs), a form of generative AI, have broken new ground on many fronts. Not only do they leverage algorithms that combine deep learning with huge data sets, enabling the technology to understand, analyse, and summarise unfamiliar content, LLMs are also able to both generate new content and accurately predict future events.

Access as the differentiating factor

Tan shared that access is what differentiates LLMs from most other forms of generative AI. As many LLMs are open-source, data scientists and developers are able to build on advancements pioneered by others, and apply them to their own use cases.

Access to large volumes of data is critical to realising the potential of these new technologies. Tan highlighted that businesses that have been able to monetise the use of LLMs and AI all typically work with large data sets. This could be proprietary data that has been amassed over a long period of time, or data sets that have been acquired from third-party data providers.

For example, a legal information vendor that provides data on US case law to the country's many law firms started out as a user-generated website for information on various areas of law. Having compiled valuable data for over a decade, they integrated the application of LLMs in their business to now allow users to access information that once required months of manual research and fact-finding to put together. Users are now able to access the same information within minutes and use it in court immediately.

Education and healthcare are key beneficiaries

Tan believes that there are two industries with the potential to benefit enormously from the effective use of generative AI. The first is education. By leveraging generative AI, educational providers will be able to deliver a personalised learning experience that suits the pace of each individual's learning style. In some instances, AI-powered personalised tutors are believed to be more effective in achieving education outcomes than human personal tutors.

The healthcare industry could be another significant beneficiary. Administrative spending accounts for roughly one-quarter of the total annual healthcare spending in the US, which amounted to nearly US$4 trillion in 2021.[26] Tan noted that if generative AI is applied effectively to administrative work in the industry, healthcare costs can be lowered significantly. A simple example he shared is the use of AI for medical scribing, which could free up time for healthcare professionals to increase standard of care instead.

Considerations for new, AI-powered businesses

While the integration of AI has the potential to improve existing business processes, many companies are also seeking to create new AI-powered products. Tan advised that these firms must first identify the type of work that the technology can add value to. This is because until recently, AI has been predominantly applied to mundane and low-value activities only, such as the use of robots as servers in food establishments.

26 McKinsey (2021). *Administrative simplification: How to save a quarter-trillion dollars in US healthcare.*

Today, AI increasingly facilitates complex knowledge-based work that demands human analysis, synthesis, and contextualisation to arrive at a decision or choice of decisions. Companies must be strategic and consider the types of problems that AI can help to solve.

On top of that, businesses must think strategically about product commercialisation too. There must be customer demand for new AI offerings to begin with. These businesses must also ensure they can compete with other firms that already have extensive research and development, as well as marketing capabilities.

Managing risks and regulation

At the same time, the proliferation of AI continues to raise concerns across industries, governments, and the broader general public. AI is often regarded as a form of super-intelligence with the potential to exert control over humanity. However, the notion of a supercomputer plotting a nefarious act is no different to a human planning such an event through desktop research. In many parts of the world, regulators and security services already have measures in place to anticipate the potential time and location of such acts being planned. In fact, many of these preventive services also adopt various forms of generative AI to optimise their processes.

Similarly, many are worried about the unethical use of AI. Several countries around the world have strict data privacy and data security laws, yet very few have enacted legislation on the application of AI. At the time of writing, only a handful of jurisdictions, including Brazil, China, the European Union, and Israel, have laws governing the ethical use of the technology.

Another concern is that the use and development of AI will be limited to a small pool of tech companies only. Tan reminded the audience that certain LLMs, such as ChatGPT-4, are closed-source and only available with a paid subscription. Limiting access will stifle innovation, slow market development, and create monopolies.

Ultimately, regulators and businesses must ensure that existing and emerging AI technologies are safe, remain as accessible as possible, encourage innovation, and help advance economic activity.

Technology for the future

Tan also highlighted the importance of embedding this new, AI-enabled way of working into today's secondary and tertiary education systems, as well as vocational training programmes. While use of generative AI is growing rapidly, there remains a large proportion of the global workforce that is unfamiliar with its capabilities and applications. Thus, the accessible nature of open-source LLMs that allows users to experiment with the technology is critical in enabling more to become familiar with its potential and hence feel less apprehensive about it. This might even lead them to discover new ideas to integrate AI into their future work and workplaces.

According to the World Economic Forum, while on one hand, AI may replace 85 million jobs worldwide between 2020 and 2025, the technology is also expected to create 97 million new jobs.[27] Given its enormous value-add potential across a range of industries, markets, and business models – old and new –, being able to work side-by-side with AI will be imperative for the success of the workforces of the future.

27 World Economic Forum (2020). *The Future of Jobs Report 2020.*

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