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REDEFINING REAL ASSETS:

Megatrends and their impact on investment strategies

Megatrends are not fixed

“Megatrends underpin demand for real assets throughout every market cycle. These long-term, structural trends allow investors to be forward-looking in their investment strategies, approaching the shifting dynamics of real estate, natural capital and infrastructure with confidence.”

However, these megatrends are not fixed. We developed our megatrend framework in 2015, but events of the last five years – the pandemic, war in Ukraine, cost of living crisis to name a few – have refined our analysis.

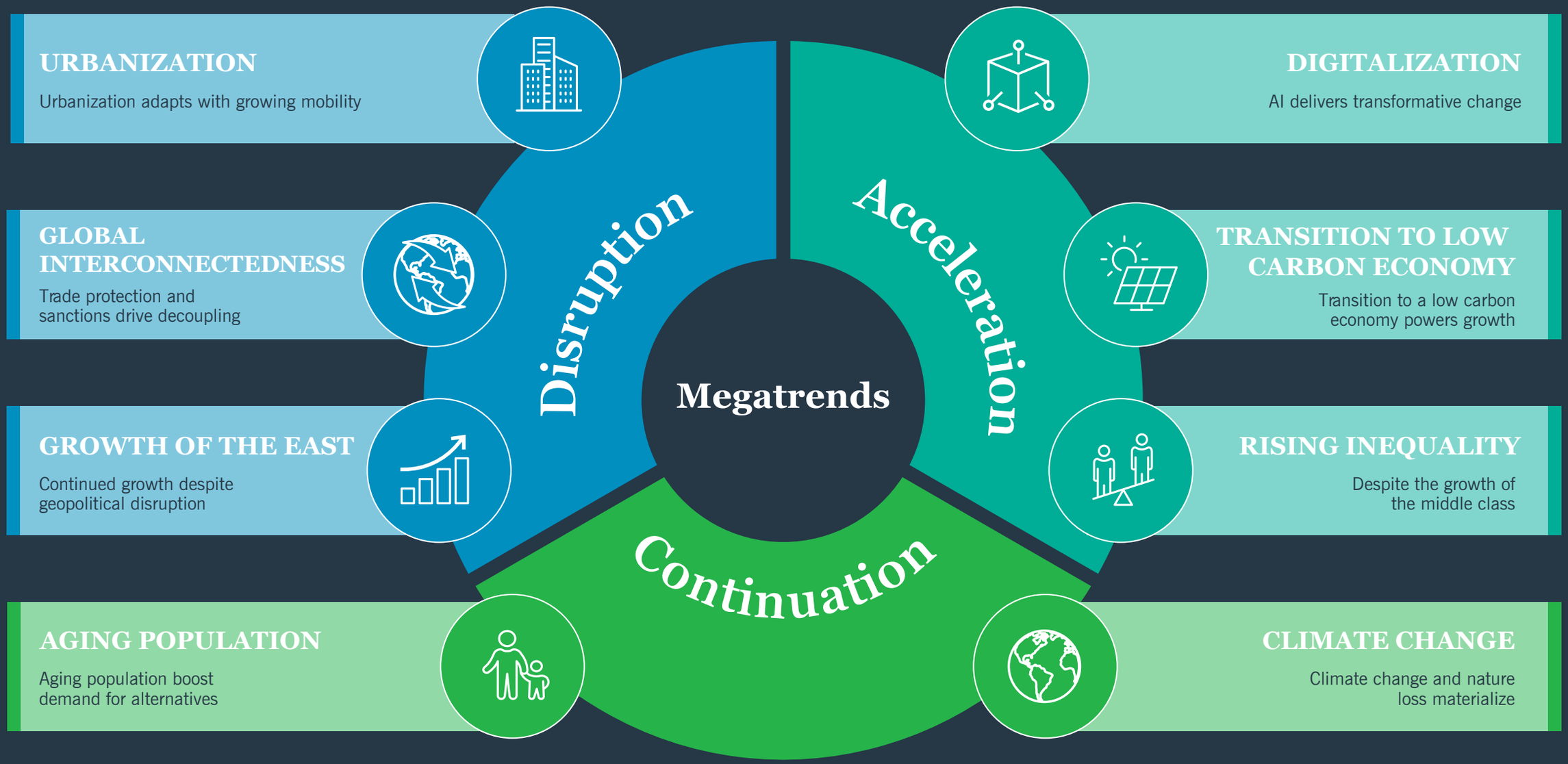
We see some trends are accelerating, some are being disrupted, while a few remain on their previous trajectory. This publication is a collection of our latest thinking; it explores the opportunities and risks to be found in each megatrend and the implications for real asset investing.

The drivers for these megatrends are varied, affecting asset classes in different ways and to different degrees. They are also deeply interconnected and often reinforce one another; digitalization and the rise of artificial intelligence (AI), for example, boosts demand for electricity and enables activities such as hybrid working and online shopping, which impact urbanization and the nature of cities. We can also expect technology and digitalization to respond to the needs of the aging population, transforming health care and life sciences, while real estate and infrastructure will have to adapt buildings and services to better meet the needs of the elderly.

Other forces such as shifting geopolitical sentiment, the need to adapt to climate change and the transition to a low carbon economy are all accelerating changes in infrastructure demands. Natural capital, which includes farmland and timberland, is impacted heavily by climate and will evolve to take advantage of the opportunities presented by the transition to the low carbon economy, but changes in urbanization and technology are transforming the opportunity set as well.

These are just some examples of how megatrends are evolving, and how they impact real assets in different ways. The following articles provide insights for the long-term opportunities of real estate, infrastructure and natural capital, emphasizing the threads that connect these asset classes, and the different dynamics at play. Each article is designed to give investors a clearer indication of how these megatrends could affect portfolio allocations to real assets, helping them to invest with confidence.

Abigail Dean
Global Head of Strategic Insights, Nuveen Real Assets


URBANIZATION
Urbanization adapts with growing mobility
GLOBAL INTERCONNECTEDNESS
Trade protection and sanctions drive decoupling
GROWTH OF THE EAST
Continued growth despite geopolitical disruption
AGING POPULATION
Aging population boost demand for alternatives
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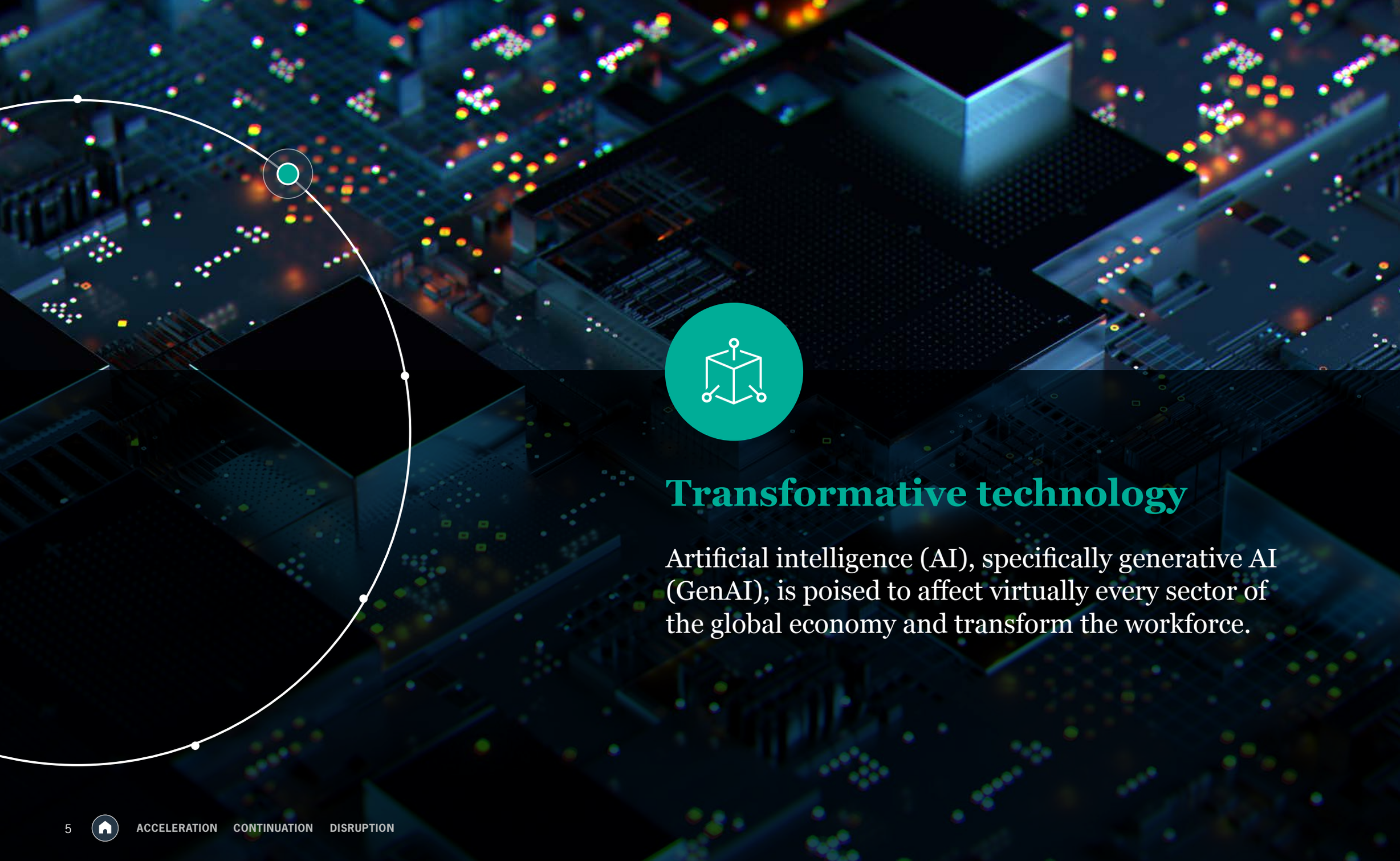
AI delivers transformative change
TRANSITION TO LOW CARBON ECONOMY
Transition to a low carbon economy powers growth
RISING INEQUALITY
Despite the growth of the middle class
CLIMATE CHANGE
Climate change and nature loss materialize

Acceleration

Transformative technology

Transition to a low carbon economy powers growth

Rising inequality



Transformative technology

Artificial intelligence (AI), specifically generative AI (GenAI), is poised to affect virtually every sector of the global economy and transform the workforce.

GenAI alone could add between **$2.6** and **$4.4** trillion to annual global GDP and is expected to automate **60-70%** of tasks currently performed by employees.[1]

Compared to previous waves of automation, these changes in the labor market will disproportionately impact workers with higher wages and educational attainment. However, advances in AI are expected to accelerate labor productivity growth between 0.1-0.6% annually through 2040[1] depending on the rate of technology adoption and redeployment of worker time.

To understand AI as a megatrend, we must understand how AI has evolved and the opportunities and risks it will bring across real assets.

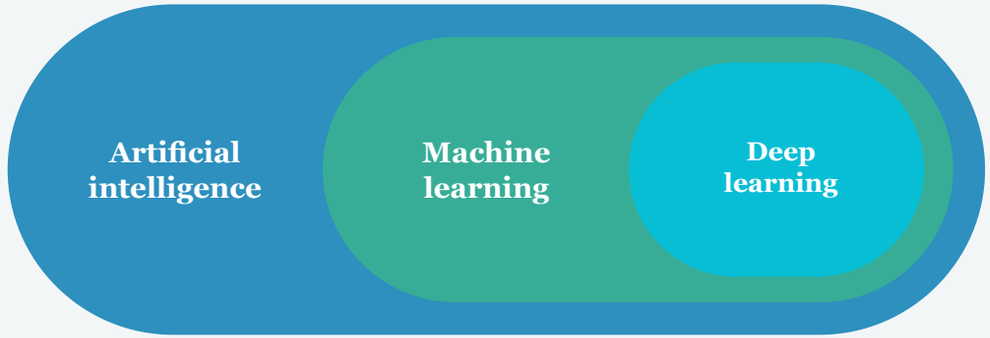
WHAT'S CHANGED

AI and machine learning algorithms have been in use for many decades. But GenAI such as ChatGPT brings renewed attention to how these transformative technologies will change our daily lives and physical world.

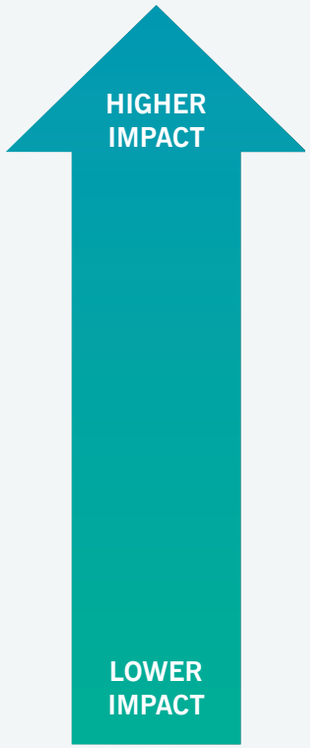
GenAI's ability to create new information from existing information will enable a fundamental shift in the economics of business and white-collar industries.

GenAI presents opportunities and risks for both corporations and individual workers. Large language models do not necessarily compete with existing software but are now competing with parts of companies and people. Workers who do not learn to embrace AI to enhance their work are at risk of obsolescence.

However, these tools also present significant opportunities for individuals. For the first time, those without data science or technical expertise can harness the full power of AI, democratizing innovation across an organization. Everyone throughout an organization now has tools to reconsider what should be versus what has been, and an ability to reimagine how we can better utilize existing technologies. We are still in the earliest innings of these use cases, but advances are being made at a remarkable pace.



IMPLICATIONS AND OPPORTUNITIES FOR REAL ASSETS



REAL ESTATE	NATURAL CAPITAL	INFRASTRUCTURE
Aging population	Changing climate and nature loss	Transition to low carbon economy
Rising inequality	Transition to low carbon economy	Changing climate and nature loss
Transition to low carbon economy	Growth of global South and East	**Transformative technology**
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Real estate

New technologies powered by AI and GenAI are rapidly emerging across the real estate technology (Proptech) world. These new use cases are being tested along the real estate value chain, from acquisition, to development and redevelopment, in operations and through disposition.

In general, AI is enabling the industry to evolve in ways that will create more dynamic, efficient, sustainable and customer-focused real estate experiences.

HOW COULD AI CHANGE REAL ESTATE?

Data centers

Data centers are experiencing unprecedented demand and is the first sector to directly see the positive impacts of the AI boom. GenAI and cloud computing platform growth requires robust data infrastructure, leading to an increased need for advanced data centers with specialized cooling and power requirements. The global data center rental market is forecast to grow at a five-year compound annual growth rate of 23%, up to 36% is contributed by the demand for AI.[2] AI and cloud-driven demand are exceeding constrained supply, creating record low market vacancy and all-time high pre-let market absorption.

Office

There is a near-perfect correlation between educational qualifications and GenAI impact.[3] Legal services are projected to be the most affected by large language models like ChatGPT. The sector is closely followed by financial activities like banking and insurance, professional services including accounting and consulting, technology sector specialties like computer data processing and media sectors. The degree AI will influence these sectors remains unclear, meaning it will take time to unravel the implications for real estate investors in the office space.

Retail

The push and pull between the ethical use of customer data and privacy will continue to be top of mind for retailers and technology companies, but will likely produce outsized benefits that unlock enhanced customer experience, new product discovery, higher sales volumes and larger customer lifetime values. On the retailer side, GenAI has the potential to create operating efficiencies across the value chain e.g. inventory management, sales forecasting and analysis. While potentially disruptive in the short-term, AI has the potential to create a more seamless omni-channel experience. For physical retail, AI could also enhance analytics leading to profitability, a deeper relationship with customers and better real estate outcomes.

Multifamily and mixed use

AI-powered tools can offer residents increasingly personalized experiences. For example, leasing chatbots and smart home technologies can customize settings for lighting, temperature and security. Furthermore, GenAI and the permanence of hybrid work will continue to increase the share of the workforce that is self-employed or working for small companies.

AI use cases

Market analysis

AI algorithms can analyze datasets to identify market trends, predict future market conditions and suggest the optimal time for acquisition.

Deal sourcing/ site selection

Tools can help investors identify off-market acquisition targets based on specified criteria.

Enhanced underwriting/ due diligence

AI can be used as co-pilots for investment underwriting that summarize and analyze confidential investment memoranda (CIMs) and streamline due diligence.

Building operations

AI is improving fault detection and diagnostic (FDD) software and enabling new smart building use cases. Property management applications can now improve real-time energy management and predictive maintenance.

Asset valuation and appraisal

Automated valuation models can provide accurate property appraisals by analyzing historical data, market trends and alternative data sources like satellite imagery.

Investor reporting

Data and images can be automatically generated for investor reports.

Infrastructure

The transportation and intermodal logistics industries have been early and significant adopters of AI, bringing advancements in operational efficiency, safety, customer service and environmental sustainability. We expect the next wave of AI to enhance the functionality of many of the AI use cases being deployed in intermodal transportation and logistics today.

HOW COULD AI CHANGE INFRASTRUCTURE?

Power

As the renewables industry matures and storage assets like batteries come online, AI can better assess demand pressure points and enable use cases like battery optimization (to dispatch at the right time) and battery life optimization (ensuring a battery doesn't go below recovery). Integration of renewable energy can be smoother with AI-powered forecasts for renewable outputs, helping to integrate them smoothly into the grid. AI may also improve site selection for battery deployments, enabling better insight to reduce grid congestion and transmission costs to end customers.

Port logistics

AI-powered tools are expected to improve container management, traffic flow optimization and customs clearance. For example, technology can be used to optimize container storage and movements within ports. This includes predicting the best storage locations for containers to minimize movement and accelerate loading and unloading processes. AI can also help manage the flow of trucks and ships, schedule dock assignments and improve loading processes to reduce congestion and improve efficiency.

Fleet management

Advanced technologies are being used for fleet optimization, particularly around routes, fuel consumption and load optimization. AI algorithms analyze traffic data, weather and other factors to determine the most efficient routes for transportation fleets. Machine learning models can help analyze driving patterns and conditions to suggest improvements, leading to reduced fuel consumption and emissions. AI is also used to optimally allocate and schedule cargo loads to maximize capacity usage and minimize empty return trips.

AI use cases

Predictive maintenance

AI algorithms can analyze data from equipment to predict failures before they happen, reducing downtime and maintenance costs.

Autonomous vehicles

AI powers self-driving vehicles and ships, which could revolutionize personal, public and logistics transportation.

Supply chain optimization and resilience

AI's predictive capabilities help in identifying supply chain fluctuations and disruptions before they occur, enhance visibility across supply chains, and can help prompt proactive decision-making.

Analyzing changing weather patterns

AI forecasts can optimize renewable energy production or predict weather-related disruptions to plan alternative routes and safeguard assets.

Safety and compliance

AI is used for real-time monitoring of operations to ensure compliance with safety standards and regulations.

Natural capital

While the impacts of AI on natural capital will not be as significant as in real estate and infrastructure, AI will enable improvements in productivity, sustainability and biodiversity.

HOW COULD AI CHANGE NATURAL CAPITAL?

Farmland

AI and machine learning algorithms are enabling newer practices such as precision farming, which involves the precise application of water, fertilizers and pesticides, based only on the needs of specific areas of a field which optimizes resource use and reduces costs, potentially increasing crop yields. AI tools can also detect plant diseases and pest infestations early through image recognition technologies, minimizing potential damage.

Timberland

AI can aid in forest management, improve monitoring of timber assets and enhance sustainability practices. Similar to farmland use cases, AI-enabled image recognition technologies can identify tree species and count populations over large areas. Finally, AI systems can also detect signs of wildfires from satellite and aerial imagery more quickly.

INTERSECTION WITH OTHER MEGATRENDS

Transition to green economy

AI will play a significant role in how the grid evolves and how the built world interacts with it. The need for expanded electricity capacity for both data centers and EV charging will be increasingly important in the evolution of cities as the competition for power between households, businesses and data centers intensifies.

Growth of the South and East

APAC is embracing AI more quickly, but certain sectors that have experienced significant growth in those regions (e.g., call centers) are at significant risk. However, AI tools can make communication more seamless.

Aging population

AI has the potential to significantly increase average life expectancies by enhancing healthcare services and research capabilities. Algorithms can analyze complex medical data more quickly and often more accurately than humans, leading to better disease diagnosis and prediction. AI can also speed up the process of new drug discovery and bring greater personalization to medicine, potentially increasing the effectiveness of treatments.

Decoupling/Protectionism

Advance chip manufacturing and supply chains are global and complex. There are possibly significant future implications for the data center industry as complicated AI supply chains are intertwined with geopolitically important regions like Taiwan.

RISKS AND LIMITATIONS

Understanding and addressing the limitations of AI is essential for the responsible and effective use of these powerful technologies.

General limitations

GenAI models can sometimes produce outputs that are nonsensical, irrelevant or factually incorrect. Further, the quality of the output from GenAI models is heavily dependent on the data they are trained on. If the training data is biased or limited, the AI can perpetuate or amplify the biases in its outputs. Importantly, GenAI also raises questions around authorship, copyright and ethical use. Data privacy and compliance departments are actively working to develop and roll out updated policies and guidelines that take into account these new considerations, especially as they relate to confidential information.

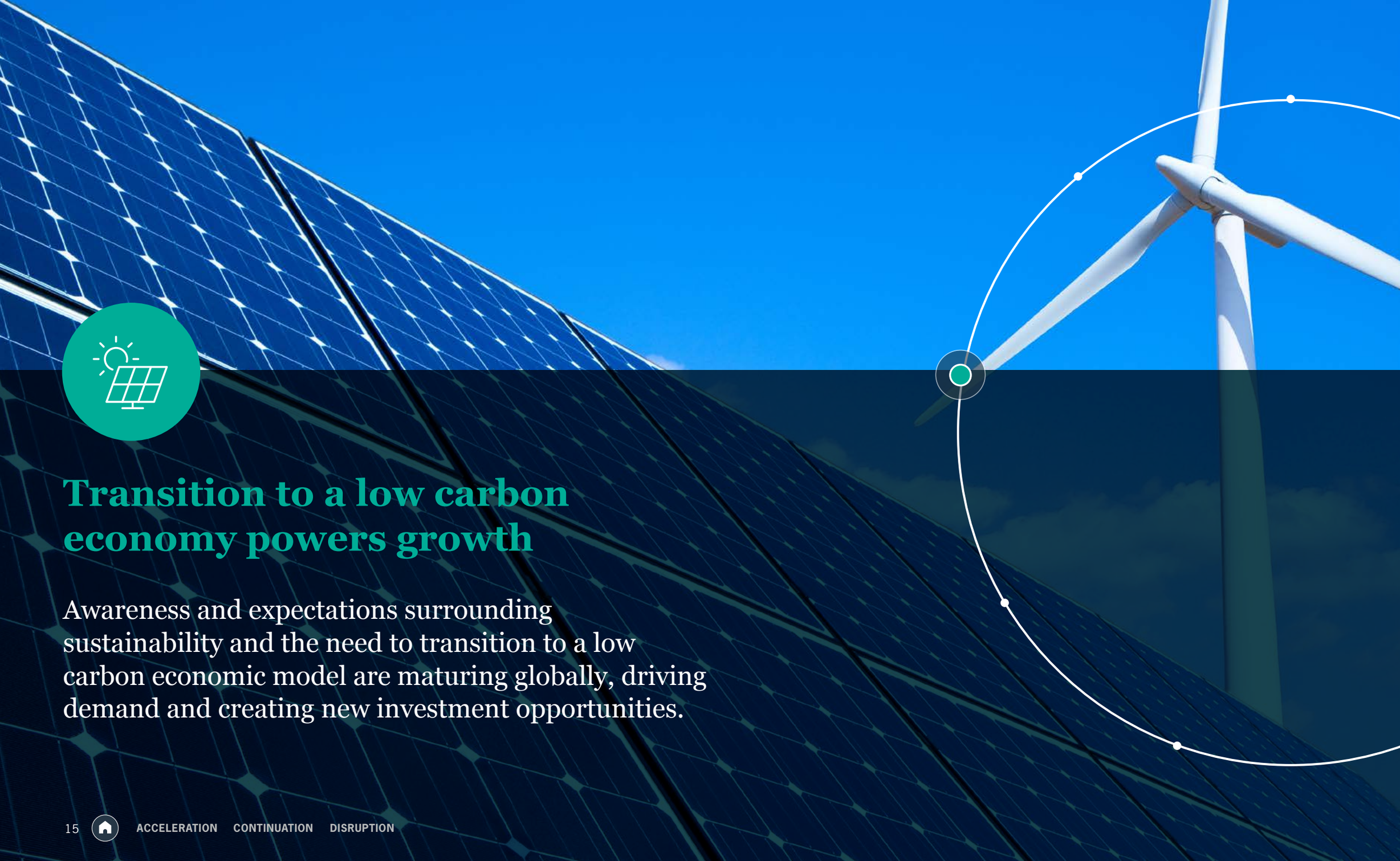
Real asset idiosyncrasies

Real estate is a hyper-local industry and data sources for real assets are imperfect tools for completely automated decision making. The availability and robustness of integrations with legacy software and systems is a significant and persistent challenge in the real estate industry. The PropTech and startup ecosystem is pushing to change these entrenched dynamics, but it will continue to be an uphill battle as accounting and property management system incumbents have varying incentives to open up their technology stacks more fully.

HOW TRANSFORMATIVE WILL AI BE?

PropTech boomed in the late 2010s and 2020s, introducing many new, innovative technologies to the real estate ecosystem, though not all have survived. iBuying, a technology that sought to streamline residential housing transactions by using algorithms to set house prices for cash buyers, is a clear example. Despite the single-family sector having the most comprehensive data sources, and users typically staying within residential markets with the most homogenous housing stock; some of the world's leading technologists, investors and venture capitalists could not scale sustainably competitive businesses with the technology. iBuying serves as a cautionary tale and underscores how challenging it is for new technologies to replace, or even replicate, real estate investment and asset management professionals.

For now, AI is full of potential, exactly how far reaching this technology can go, how it will change the way we work across vastly different sectors and how far it will change the course of real asset investments remains to be seen. Change is the only constant we can predict with certainty.



Transition to a low carbon economy powers growth

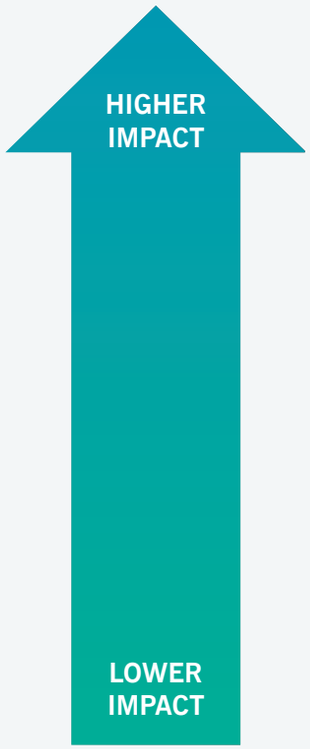
Awareness and expectations surrounding sustainability and the need to transition to a low carbon economic model are maturing globally, driving demand and creating new investment opportunities.

The landmark Paris Agreement of 2015 saw 196 parties agree to hold "the increase in the global average temperature to well below 2°C above pre-industrial levels" and pursue efforts "to limit the temperature increase to 1.5°C above pre-industrial levels." The agreement has been a driving force in the transition to a low carbon economy. Today, 140 nations (representing 88% of global emissions) and 65% of Forbes 2000 corporates have made net zero carbon commitments. 675 financial institutions having joined the Glasgow Financial Alliance for Net Zero. With interim targets in 2025-2030, the window for progress is closing.

Given the scale of the investment needed to fund the transition, investors are finding ample opportunities across asset classes to mitigate risk and generate returns, while recognizing that capital alongside thoughtful government policy and technological innovation will be key for success.

Supporting investor demand, our annual EQuilibrium survey of institutional investors found ***70% of respondents reported ESG factors influence investment decision making.*** A similar proportion reported going beyond regulatory requirements on the low carbon transition.

IMPLICATIONS AND OPPORTUNITIES FOR REAL ASSETS



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Real estate

Real estate accounts for around 39% of total global emissions.[4] The magnitude of the economic and social transformation required as part of the low carbon transition presents opportunities and challenges for the asset class.

Supply/demand imbalance leads value creation for low carbon real estate

Real estate faces a chronic under supply of sustainable buildings. A recent study by JLL found that by 2030 there will be a 57% to 75% gap (depending on the region)[5] between supply of sustainable space and occupier demands (Figure 1). Evidence of green premiums are emerging, and the supply/demand imbalance should lead values to hold and increase. The divergence will only increase, with non-green buildings becoming harder to transact.

Best-in-class sustainable assets in prime areas can command better rents and stickier tenants.

Transition unlocks new opportunities

The market associated with retrofitting existing buildings to improve performance and extend their lifespan will continue to thrive. A study by the Urban Green Council found that annual investment to meet Local Law 97[6] in New York alone would need to increase 13-fold, presenting a retrofitting market opportunity of $20 billion. This brown-to-green transition has the potential to transform the sector.

The rise of government subsidies to support green retrofit provides an institutional-grade means of investing in the transition. For borrowers, low carbon ready assets can see reduced borrowing costs of 10+ basis points (bps) as lenders understand green assets hold less risk while also looking to increase their share of sustainable financing products.

Challenges must be overcome for the transition

The challenges in transitioning to a low carbon economy cannot be underestimated. This is particularly true given the limited time to effect wholesale change in an industry that can be slow to react.

The cost of transition is considerable. McKinsey expects $1.7 trillion is required annually to 2050 to decarbonize buildings.[7] The question of how this will be funded is a complex one, but political responses and investment from the private sector will be essential.

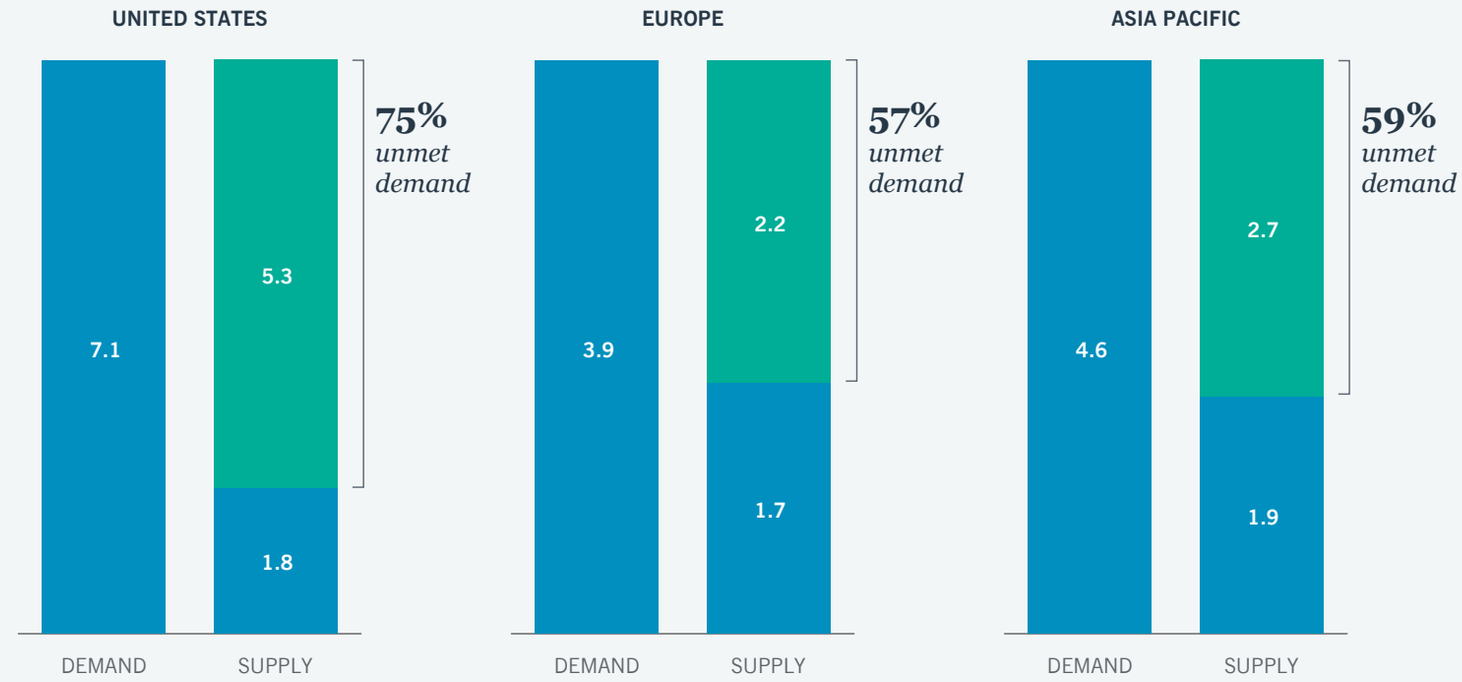
Buildings, their technical systems and who pays for utilities are not always straightforward, giving rise to split incentives. Sectors such as retail, warehousing or industrial do not yet have significant occupier demand for low carbon space.

This impacts the payback of improvements and does not incentivize rapid adoption. In these sectors there is limited landlord control with the majority of energy consumption by tenants. Tenant engagement, including through green leasing[8], is essential.

Overall, the real estate sector has the capabilities to transition to a low carbon model, spurred on by emerging technology and certainty offered by clearer government policy. However, the high levels of capital expenditure required means that there is a risk of stranded assets.

Figure 1: Occupational requirements compared to development pipeline

Supply/demand



Source: JLL 2024

Infrastructure

The transition to a low carbon economy that supports economic growth is being driven by ambitious global goals and rapidly increasing demands for power.

Climate goals top of mind in driving demand for renewables, decarbonization

To meet these demands, the International Energy Agency expects investment in renewables must double to £1.2 trillion per year by 2030.

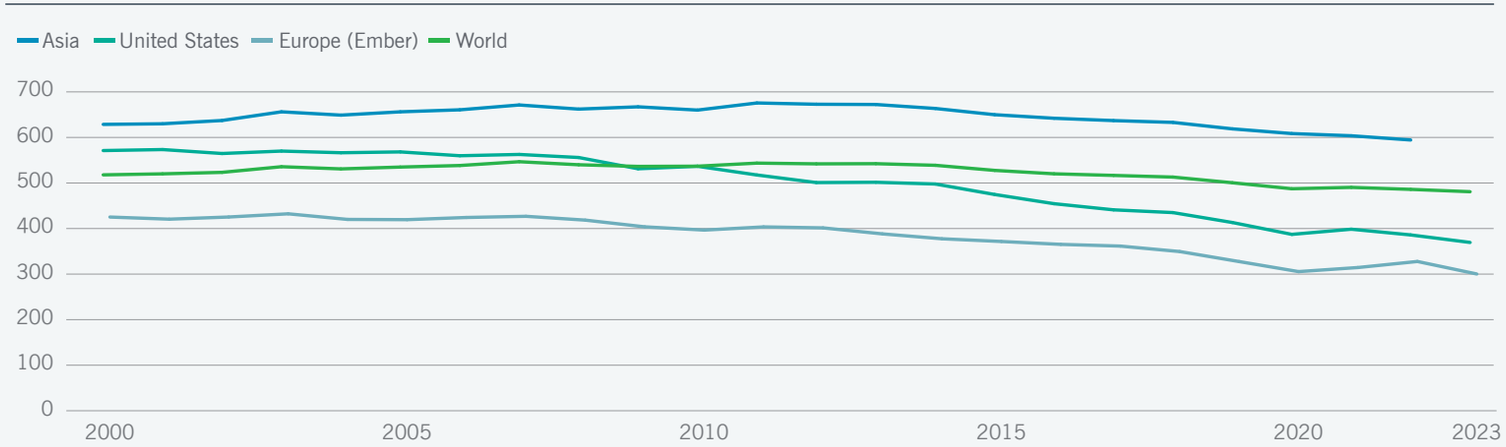
At COP28, nearly 200 nations agreed to triple renewable energy capacity and double energy efficiency by 2030 to meet international net zero goals as outlined in the Paris Agreement.[9]

The EU revised Renewable Energy Directive, adopted in 2023, raises the EU's binding renewable energy target for 2030 to a minimum of 42.5%. As the energy sector is responsible for more than 75% of the EU's greenhouse gas emissions, increasing the share of renewable energy across different sectors of the economy is key to reducing net greenhouse gas emissions by at least 55% by 2030, and to becoming a climate-neutral continent by 2050.[10]

These commitments reflect the urgent need to reduce carbon emissions, presenting new opportunities to deploy capital into the sector. Over the past decade, the growth of renewable energy, such as wind and solar, has consistently outperformed expectations whilst the cost to deploy renewables has decreased cconsiderably and this growth story is only getting stronger.[11]

Carbon intensity of electricity generation, 2000-2013

Grams of carbon dioxide-equivalents emitted per kilowatt-hour of electricity generated



Source: Ember (2024); Energy Institute - Statistical Review of World Energy (2024)

Energy demand continues to increase supported by new technology adoption

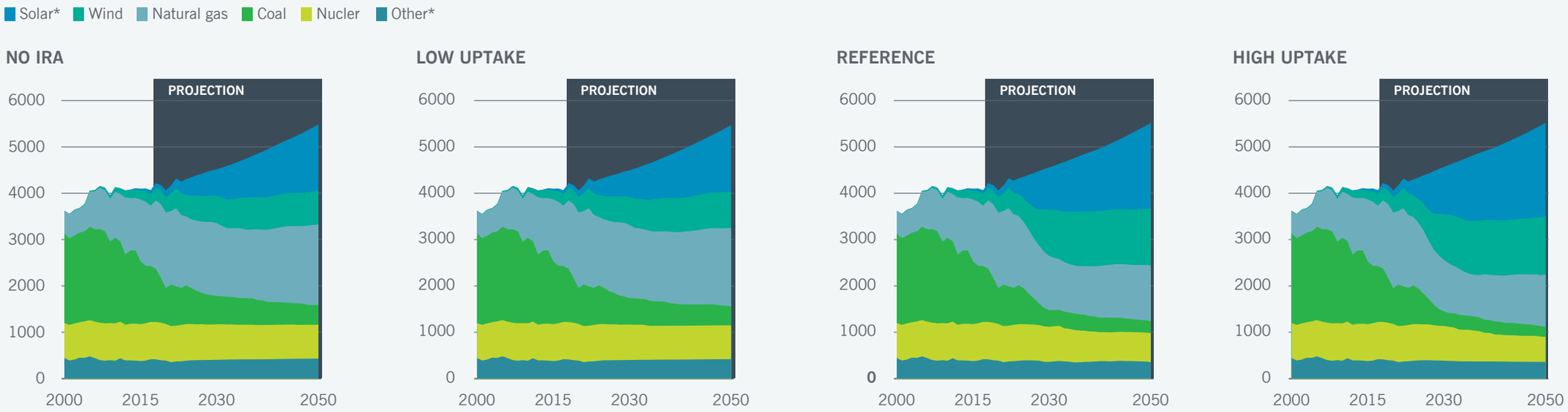
The global demand for power is expected to surge as economies increase their dependency on digitalization and power-intensive AI applications.

A study from Goldman Sachs estimated that in the U.S., power demand will accelerate to a 2.7% 5-year compound annual growth rate by 2030 versus 0% for the past 10 years.[12] Forward-looking investment strategies that are poised to tap into this growing demand will be well-placed to capitalize on increased infrastructure needs, while also honoring sustainability commitments.

A holistic view of the combined environmental and social impact of increased energy demands is essential for crafting resilient infrastructure portfolios. For example, lower energy solutions for data center equipment cooling require larger quantities of water. This would prove destabilizing for the local community and ecology in areas of water scarcity. Nuveen Infrastructure assesses factors such as power use effectiveness (PUE), access to renewable energy sources, community considerations and water stress to capture these complexities and trade-offs when assessing data center investments.

U.S. net electricity generation by fuel

Billion kilowatthours



Data source: U.S. Energy Information Administration, Annual Energy Outlook 2023 (AEO2023)

Note: IRA=Inflation Reduction Act

*Includes utility-scale and end-use photovoltaic generation and excludes off-grid photovoltaics.

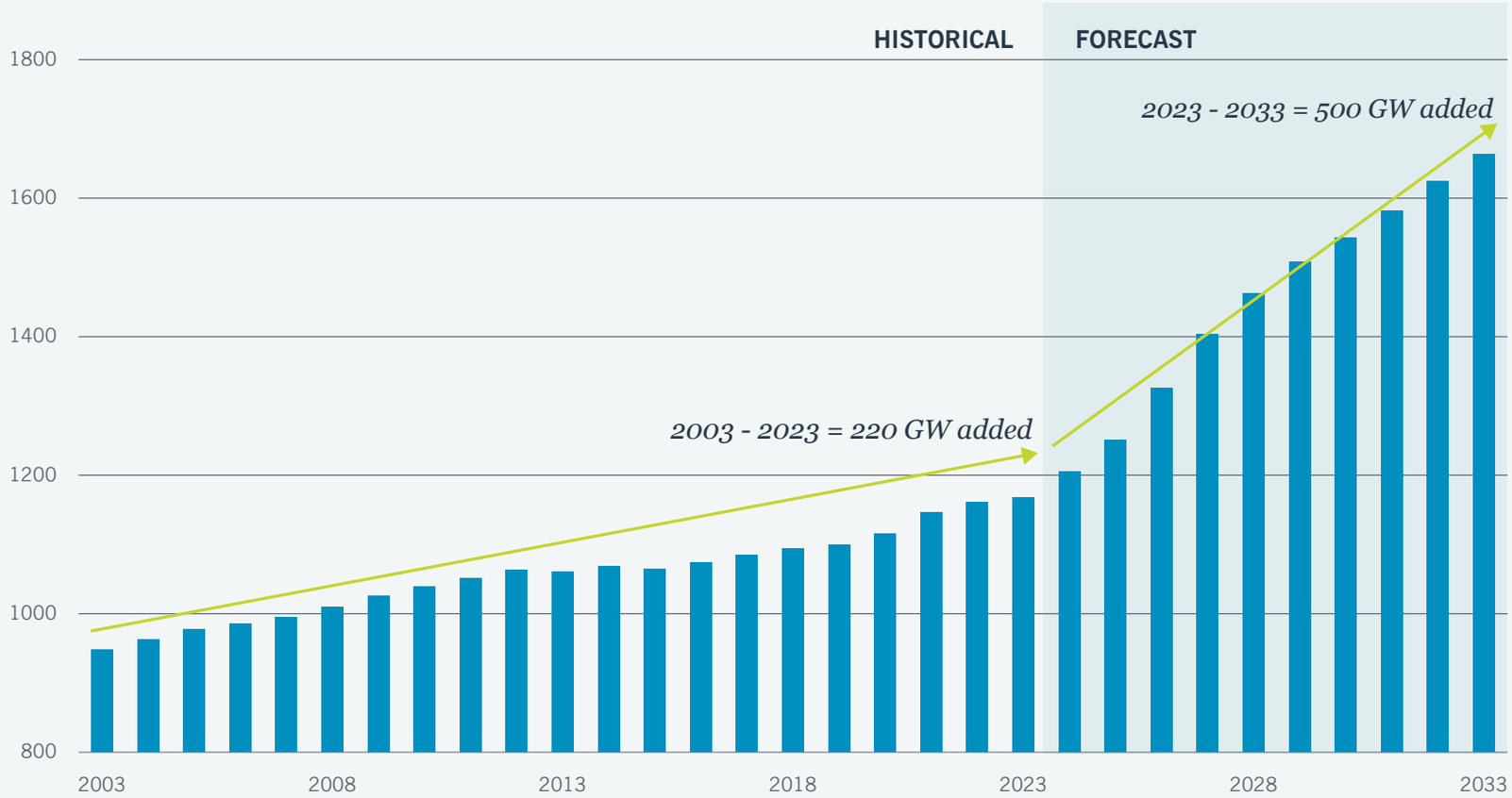
**Includes petroleum, conventional hydroelectric power, geothermal, wood and other biomass, pumped storage, non-biogenic municipal waste in the electric power sector, refinery gas, still gas, batteries, chemicals, hydrogen, pitch, purchased steam, sulfur, and miscellaneous technologies.

Electricity demand creates an assetclass: Energy-as-a-Service (EaaS)

Given the anticipated growth in electricity demand, it is possible that power prices will rise. Correspondingly, energy-as-a-service, which leverages energy efficiency and demand response will become a prominent investment theme. In the EaaS business model, customers enter into long-term service agreements with the EaaS provider who covers the upfront installation and equipment upgrades (i.e., Heating, ventilation, and air conditioning (HVAC), lighting, and refrigeration). The provider guarantees the customer a specific percentage reduction in their power bill, and in turn is entitled to all additional savings. The steady stream of cash flows, long duration contracts, well-understood technology and diversification of customer base de-risks this lending opportunity. EaaS providers need flexible financing to capitalize projects on a rolling basis as customers are acquired. The current annual market size for energy efficiency is $30 billion.

Tremendous growth in electricity infrastructure

U.S. electric power sector generation capacity (GW)



Source: U.S. Energy Information Administration.

Natural Capital

Institutional investors have several mechanisms to align portfolios with emissions reduction targets. Beyond simply reducing exposure to carbon-intensive sectors, investors may increase allocations to carbon efficient or low carbon investments and invest in climate solutions that remove CO2 from the atmosphere.

Allocations to natural capital can support these goals in several important ways.

Efficiently decarbonizing investment portfolios

As an asset class, natural capital, such as timberland and farmland, has the lowest average carbon intensity — or net CO2 emissions per dollar invested — among both alternative and traditional asset classes.

A low or even net-negative carbon profile can balance more emissions-intensive sectors within an institutional portfolio, helping to achieve climate targets efficiently without having to sacrifice returns unnecessarily. Over $9 trillion assets under management, represented by the Net-Zero Asset Owner Alliance, is committed to transitioning investment portfolios to net zero greenhouse gas emissions by 2050.

While the optimal decarbonization pathway will be unique to each asset owner, we believe natural capital's low carbon intensity and risk-return profile can be an efficient strategy to help achieve this goal.

Investing in nature-based climate solutions

As whole economies and supply chains decarbonize, certified sustainable timberland and farmland assets will be well positioned to benefit from growing demand for carbon-efficient food, fiber and timber.

In many geographies, growing markets and policy frameworks are supporting pricing for these products, incentivizing emissions reductions from land management practices and throughout the supply chains. For example, in the U.S., California's Low-Carbon Fuel Standard has been a major demand driver for renewable diesel, which reduces carbon intensity by 65% on average when compared to petroleum diesel and provides grain and oilseed farmers with a new end-use market for crops.

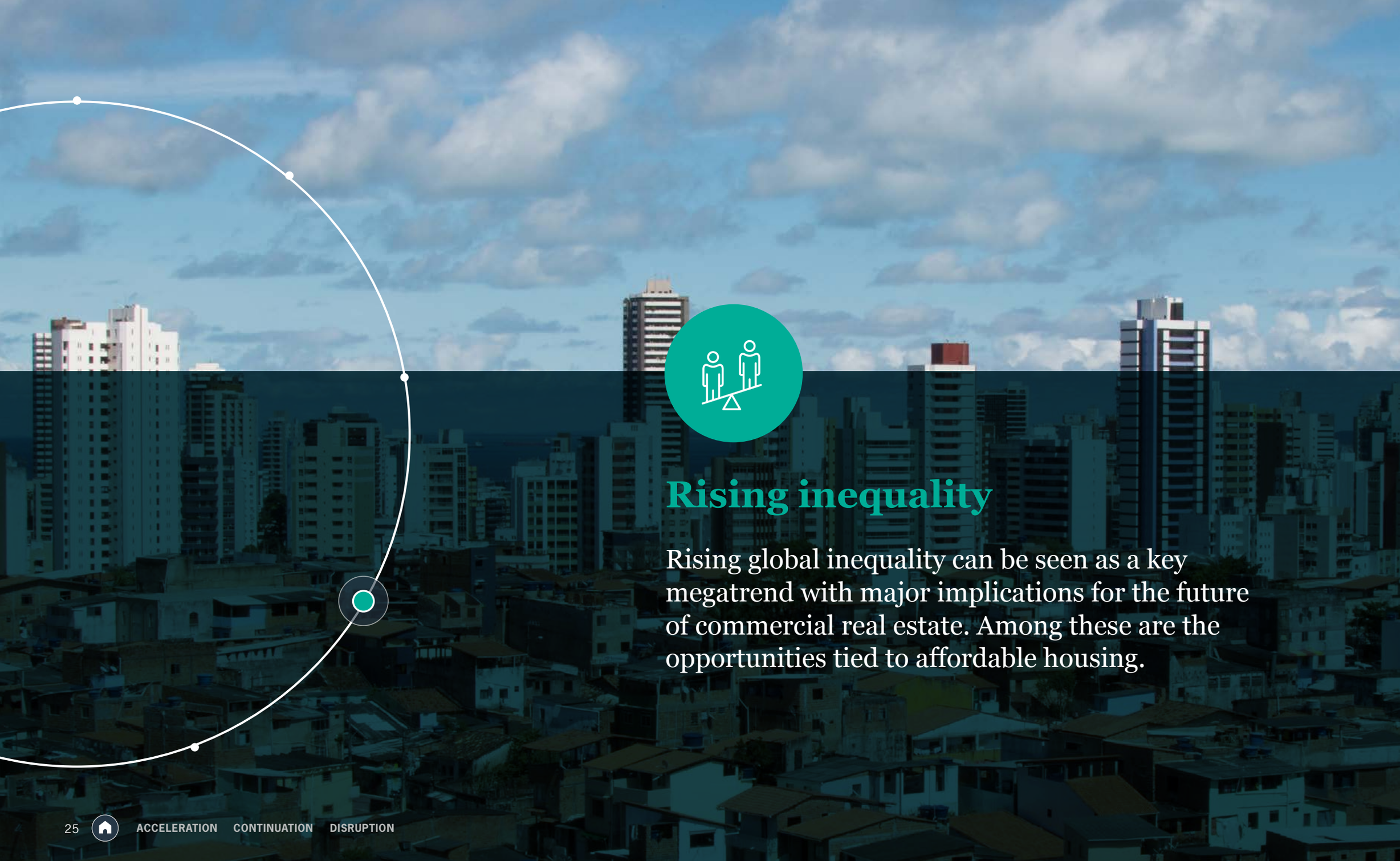
In addition to supporting supply chain decarbonization, investing in natural capital – trees and soil – represents a direct investment in a carbon removal technology offering near-term potential to generate credits that represent real, measurable climate benefits. Carbon credits can be generated through changes in land management that reduce greenhouse gas emissions or sequester CO2 from the atmosphere. To quantify the climate benefits of these changes, there are established crediting standards and mechanisms for monitoring, reporting and independent verification. The global market for carbon credits could grow from about $2B currently to $100B per year by 2030 by some estimates.[13]

For land-based investors, exposure to carbon credit markets has the potential to improve financial returns compared to management for commercial timber or agricultural crops alone, enhance portfolio-level diversification benefits, and contribute positively to climate targets.

A low carbon economy will bring growth opportunities

The transition to a low carbon economy is well underway. As carbon emission reduction targets come into focus ahead of 2030 and 2050 deadlines, governments, companies and investors are seeking to accelerate the transition to low carbon across asset classes.

With this acceleration, ***investors will see shifting demands across real estate, infrastructure and natural capital,*** driving growth in these areas as greener buildings, renewable energy and positive carbon storage practices become increasingly commonplace.



Rising inequality

Rising global inequality can be seen as a key megatrend with major implications for the future of commercial real estate. Among these are the opportunities tied to affordable housing.

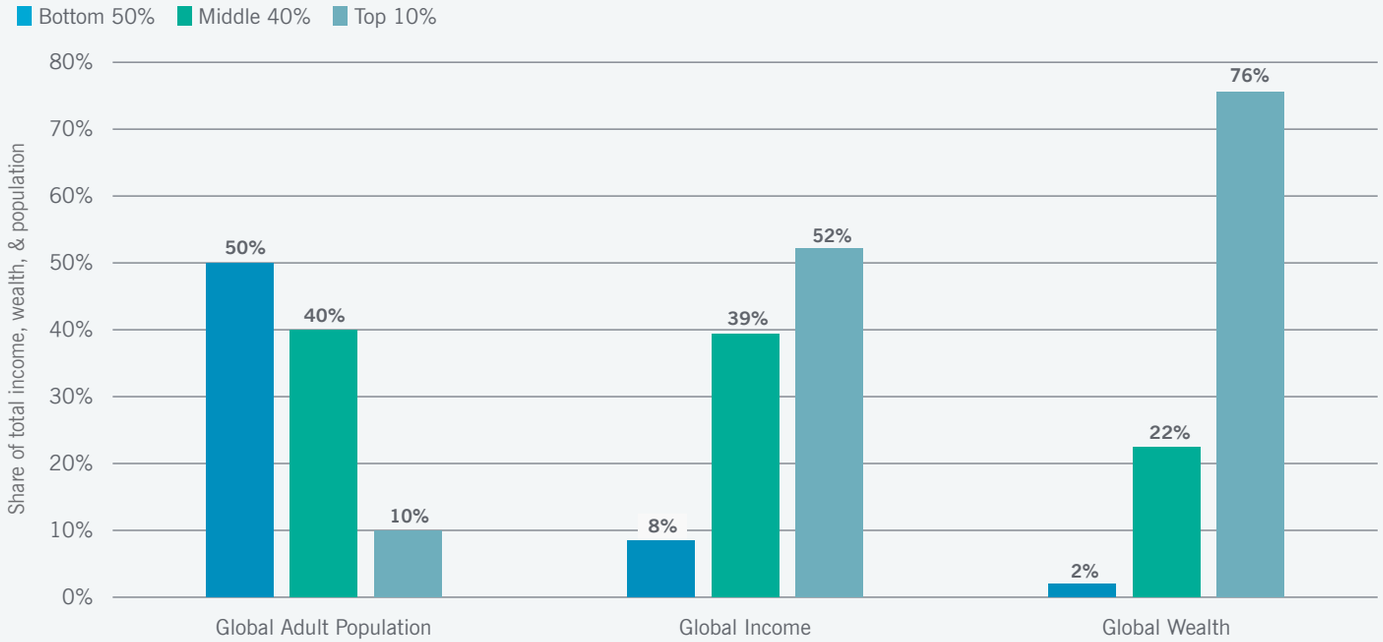
With an increasing population facing a cost-of-living crisis, below-par financial literacy and unequal access to local grocery outlets and healthcare, affordable housing investors have an opportunity to tap into this global demand while bridging the gap on various societal inequalities.

THE CURRENT STATE OF GLOBAL WEALTH

The top 10% of the global population accounts for 52% of total income and 76% of total wealth, according to the World Inequality Lab (Figure 1). Concurrently, the bottom 50% of the global population accounts for a 8% of total income and 2% of total wealth.[14]

While a small portion of the global population controls a significant amount of total wealth, inequality varies by region. The top 10% of the population controls 59% of total wealth in Europe, 67% of total wealth in South and Southeast Asia, and 70% of total wealth in North America. In the U.S., 39% of adults do not have sufficient non-retirement savings to cover one month of living expenses and

Figure 1: Distribution of global income and wealth



Source: Nuveen Real Estate Research; World Inequality Report 2022

nearly one-third of adults report they are not confident they can come up with $2,000 if an unexpected need arose within the next month.[15]

TAPPING INTO A GLOBAL DEMAND WITH AFFORDABLE HOUSING

Affordable housing initiatives help regenerate communities when they provide sustainable places for people to work and live; moving from redundant to repurposed places can reduce geographic inequality across many of our towns and cities.

For example, installing grocery, healthcare and other amenities provide meaningful support to underserved communities. Government schemes differ from region to region, though the common thread is that to support this global demand for affordable housing, investment is needed.

We have seen a widening wealth gap across regions, leaving the majority of global wealth in the hands of a few, while many people in lower-income areas are facing the same challenges globally: a cost-of-living crisis, poor financial knowledge and difficulty in accessing necessities such as grocery and healthcare facilities.

Real estate focused on affordable housing is tapping into a sector that offers substantial, global demand, backed by government schemes, providing a potentially low volatility model for investment. Alongside this, affordable housing presents an opportunity to mix meeting a global demand by delivering housing and facilities which positively impact daily lives, from grocery shopping to education at all levels.

IMPROVING ECONOMIC EQUALITY

Among the most challenging obstacles to addressing wealth inequality is the cost burden many renters face. The rising price of rental housing prices, almost globally, has meant many are finding it tougher to keep up with rent and other bills, making it unlikely that lower income individuals can save money each month. Tackling the cost of rental prices is one component of this issue, though another is improving financial literacy and educating tenants on the tools available to help ease financial burdens.

According to TIAA Institute's analysis, most U.S.-based adults are making financial decisions with a generally poor level of financial literacy. The TIAA Institute-GFLEC Personal Finance Index (P-Fin Index) assesses financial literacy among U.S. adults annually, examining the relationship between financial literacy and financial well-being.

According to the 2024 report, U.S. adults answered only 48% of the 28 index questions correctly. As such, there is a growing need to improve financial literacy. In our view, responsible rental housing owners can improve residents' financial well-being through financial literacy and employment aid programs within living communities. By offering these resources at affordable housing properties, for example, responsible owners can positively improve economic equality and promote upward financial mobility for lower-income households.

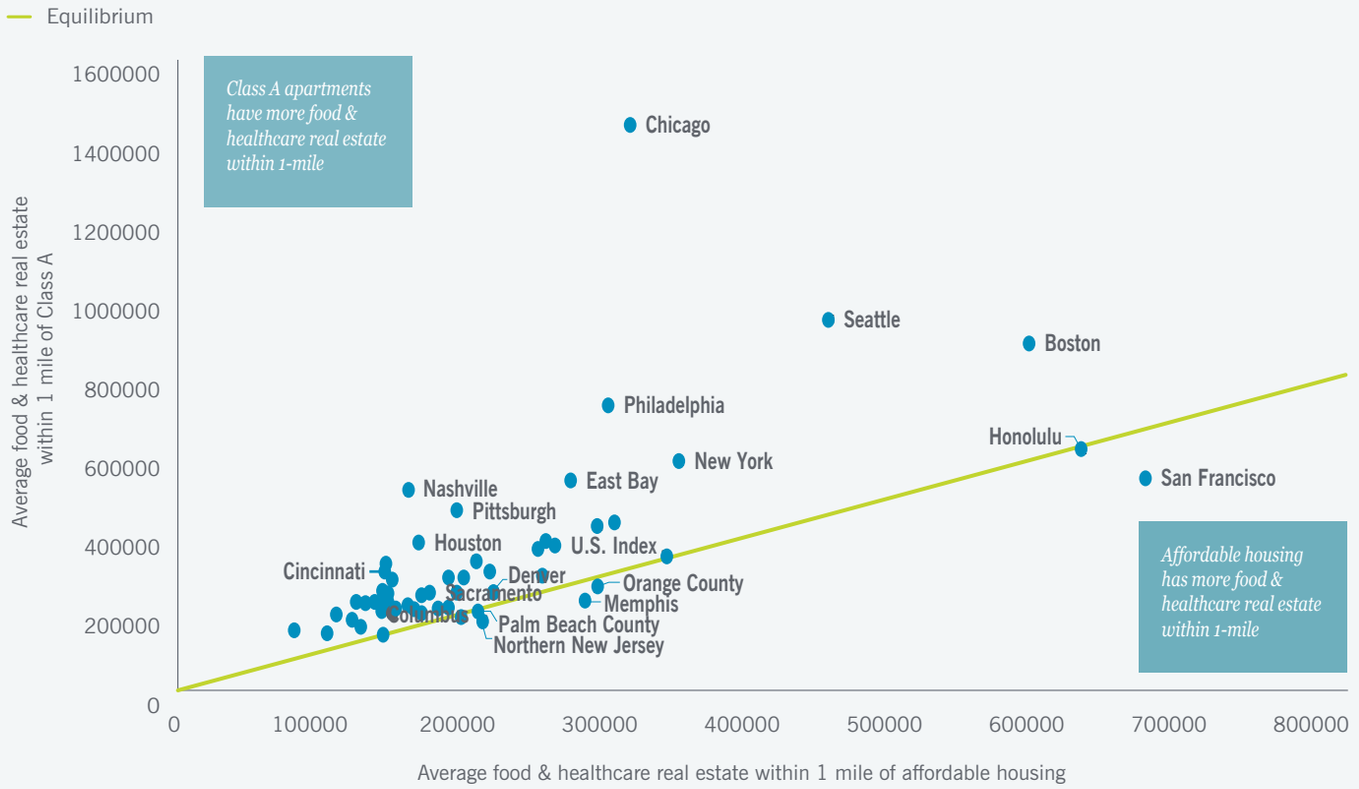
Recent insights from U.S. mortgage provider Fannie Mae indicate a growing share of the population is living paycheck-to-paycheck. The percent of U.S. renters who say they do this increased from 50% in 2021 to 63% in 2023.[16] Addressing these challenges through social impact investments like affordable housing with education is one way of providing an effective bridge to improve the financial well-being of many.

To improve economic equality, responsible rental housing owners can initiate programs within communities that support residents' financial well-being. One example from the U.S. is partnering with an organization like The Flagstone Initiative, which allows

residents to split their rent payment into two payments to better align with standard bi-weekly paychecks. This allows renters to free up funds for other essential items and experience less financial strain at the start of the month.

Other schemes exist that help to build credit scores for residents, while others offer rent-relief support for those who experience sudden financial hardship. These initiatives help to stabilize the rental and housing market, creating less tenant turnover and reducing the need for evictions. Providing essential support structures for tenants through different schemes can help to ease financial concerns and begin building a risk profile of tenants, putting them in a better position to get on the property ladder.

Figure 2: Access to health care and food within 1 mile: affordable housing vs. Class A, by market



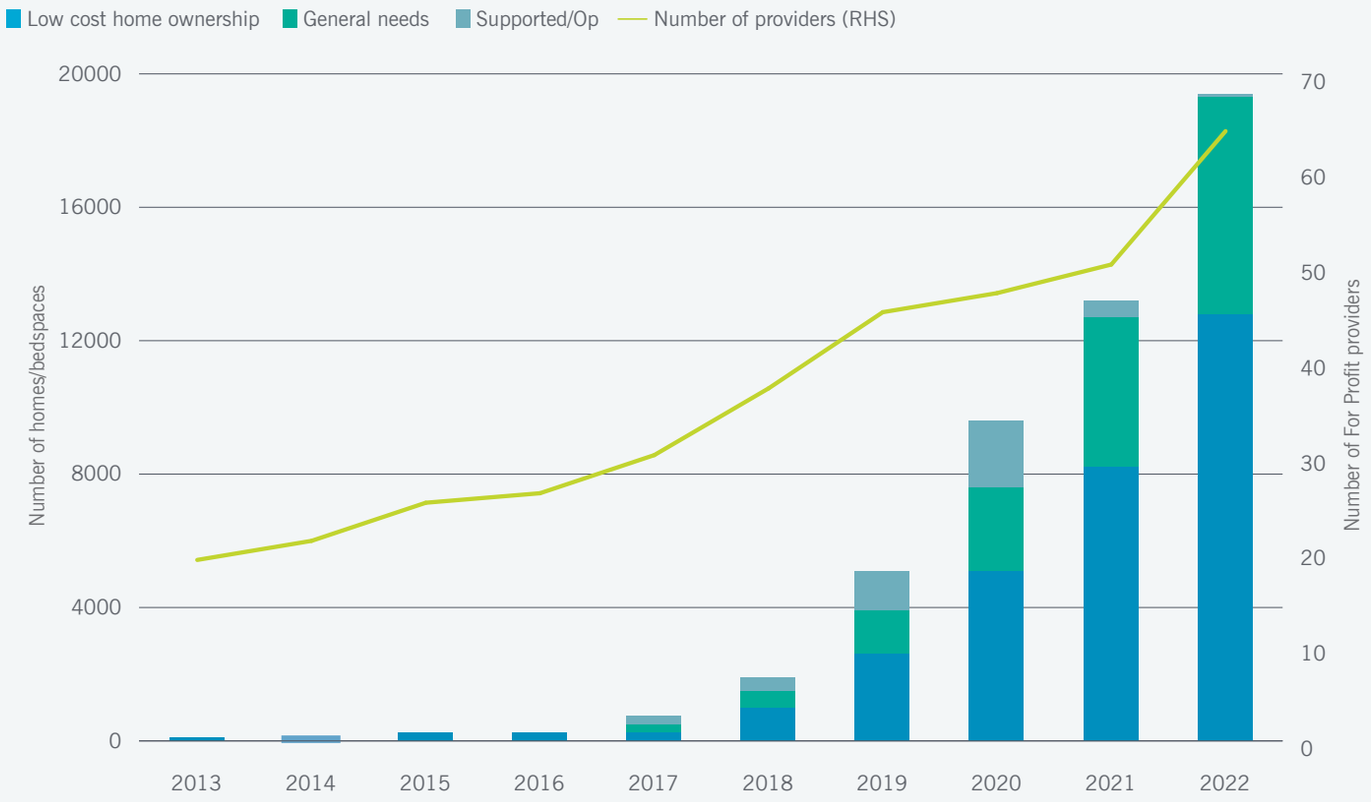
Source: Nuveen Real Estate Research; CoStar, May 2024

IMPROVING HEALTHCARE AND FOOD ACCESSIBILITY

Nuveen Real Estate research indicates lower-income renters have unequal access to healthcare and necessity food retail than higher-income renters. Specifically, affordable housing residents are more disadvantaged than Class A apartment residents in accessing walkable healthcare and necessity food retail.

According to CoStar data, Class A apartments have more healthcare and food real estate within one mile of their property than affordable housing communities across 46 of the top 54 U.S. markets (Figure 2). This presents an opportunity for investors to develop regeneration communities that bring a sustainable ecosystem of necessity food, healthcare and education to affordable housing communities.

Figure 3: U.K. affordable home: FPRPs have almost doubled their stock every year since 2015



Source: Savills 2023

TIAA Institute's analysis of health disparities by income indicates that in the U.S., the difference in life expectancy between rich and poor is 15 years for men and 10 years for women.[17] As such, there is a clear need to improve lower-income communities' access to healthcare access.

The creation of these ecosystems is an opportunity to enhance economic activity, create jobs and improve affordable housing residents' overall well-being, while filling a growing demand.

GLOBAL DEMAND FOR AFFORDABLE HOUSING

Like the U.S., European life expectancy is intrinsically linked to income inequality. In the U.K., the life expectancy gap between the most and least deprived geographies has increased from 7.4 to 8.7 years.[18] The rise in inequality is now entrenched across political agendas and in 2022, the U.K. government announced its long awaited 'Levelling Up' plan to address and close the gap between the rich and poorest parts of the country. By introducing funds to target direct investment into underserved regions, it acknowledged that private sector capital is required to help solve social and economic inequality.

Real estate investors have an important role to play in enhancing social infrastructure, which includes modern healthcare facilities and affordable housing. An asset's operational programs will be essential to further help address inequality and enhance the quality of life for lower-income renters, alongside ensuring locations consider safety, accessibility to local transport and needs-based services such as food, employment, health care and education.

European social infrastructure, including affordable housing, is often controlled by state authorities and can therefore be hard to access. However, a European Union study found a €7 billion annual investment gap in social and affordable housing. This means that investment in this sector needs to increase by 25%, supporting the case for stronger private/public sector partnerships to successfully address inequality.[19]

The U.K., for example, has seen a growing number of affordable housing providers (see Figure 3). Estate agent Savills predicts For Profit Registered Providers (FPRP) could commit up to £23 billion for affordable homes by 2026, enough to fund 130,000 new homes for shared ownership and general needs rent.

Income inequality has been severe in Asia Pacific, with the richest 10% earning more than half of the region's total income.

In the U.K., the life expectancy gap between the most and least deprived geographies has increased **from 7.4 to 8.7 years**.[33]

Wealth distribution is even more uneven than income distribution and asset value appreciation has intensified this in emerging Asian markets such as India and Southeast Asian countries.

Conversely, advanced economies in Asia Pacific with higher levels of education and greater opportunities for social mobility will likely have policies in place to address the issue of inequality, such as providing affordable housing for lower income households. However, as in Europe, affordable housing is highly regulated by government authorities in the region. Only Australia has initiated pilot program that the state government partners with the private sector to deliver a predetermined portion of affordable housing in selected government approved residential projects.

ADDRESSING INEQUALITY THROUGH AFFORDABLE HOUSING

The widening global wealth gap is made up of countless challenges, but across geographies, we see similar problems. Cost of living concerns make it difficult to keep up with rental prices and bills, meaning many are unable to save money. Other symptoms of this wealth gap are a lack of financial literacy among many and inadequate access to necessities like food, health care and education.

Government intervention to address this matter is at various stages of success in different regions, though across North America, Asia Pacific and Europe, there is a growing consensus that private investment is needed to meet the demand of affordable housing. Investors considering affordable housing, possibly to meet socially focused portfolio goals, are tapping into a market with global demand.

Regenerating underserved communities will take significant capital, but through this route, investors will be helping establish infrastructure that directly tackles these avenues of wealth inequality.

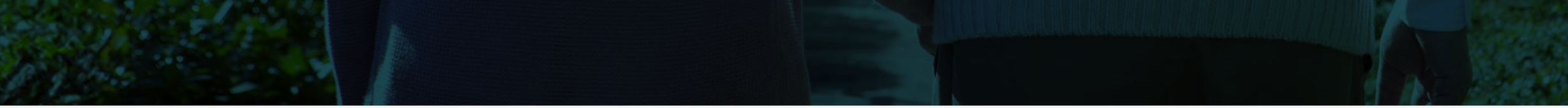
Continuation

How does an aging population impact real estate?

Addressing climate impacts and nature loss through real assets

How does an aging population impact real estate?

Globally, life expectancy is increasing, creating a growing demographic of senior citizens (those aged 65 and over). At the same time, working age populations (those aged between 15 and 64) are stalling in some countries, and even expected to decrease.



As people live longer and the working population gets smaller, real estate demands are likely to shift significantly. Understanding how an aging population will affect demand for buildings and services is crucial to future proof real estate portfolios.

WHAT'S CHANGING?

The global population has increased 26% since 2000.[20] This trend is playing out in three ways:

- Life expectancy is increasing. The World Health Organization reported average life expectancy grew from 66.8 years in 2000, to 73.1 years in 2019. As a result, the senior population as a proportion of total population is growing in many countries. In Japan, for example, its senior citizens are projected to represent around 25% of the national population by 2065.[20]
- In some regions, an increasing senior age demographic is coinciding with declining fertility rates. In Europe, China and Japan, working age demographics will begin to fall in absolute terms over the next 20 year.[20]
- Some countries are seeing population growth across all demographics. India's projected population overtook China in 2022, making it the most populous country in the world. African nations are also on course to see populations increase, with high birth rates over the last 20 years.[20] The African continent will likely have the largest working age population in the future.

The shifting trends in the global population are materializing in different ways, and the impact on different regions will be varied. However, in regions where a senior demographic is expected to overtake the working age population, real estate demands could well shift radically.

WHAT DOES AN AGING POPULATION DO TO REAL ESTATE INVESTMENTS?

A growing population of 65 and over will change demand for real estate. Nuveen Real Estate has identified three key areas for investments: supplying dedicated care facilities; refurbishment opportunities for senior care in urban cities; and tapping into increased demand for alternative real estate sectors.

KEEPING UP WITH DEMAND

Targeting the development of care facilities could be an attractive space for real estate investors as demand currently outstrips supply.

There are already indicators of a supply and demand imbalance for senior care. In the U.K., estate agent Savills[21] noted that 14,400 new care home beds will be needed annually over the next 10 years. It took suppliers three years (2020-2023) to meet that annual target, while only 5,900 beds were under construction in late 2023.

Canada has similar supply concerns. Deloitte[22] estimates demand for care home beds will rise by 59% by 2031 compared to 2019 levels, which is likely to create shortages within the care sector.

An undersupply of specialty care equipment such as beds could prove to be an early warning of an increased demand for care home facilities in the coming decades.

Japan underlines this concern. As stated above, the senior population is expected to account for around 25% of the national population by 2065. Care home supply is expected to fall well short of the estimated 8 million increase in senior population in this period.[23]

To meet this growing demand in Japan and countries in a similar position will require investment from the private sector.

REVAMPING REAL ESTATE

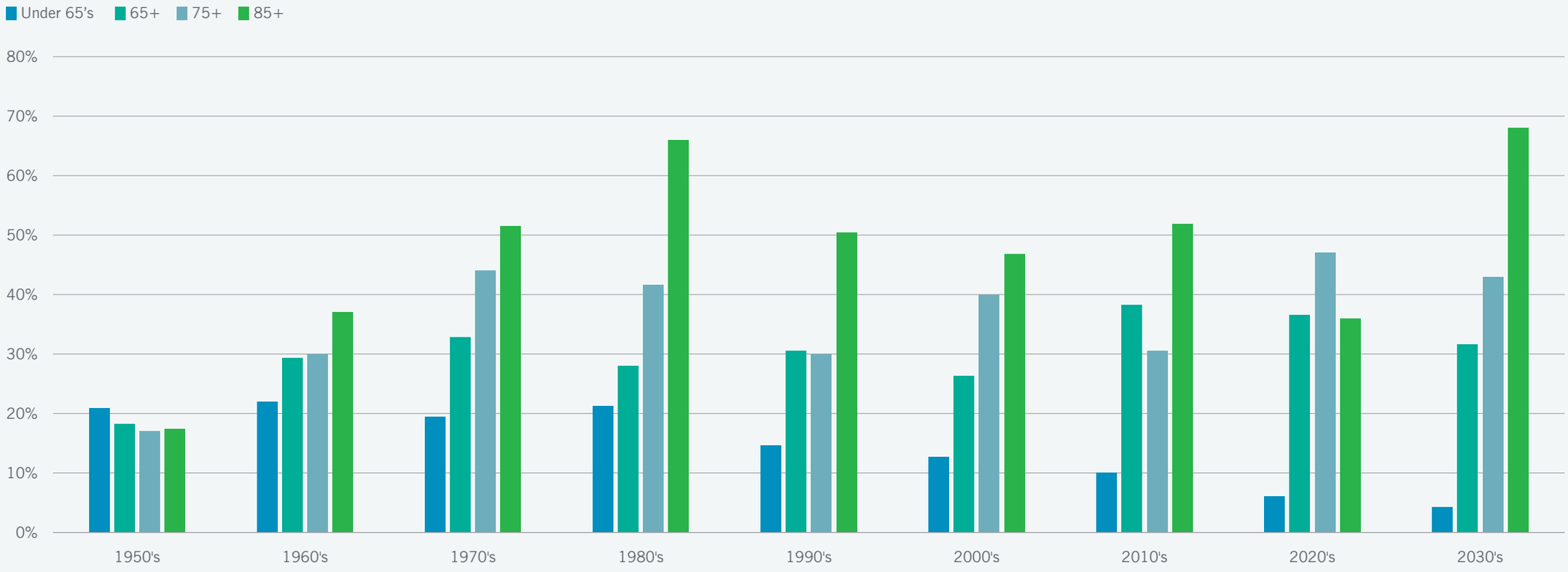
In countries where the working age demographic is falling, such as the U.K., China and Japan, opportunities to refurbish assets to support an increased senior population are likely to come into scope.

Demand for office space could fall with a stagnating and declining working age population. Under-used buildings could be revamped to support, for example, inpatient and outpatient senior care.

The U.K. has already showed signs of the office refurbishment trend. The normalization of working-from-home has meant the demand for office space has declined. In 2023, a little over 20% of real estate deals focused on the hospitality industry (which totaled £2.4 billion) were office-to-hotel conversions.[24]

If the demand for office space and similar employment-focused real estate were to decline in line with a falling working age demographic, developers may well look at these properties as development opportunities to meet growing demands from sectors such as hospitality, residential and senior care. These locations would also provide seniors with an ease of access to groceries, health care facilities and transport.

Figure 1: Global population growth by decade



Source: OECD, 2024

BEYOND RESIDENTIAL

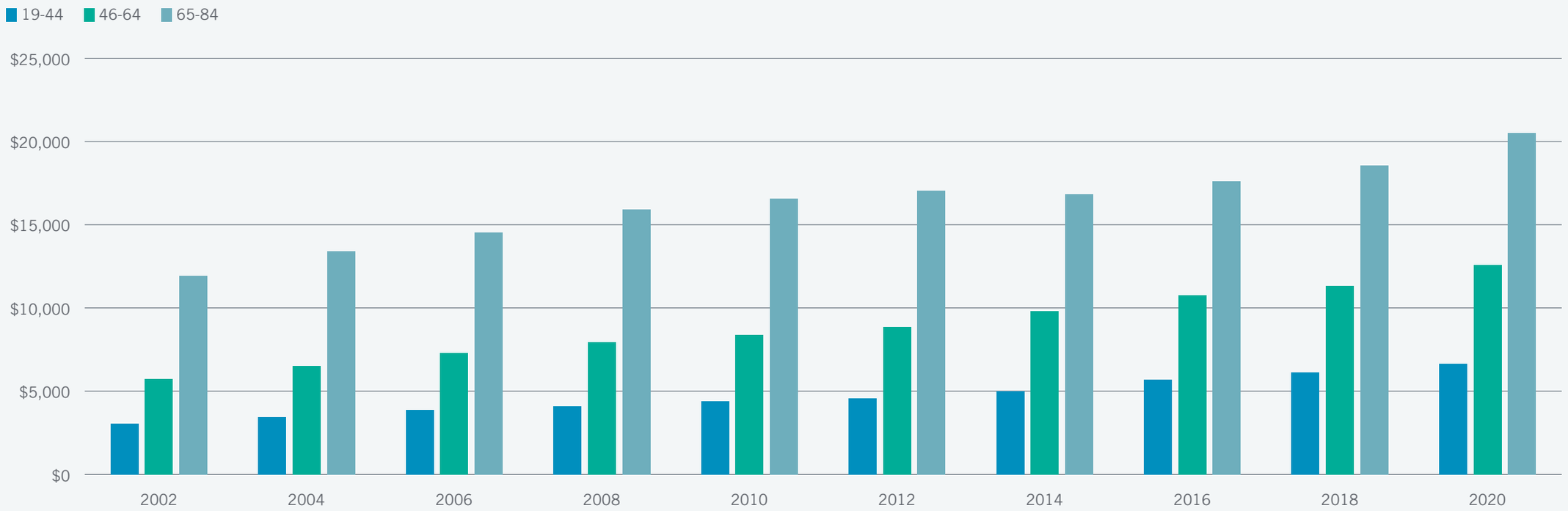
As further investment is made into senior residential housing, the health care sector, particularly medical offices, may also face heightened demand in future.

In the U.S., over 65s spend on average three times more on health care than the population aged 19 to 44 years (Figure 2). This age cohort is projected to grow three times faster than the general population between 2024 and 2040 and is set to represent 22% of the population by 2040. At present, medical office is currently 93% occupied and stands to benefit greatly from this demographic tailwind.[25]

The U.S. also benefits from a shift away from hospital care to outpatient facilities, which are often more convenient and less expensive. Since 1995, hospital admissions declined by 21% while outpatient visits increased by 52%.[26] Combined with a dwindling pipeline, this should push occupancy close to its structural limits, presenting substantial opportunities for acquisitions and development of modern medical outpatient facilities. And these opportunities are not confined to the U.S.

Figure 2: The senior population are the lead consumers of personal healthcare

U.S. personal healthcare spending by age ($)



Source: Centers for Medical and Medicaid Services, 2024

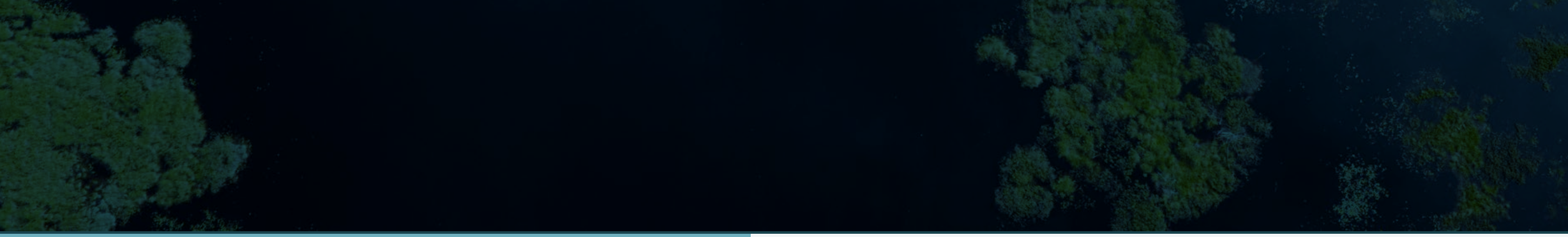
AGING POPULATION DRIVING OPPORTUNITIES

The commercial real estate market will change significantly in the face of an increasing senior population. Development to address senior care needs cannot depend simply on new construction projects. Refurbishing existing properties – for example, office buildings in cities with a dwindling workforce – will provide an avenue for developers to address the growing yet varied demands of senior care.

As with other megatrends, such as urbanization and the transition to a low carbon economy, adapting real estate needs for the aging population will require private sector investment, making the senior demographic an increasingly important investment opportunity for real estate.

Addressing climate impacts and nature loss through real assets

The effects of climate change are a megatrend on a global scale, influencing the expected risk-return profile of real assets investments and the opportunity set for investors.



The increasing frequency and severity of physical climate hazards, as well as nature loss resulting from changing ecosystems ***requires new ways of thinking about financial risk and return in real assets investments.***

As addressing these challenges becomes increasingly important, a growing set of real asset investment opportunities are appearing, designed to mitigate and even begin to reverse climate impacts and nature loss.

CLIMATE AND RISK-RETURN PROFILE

Climate hazards and nature loss can have direct material impact on real assets investments, and its effects can extend to the broader value chains to impact markets worldwide. In some cases, asset values and income returns from real estate, infrastructure and natural capital investments can fall. In other cases, real asset investment performance will benefit from changing climatic conditions and opportunities to combat nature loss.

Understanding the potential financial risk of climate impacts and nature loss will be critical to individual investment selection, portfolio design and diversification to achieve long-term performance objectives.

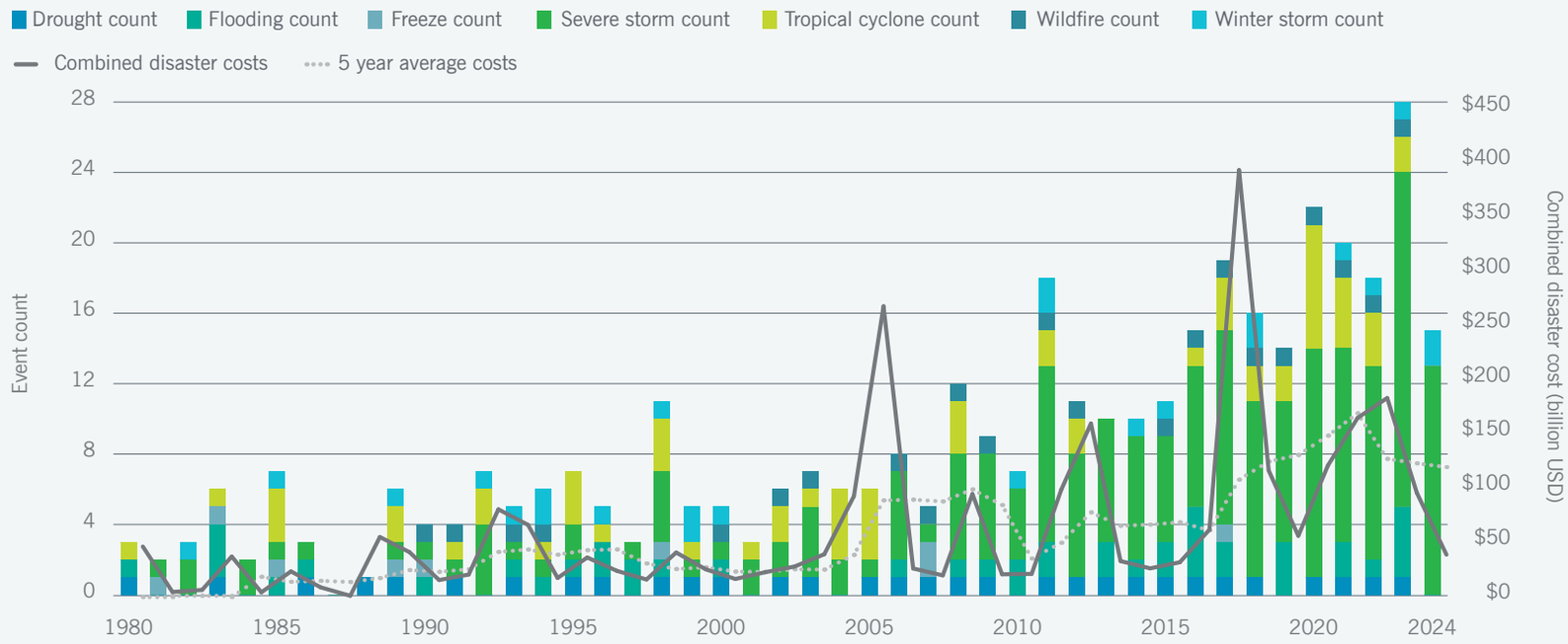
Unlike purely financial investments, investing in real assets involves owning and, in some cases, operating a physical asset in a specific location. The investment location determines the asset's climate impacts risk profile. Exposure to hazards such as drought, extreme heat, hurricanes, floods and wildfires as well as economic dependencies on nature and exposure to risks related to nature loss will vary by location.

As financial losses attributed to climate hazards rise (Figure 1), quantitative tools capable of estimating potential ramifications to real asset investments are quickly evolving, enabled by advances in technology and data availability.

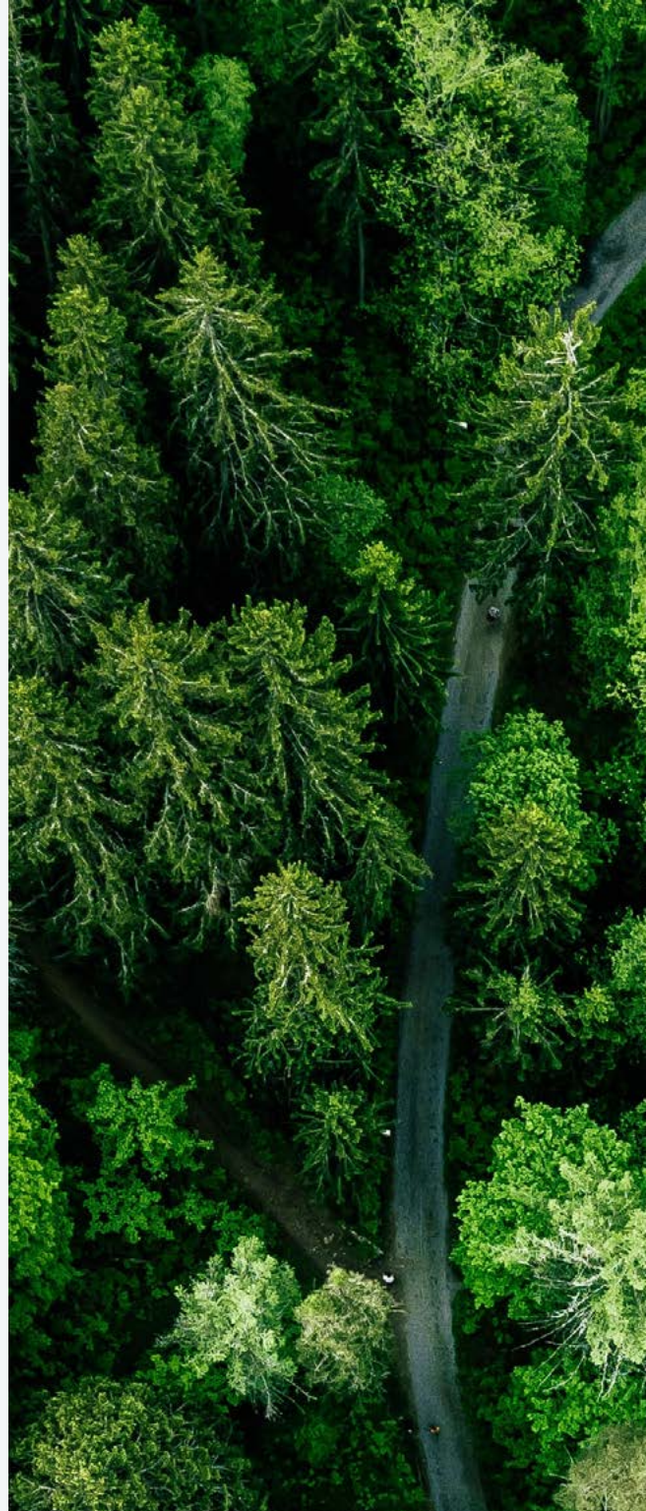
The costs of climate hazards are increasing in some areas, however, in low-risk geographies and sectors we expect a rising demand for real assets over time. Climate-resilient asset values may appreciate relative to similar assets in higher-risk geographies for climate impacts because of this. These climate-resilient assets may further benefit from attractive pricing and income returns in the presence of broader climate-induced market volatility.

Quantitative tools are evolving to estimate individual asset- and portfolio-level exposure to physical climate risks and dependencies on nature. Incorporating these metrics into standard financial frameworks will allow real asset investors to design investment portfolios that can optimize climate and nature risk-adjusted returns.

Figure 1: U.S. billion-dollar disaster events 1980–2024 (CPI-adjusted)



Source: NOAA National Centers for Environmental Information (NCEI) U.S. Billion-Dollar Weather and Climate Disasters (2024). Note: 2024 data year-to-date through July 9th.



EXPANDING REAL ASSET OPPORTUNITIES TO ADDRESS CLIMATE IMPACTS AND NATURE LOSS

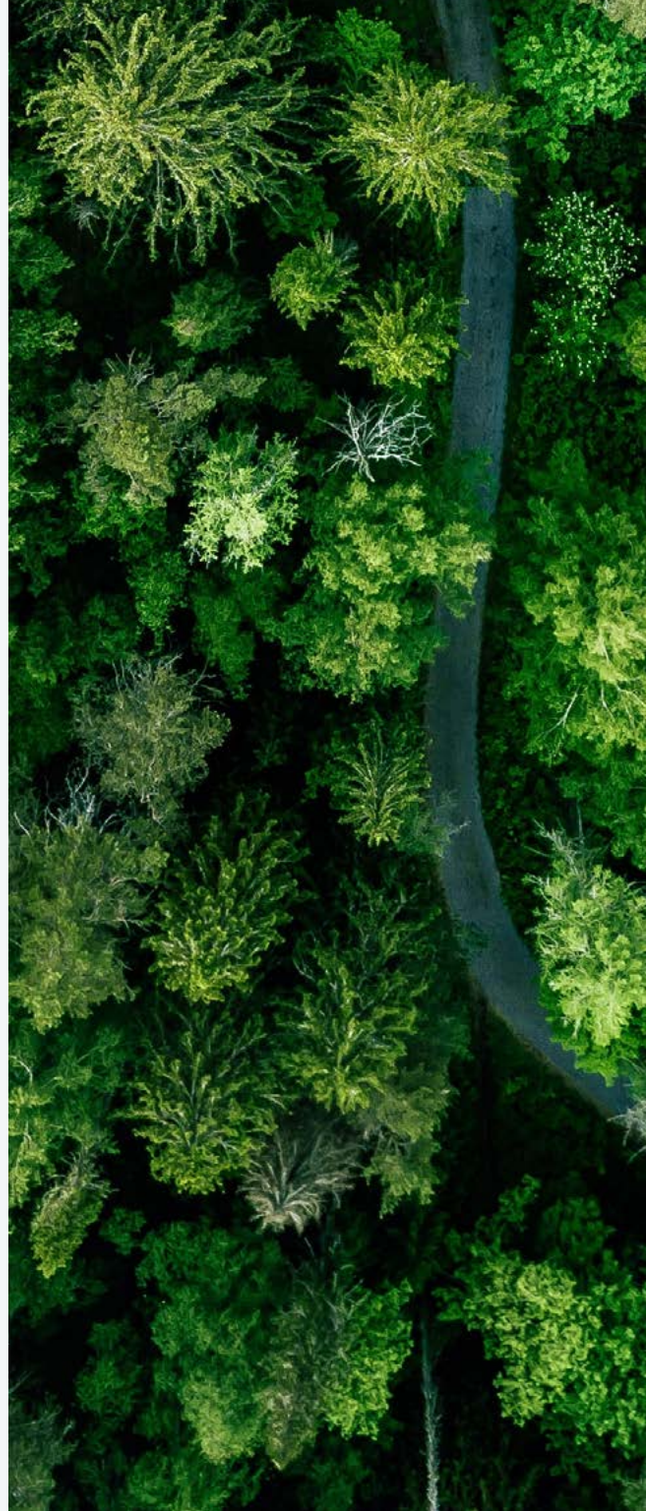
As the expected economic, environmental and social costs of climate change rise, policy together with public and private investment is needed to build in resiliency to climate hazards and halt and reverse nature loss.

Recognizing the urgent societal need to address these challenges, there is an expanding set of solutions-oriented private investment opportunities across real assets.

These opportunities create pathways for investors to contribute to solutions that mitigate and even reverse climate impacts, generating climate and nature benefits as well as a positive financial return. Investments in sustainable land use, nature-based solutions and resilient infrastructure and real estate can address a wide range of climate impacts.

Figure 2: Addressing climate impacts through real assets solutions

	INVESTMENT OPPORTUNITIES	STRATEGIES AND PRACTICES	CLIMATE, NATURE, AND RESILIENCY BENEFITS
Natural capital	• Sustainable land use • Nature-based solutions	• Transition to nature positive practices • Protect natural forest areas • Reforest land and restore forest cover • Restore wetlands, streams, and habitat	• Reduced emissions from fertilizer • Reduced deforestation • Improved habitat for species and biodiversity conservation • Food security
Infrastructure	• Resilient infrastructure	• Public-private partnerships to improve transportation and water systems • Adapt or improve infrastructure to withstand extreme climate hazards	• Water conservation, improved efficiency, and security • Resilient transportation networks • Reduced emissions from renewable energy sources
Real estate	• Resilient real estate • Green development	• Design and build more resilient, affordable, connected, greener cities • Balance nature impacts with restoration • Long-term regional strategies incorporating climate migration expectations	• Reduced urban heat extremes and associated casualties • Improved carbon sequestration and storage and reduced emissions • Protected coastlines and habitat for species and biodiversity conservation



Natural capital

Climate impacts are already being felt in some natural capital investment geographies via changes in crop and timber yields, asset values and market conditions.

These changes affect asset management and portfolio positioning to varying degrees depending on location.

In the near-term, climate hazards with the greatest potential impact on the asset class include drought and wildfire in some major investment regions. As climate impacts are expected to intensify over time, a globally diversified natural capital portfolio will be critical to reduce risk and maintain long-term performance.

Climate impacts are also creating opportunities for investors. It is estimated $210 billion of private investment will be needed annually in forestry and agricultural systems to limit climate change to 1.5°C, protect 30% of land and sea by 2030 and reach land degradation neutrality by 2030.[27]

Investments in sustainable timberland and farmland that protects, improves and restores nature can generate measurable climate and nature benefits, helping to achieve related targets alongside positive financial returns.

Many of these strategies include management practices for agricultural crops and commercial timber alongside management for carbon, biodiversity or stream and wetland restoration. And in the long-run, this broader ecosystem focused approach to management will result in assets that are more resilient to climate risks like drought and extreme precipitation. There are also opportunities for investments in land-based assets where carbon or ecological restoration credit sales, for example, are the primary drivers of return and asset level management.

Environmental markets are helping make many of these strategies more attractive and scale their positive impact on climate and nature. Environmental markets that put a price on carbon sequestration and storage, or nature protection and restoration, create incentives to change management practices in a way that increases carbon in trees and soil, as well as improves, not diminishes, biodiversity.

To quantify the climate and nature benefits of these changes, there are established crediting standards and mechanisms for monitoring, reporting and independent verification. As environmental markets expand and develop, opportunities to incorporate climate and nature benefits into natural capital investments will continue to grow.

Real estate

Climate impacts on commercial real estate properties span direct and indirect financial risks.

Examples of emerging climate-related financial risks are outlined in Figure 3, though the risk profile for individual assets or portfolios vary by location and sector.

As climate impacts become more evident and owners and buyers become more sophisticated in climate risk analysis, we expect resilient properties will attract valuation premiums and at-risk properties will transact at a discount. Beyond short-term financial risks related to climate hazards, full consideration of future risk will be critical to avoid acquiring or holding stranded assets due to a smaller number of buyers and protecting long-term performance.

The landscape scale of climate impacts requires that climate risk analysis extends beyond individual real estate assets and encompasses a broader market view. For example, while a property may have features in place to reduce risks, the surrounding community may not be as resilient to climatic events, experiencing continuity and stability challenges as a consequence. One U.S. study identified lower real estate sales volumes in high-risk areas compared to low-risk areas.[28]

As regions face increasing climate risks and events, there may be shifts in perception and demand for real estate in local markets. A major research analysis in 2023 for the U.S. revealed that 3.2 million people have already fled neighborhoods due to high flood risk between 2000-2020, and this trend is expected to continue over the next 30 years.[29]

These migration predictions attempt to capture where populations may shift from unprotected to more resilient real estate markets. Climate-resilient regions and markets create opportunities for investment in accessible, affordable and resilient housing and across sectors for growing populations. Secondary or tertiary markets facing muted climate risks may become the next frontier for real estate investment.

Responsible management and green development strategies can mitigate climate risks and may enhance property values. Protecting or expanding tree cover and vegetation, for example, can significantly reduce heat stress felt by the occupants and work to decrease urban heat extremes, in addition to enhancing measures of well-being.

Risks attached to a rising sea level are also a focus for these strategies. As investment and development strategy adjust for higher sea levels, over time this preserves and protects coastlines, which in turn, can soften the destructive impact of severe storms and storm surge to the built environment.

Figure 3: Potential financial risks of climate impacts on real estate

DIRECT RISKS	INDIRECT RISKS	
• Property damage and repairs • Higher operational costs • Loss of business continuity and rent payments • Relocation costs for tenants during a disaster • Capital expenditures for adaptation/ mitigation projects	• Smaller bid pools • “Brown” discounts in the form of lower bid prices and sale values • Market cap expansion to reflect lower liquidity or volatility • Changing investor sentiment • Longer vacancy periods	• Reduced rental demand • Higher borrowing costs • Increased insurance premiums • Un-insurability • Local economic disruptions to businesses and infrastructure • Property tax increases to subsidize resilience projects or smaller tax base • Increased regulation on carbon emissions

Infrastructure

The infrastructure investment landscape has shifted considerably in recent years and as climate impacts intensify, identifying and managing both evolving risks and emerging opportunities is critical now more than ever.

Increasing frequency and severity of climate hazards has the potential to damage physical infrastructure or impede key functions. This can lead to higher maintenance expenses, insurance premiums and financing costs.

Similar to real estate and natural capital, geographic and market diversification is essential to mitigate localized climate risks and develop portfolio resilience.

Public sector support for building climate-resilient communities, technological advances, increasing corporate commitments and sustainable investment mandates are creating new opportunities for infrastructure investments. Adapting and upgrading existing infrastructure, in some cases in partnership with the public sector on large-scale projects, has potential to improve the resiliency of the infrastructure investment itself and can benefit whole communities. Many transportation and water systems were not built to withstand extreme rainfall or severe storms without suffering major damage, closures or loss of service. Evidence is growing which suggests infrastructure investments, when combined with active asset management, can be designed to withstand extreme climate hazards, which reduces repair and reconstruction costs, improves long-term viability and ultimately benefits communities, particularly at times when emergency services and disaster relief are most needed.

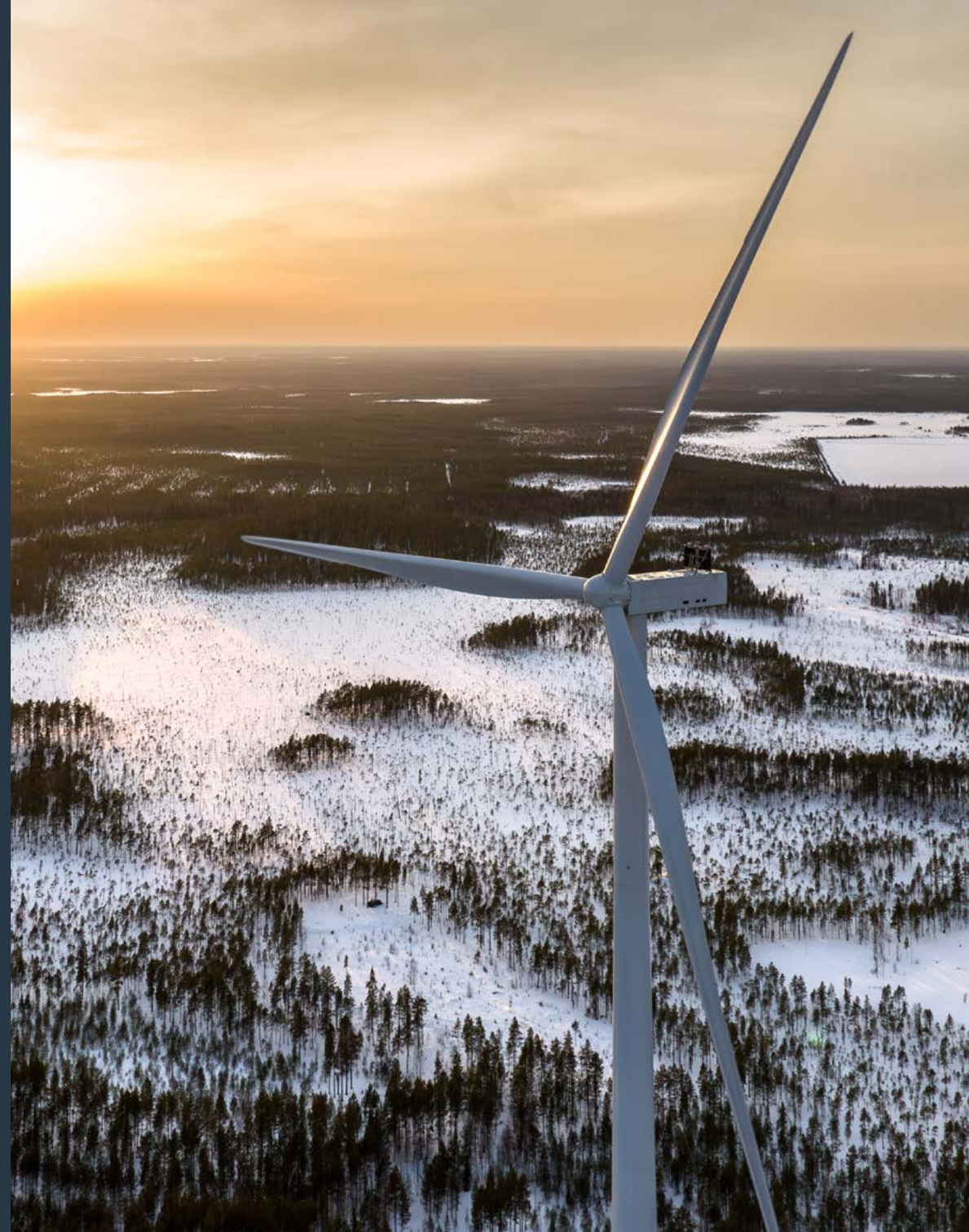
Clean energy projects, such as wind and solar, are vulnerable to climate hazards. Addressing and managing potential risks to these is critical to avoiding related damage to panels and turbines that could affect investment performance. For example, locating renewable wind farms in areas likely to experience extreme wind events risks physical damage, but by selecting the appropriate type of technology, turbines can withstand these extreme conditions. High wind operation control (HWOC) is a critical feature in modern wind turbines that can increase the normal shutdown wind speed of 25m/s to almost 32m/s while reducing power output. Utilizing this technology optimizes turbine performance and safety during high wind conditions, ensuring the turbine continues to operate efficiently while minimizing the risk of damage.

REACTING TO CLIMATE EVENTS CREATES OPPORTUNITIES ACROSS REAL ASSETS

Addressing the rate and severity of climate events is likely to be an ongoing priority of governments and companies. Advancements in technology are paving the way for new opportunities across real estate, infrastructure and natural capital, from measuring the potential impact of climate events, to improving clean energy equipment and using datapoints to identify optimal asset locations.

As solutions to climate events become more achievable, private investment will play an integral role in reducing and reversing the impacts of climate change.

Progress in technology has helped develop environmental markets and responsible investing strategies, highlighting the far-reaching opportunities climate-related solutions will provide investors for the long term, and how positive environmental goals can be reached alongside financial returns.



Disruption

Transforming urbanization

The rise of protectionism

Growth of the East

Transforming urbanization

Urbanization promises greater prosperity for an increasing share of the world's population. And yet it historically is associated with widened income inequality and degrading the natural environment.

THE JOURNEY TO URBANIZATION

2009 was a tipping point for the world population. That was when the majority became urban dwellers. Today, an estimated 57.9% of the population lives in urban areas and that is expected to rise to 68.4% (Figure 1) by 2050, according to the United Nations.

Prior to the mid-19th century, less than 10% of the world's population lived in urban areas (Figure 2). The Industrial Revolution changed that. Technological advancements increased the economic output of cities, enticing the rural population to them. Meanwhile, modernized sanitation in cities helped lower mortality rates in more developed nations.

From automated machinery for agriculture and manufacturing, to today's innovations in areas such as generative artificial intelligence, urban areas have continued to evolve through the 20th and 21st centuries with advancements in communication, automation and transportation.

The threshold for what is considered urban is relatively low and varies across nations. Controlling for this by measuring the growth in urban population greater than five million is revealing. In 2000, there were 46 cities with populations exceeding five million. The combined population of these cities equaled 555 million, or 9.1% of the world's population at the time.

By 2035, the number of cities over five million is expected to nearly triple to 12 (see figure 3). The combined population would exceed one billion and would represent 13.6% of the world population, a 50% increase in 35 years.

Figure 1: Share of population

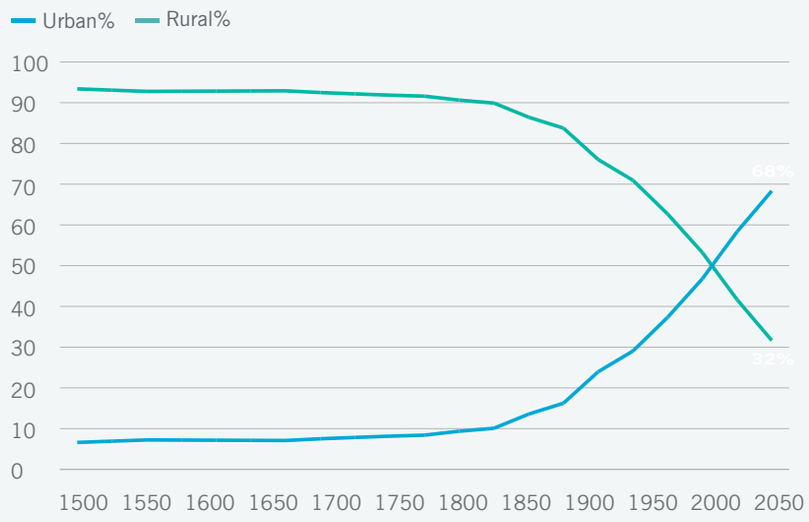
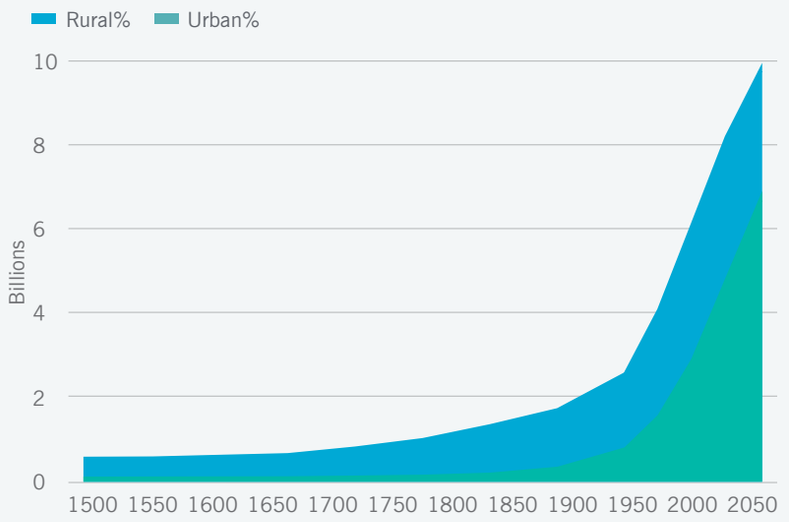
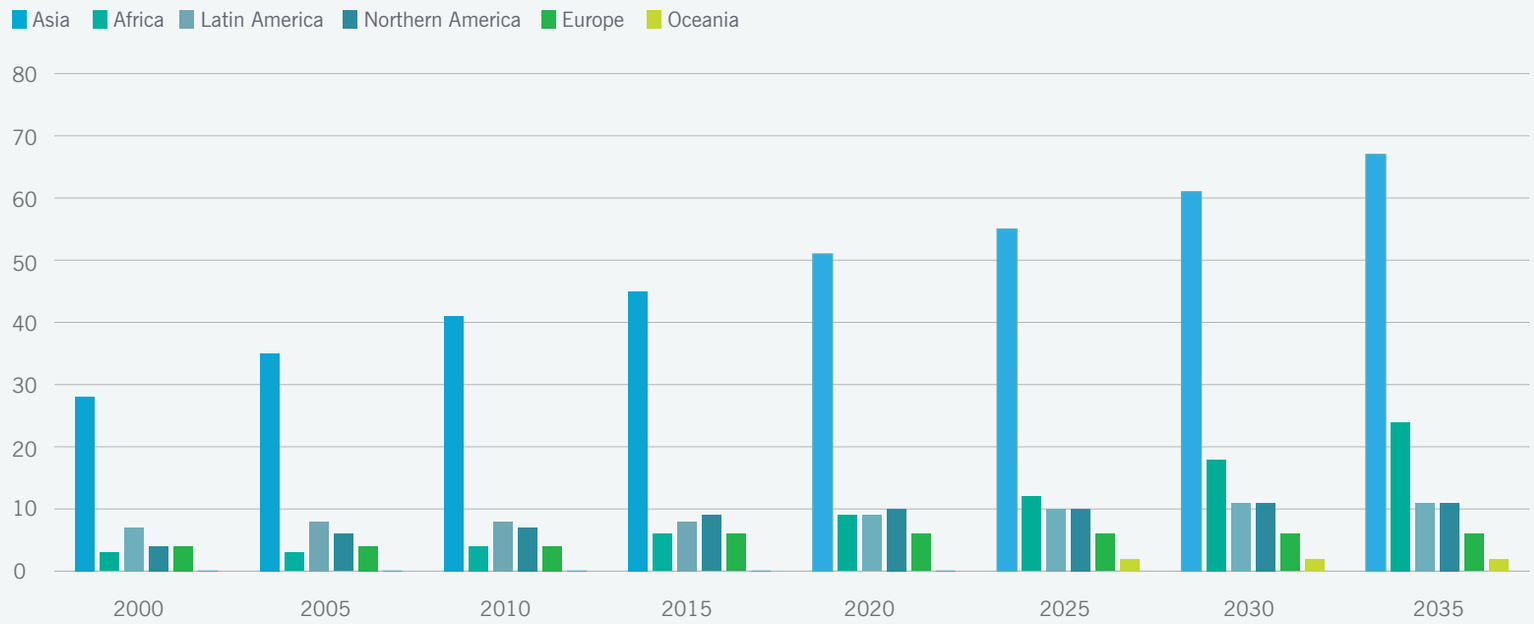


Figure 2: Total population



Source: United Nations, Department of Economic and Social Affairs, Population Division (2018), HYDE (2023), Nuveen Real Estate Research (July 2024)

Figure 3: Number of cities with populations greater than five million



Source: United Nations, Department of Economic and Social Affairs, Population Division (2018), HYDE (2023), Nuveen Real Estate Research (July 2024)

Asia stands out. It is home to more than half (67) of these mega cities, with a projected combined population of 817 million (equivalent to 9.6% of the world's population) by 2035. In contrast, all the other regions' mega cities combined would represent just 6.3% of the population.

Africa is expected to experience the biggest projected gain in urban populations, growing from just three cities with over five million in 2000 to 24 by 2035. The mega city population will grow nearly tenfold from 27 million to 234 million.

URBAN VS. SUBURBAN

In high-income, developed nations, populations are already heavily urbanized but recent decades have seen migrations to lower density suburban areas, adjacent to cities. While considered urban by most definitions, this lower density development pattern has led to greater dependence on personal and commercial automobiles, the carbon intensity of which is contributing to increased greenhouse gas (GHG) emissions.

Lower density areas affect the availability of land, forests and farmland per capita more than denser urban development. Conversely, highly urbanized areas with modern infrastructure can move people frequently and efficiently by way of mass transit, provide stable renewable energy, clean water, efficient waste removal and modern sanitation, that are less detrimental to the environment than suburban sprawl.

WHAT HAS CHANGED?

The covid pandemic had a significant negative impact on urbanization. Foreign direct investment decreased 15% between 2020 and 2022, compared to levels in the previous decade[30], which caused severe delays to city-based construction projects. Additionally, supply chain issues caused by the pandemic, and rising global tension have worked to disrupt and stunt the full potential of a sustainable urban future.

The pandemic was also a catalyst for many people migrating away from mega cities. A more lenient view on working from home has meant being located close to city centers is no longer as crucial as it was pre-pandemic. That said, most employers require in-office attendance for at least part of the week, meaning that workers do need to live within a commutable distance to their offices.

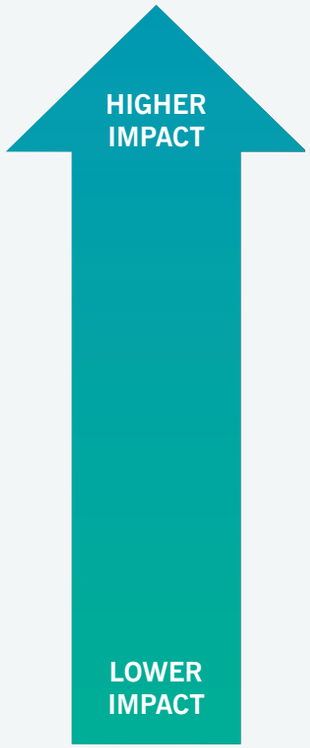
And so, the steady march towards urban living continues. The disruptions caused by the pandemic are easing, and different challenges remain in focus. None more so than climate change.

Cities generate about 70% of the global GHG emissions and remain particularly vulnerable to climate-related risks such as frequent and prolonged heatwaves, droughts, flooding or water scarcity. The mixture of concrete, metal structures, asphalt and minimal green areas make urban areas absorb heat, turning them into heat islands. The EU's Copernicus observation program discovered that temperatures could be up to 10°C higher in urban areas compared to rural ones.

Persistent changes in climate have a long-term negative effect on economic growth.[31] Urban areas need more ambitious adaptation measures to avoid such economic losses. These measures can substantially decrease climate-related losses, but only if implemented quickly and efficiently.

Cities generate about **70% of the global GHG emissions** and remain particularly vulnerable to climate-related risks.

IMPLICATIONS AND OPPORTUNITIES FOR REAL ASSETS



REAL ESTATE	NATURAL CAPITAL	INFRASTRUCTURE
Aging population	Changing climate and nature loss	Transition to low carbon economy
Rising inequality	Transition to low carbon economy	Changing climate and nature loss
Transition to low carbon economy	Growth of global South and East	Transformative technology
Transformative technology	Protectionism drives decoupling	Growth of global South and East
Growth of global South and East	**Urbanization and the evolution of cities**	Protectionism drives decoupling
Urbanization and the evolution of cities	Transformative technology	**Urbanization and the evolution of cities**
Changing climate and nature loss	Rising inequality	Aging population
Protectionism drives decoupling	Aging population	Rising inequality

Real estate

Growth and change have always been an impetus for real estate demand. The world's population continues to grow, and the continued migration from rural to urban areas presents opportunities for increased demand across core and alternative real estate sectors globally.

Retail and industrial

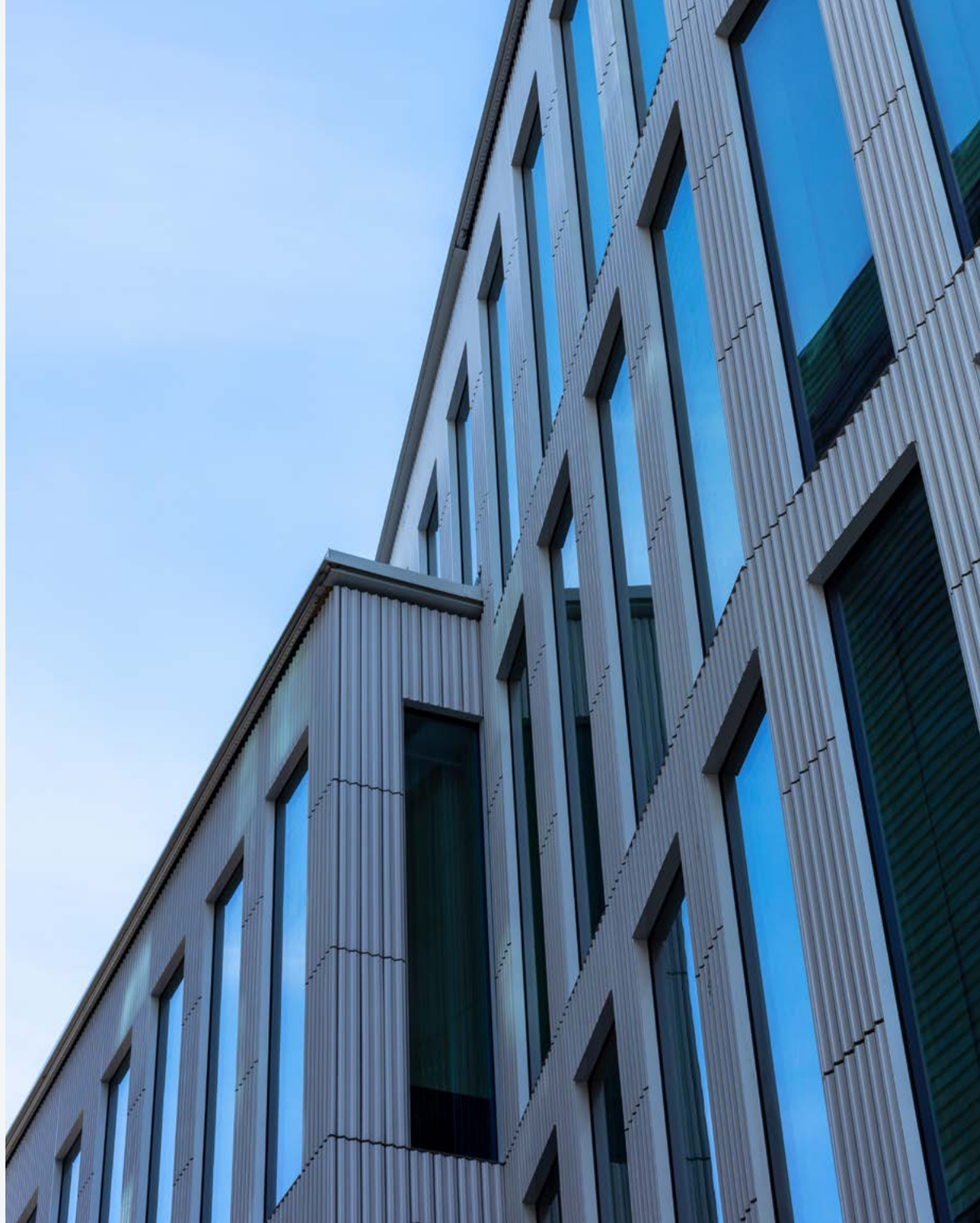
A rising, and increasingly urbanizing population, especially in Asia and Africa, should lead to explosive growth in consumption, mirroring the growth achieved in the developed world at even greater scale. Increased density and rising incomes will create thousands of attractive retail trade areas not currently in existence.

Housing

A growing population will require more, better and diversified housing options. Increasing household incomes typically lead to smaller household sizes and a demand for a variety of housing options, presenting many development opportunities. Most mature markets face a housing crisis with low inventory and increasing prices. Denser, more efficient urban housing can help ease the supply/demand imbalance, helping to reduce living costs.

Office

Developing areas should see economies shift towards a greater share of workers in financial, professional and technological services as more of the population becomes highly educated. Mature urban areas will present opportunities for existing office space to be rehabilitated or demolished and replaced by new or refurbished properties that have been decarbonized.



Infrastructure

Creating a sustainable and resilient urban future will need renewable energy, smart grid solutions, energy-efficient systems and various other technologies. To reach a carbon-free future, it will take a collaborative effort from governments, investors and policymakers to craft supportive policies to drive this transition.

By focusing on these strategies, we can build cities that are not only greener and more livable but also economically vibrant and resilient.

Energy transition

Currently, urban areas consume 78% of the world's energy and account for over 60% of GHG emissions.[32] As cities expand, energy consumption, CO2 emissions and grid infrastructure will face unprecedented demands, driving the need for innovative and sustainable energy solutions.

The expanding global urban population will push additional demand for electricity, necessitating more renewable energy sources. Solar, wind, battery storage and hydrogen will be crucial to meet the emerging power needs. As the cost of these technologies continues to decline, they are becoming increasingly competitive compared to traditional fossil fuel-based power generators.[33]

Smart grid technologies will be critical in the transition to a low carbon economy, enabling efficient management of peak loads while providing flexibility and resilience. The influx of new renewable energy sources and the surge in demand from electrified lifestyles will test the current grid's capacity. For instance, the growing popularity of electric vehicles (EVs) will put significant strain on the grid, necessitating a substantial investment in new infrastructure to meet the increasing demand for electricity.

Digital infrastructure

The growing urban population's high demand for data will drive the growth for digital infrastructure including mobile infrastructure, data centers and fiber. Increased power demand from digital infrastructure alongside growing economies are stressing the current systems, providing opportunities to partner across subsectors. Constraints on the power grid and access to spare capacity will influence data center site selection and drive development opportunities.

Waste removal/reduction

As urbanization accelerates, a primary challenge will be managing the increasing amount of waste produced. In the future, cities could harness the power of methane emissions from landfills to generate electricity. And to take it further, carbon capture and storage technologies should be a game-changer in reducing CO2 emissions.

Most technologies needed to make cities carbon-free are already available and simply need to be deployed. Urbanization will drive clean energy policies as citizens demand solutions that enhance their quality of life. Governments must respond by creating public policies that encourage investment in these new technologies, offering attractive returns for investors and companies willing to take on the challenge of deploying and operating low-carbon infrastructure.

Natural capital

Urbanization has both supply and demand impacts for land-based natural capital investments. On the supply side, urban and suburban growth can reduce the availability of land for agricultural production. On the demand side, urbanization is a major driver of building materials, like timber.

Development linked to urbanization that negatively impacts ecologically significant wetlands, streams or habitats must be balanced with restoration of similar areas.

Farmland supply

Urban expansion in many parts of the world often leads to the loss of farmland. According to the 2022 Census of Agriculture, the U.S. lost over 14 million acres, nearly 4%, of its farmland from 2017-2022.

The drivers of land-use change are diverse and vary by region, but development pressure is a common theme. The loss of farmland has global implications for food production, the economy and environmental systems such as biodiversity and carbon storage. From an investment perspective, loss of farmland also increases pressure on the existing farmland to become more productive to meet demand from growing population, an ongoing trend that drives farmland values higher over time.

Timber demand

New home construction and residential improvement are among the most important end-use markets for a wide range of timber products, from lumber to flooring.

In the U.S., the residential building market accounts for 75% of all wood product consumption (FEA, 2024). In addition to traditional wood-based residential construction, the growth and development of mass timber technology in recent decades has led to constructing low-rise, mid-rise and industrial buildings with wood. Substituting wood for more carbon-intensive materials in buildings can significantly reduce emissions from the building sector, which currently accounts for about 40% of global GHG emissions annually.[34]

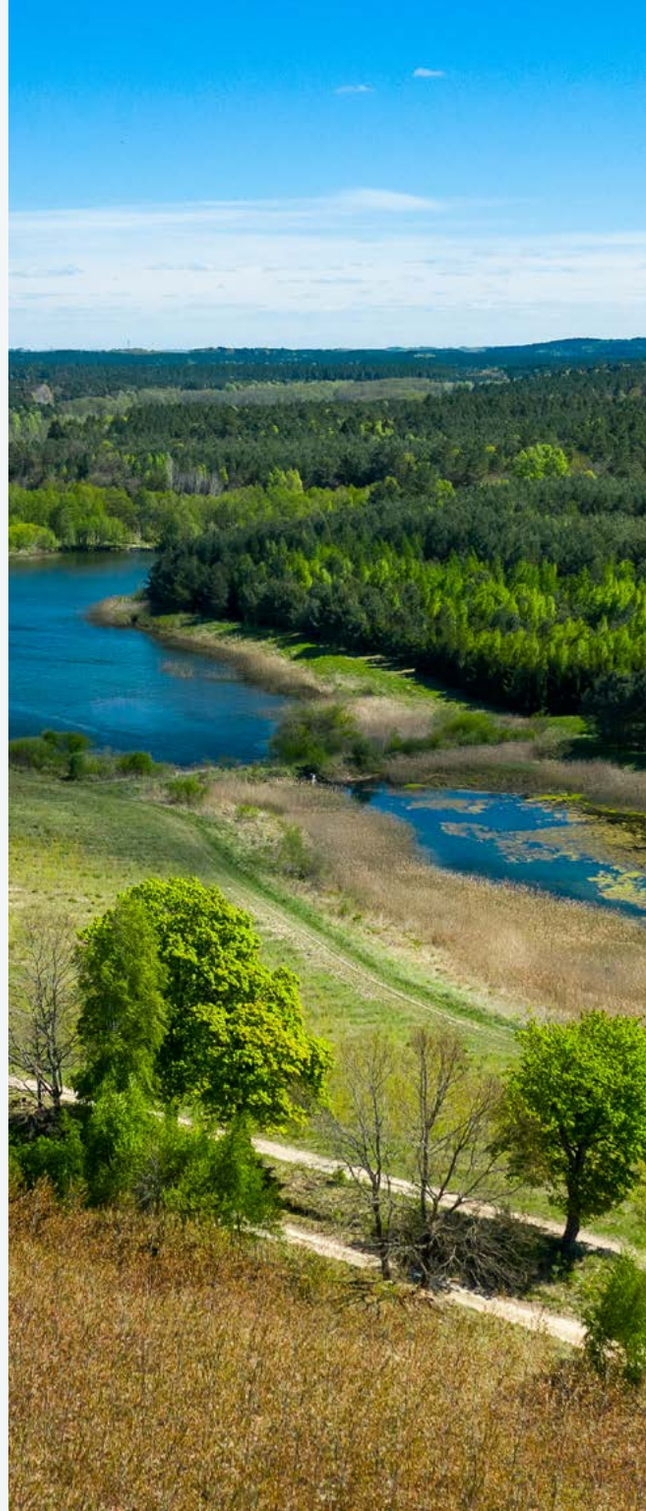
Timberland investment can help unlock this climate mitigation practice and may provide added value for investors with climate or portfolio decarbonization targets.

Balancing development with restoration

In several investment geographies, laws require balancing the negative environmental impacts of development with the restoration of similar natural areas.

In the U.S., a market-based system of credits from restoration projects and debits from development ensures no net loss of ecologically important, federally protected areas.

Demand for restoration credits tends to be strongest in areas where there is significant residential and commercial development, transportation and public infrastructure projects related to urbanization. Land-based investments that actively enhance or restore areas of wetlands, streams or endangered species habitats can earn credits and generate revenue from the sale of those credits.



URBANIZATION IS CHANGING IN MORE WAYS THAN ONE

The progress of urbanization was thrown off course by the pandemic, compounded by rising geopolitical tensions and international trade disputes. The pandemic has also seen people migrating from city areas as working restrictions eased for some jobs, moving out to suburban and rural areas.

Despite these disruptions, we believe urbanization remains in a strong position, touching opportunities across real estate, infrastructure and natural capital.

Real estate should benefit across regions, as growing urban populations, especially in Asia and Africa consume more goods and services, creating opportunities in retail and industrial sectors, while housing will continue to offer varied development opportunities. Mature urban areas will continue to evolve through rehabilitated or replaced buildings with more sustainable designs.

Infrastructure will continue to pivot as environmental goals become increasingly important to governments and developers. A greater dependency on renewable energy will pave the way for smart grid technology having a critical role in the transition to a low carbon economy.

Natural capital will continue to face some challenges, primarily through the expansion of cities threatening the availability of farmland. However, timber demand should increase as urban development seeks to use alternative, greener construction methods.

How cities are built and which economic hubs attract workers are shifting. As we look to the future, urbanization seems to be steadily coming back to full strength following a period of disruption.

“We believe urbanization remains in a strong position, touching opportunities across real estate, infrastructure and natural capital.”

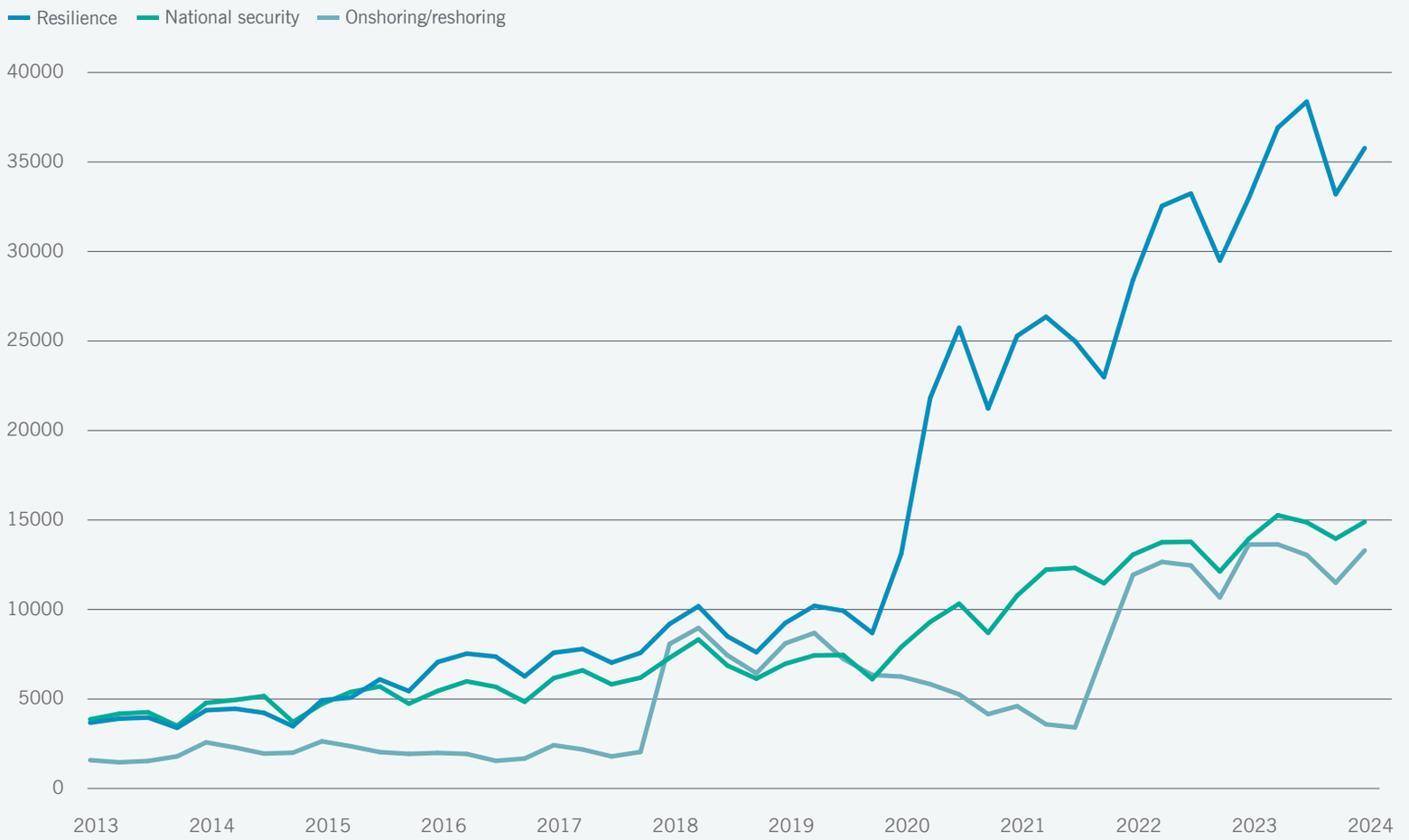
The rise of protectionism

Protectionism seems to be increasing worldwide, with discussions of nearshoring and reshoring reaching fever pitch in recent years. Yet the value of global imports reached a new peak in 2022.

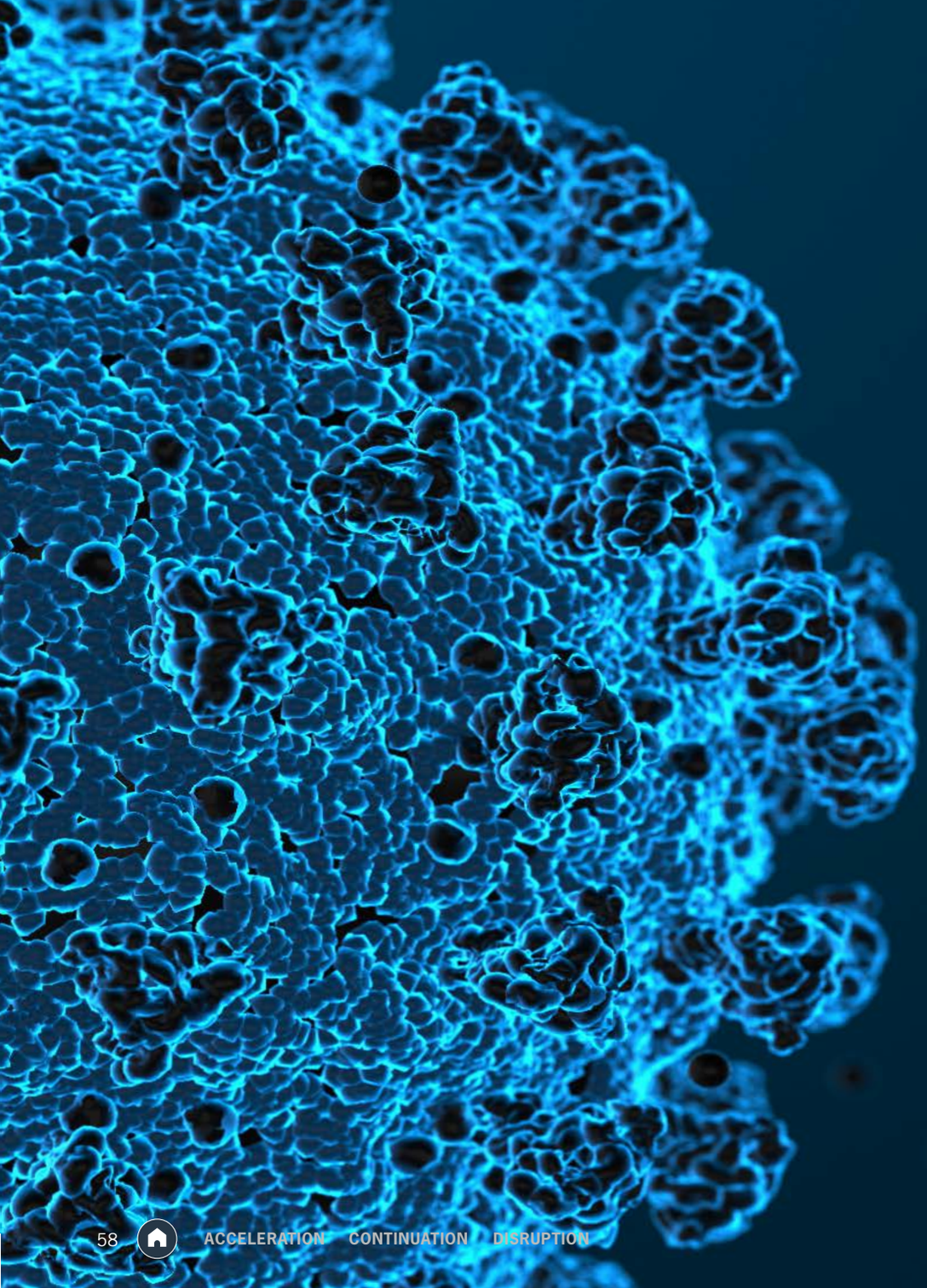
What should we make of the oft-cited rise in protectionism? If countries do retrench, what does that mean for real assets?

Although global imports continued to reach new peaks relative to the size of the global economy, the exchange of goods has been stagnant since the 2008 financial crisis. Amid this conundrum, the rhetoric from political and business leaders, in developing and developed countries alike, has become increasingly protectionist.

Figure 1: Mentions of onshoring and reshoring are on the rise



Source: AlphaSense (2023)



WHAT HAS CHANGED?

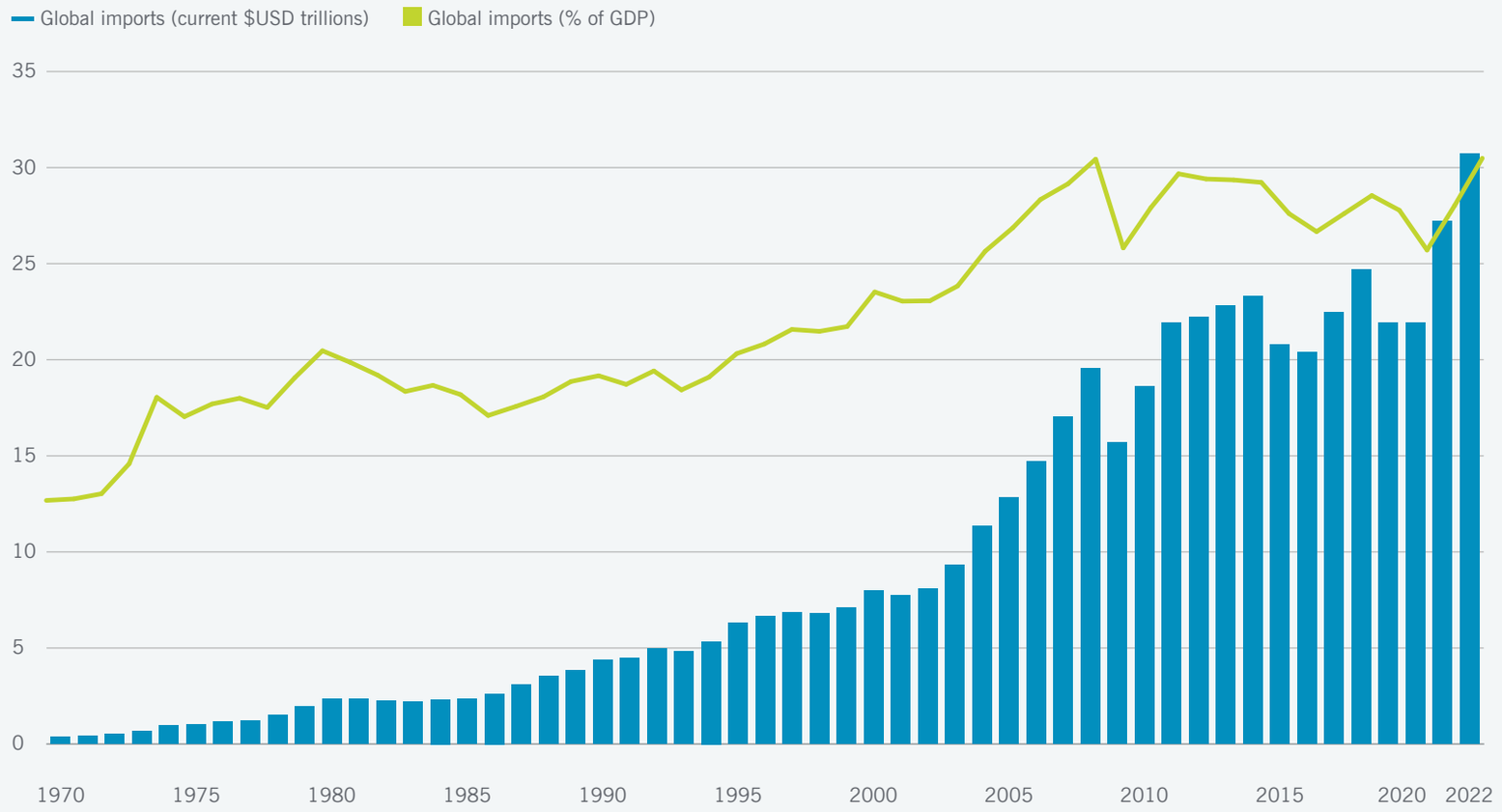
The pandemic highlighted vulnerabilities in global supply chains. Retailers and manufacturers, faced with surging demand for goods in late 2020 and early 2021, often faced inventory shortages due to closed Chinese manufacturing plants and delayed seaport activity alongside truck driver shortages in destination countries. In reaction, companies have increasingly considered alternatives to existing globalized logistics operations, which largely relied on China-manufactured products and shipping them around the globe for final use.

As part of this reassessment of supply chains, Western companies have considered relocating production closer to end users by either moving factories to neighboring Canada, Mexico or peripheral Europe ("nearshoring") or relocating production directly back to the U.S. and E.U. ("reshoring"). Such a shift may carry significant implications for logistics demand over the next several years, and investors in the logistics space may benefit from understanding the risks that a revised supply chain will have on previously in-demand locations and the opportunities a revamped network will present to warehouses in some locations.

In many ways, the disruptions related to the pandemic were just the latest in a series of hits to global supply chains that occurred over the last five-10 years. Like the pandemic, many of these supply chain disruptions were caused by natural or environmental events. For example, the 2011 earthquake and tsunami off the coast of Japan in 2011 led to the Fukushima nuclear disaster, crippling automotive supply chains for months as factories were forced to shut down. Geopolitics has also been the source of cracks in the global supply chains, with events like the Arab Spring in 2011, the U.S.-China trade dispute in 2018-2020 and most recently the war in Ukraine altering global trade patterns.

Consequently, companies have become more cautious in creating globally integrated supply chains. Global trade (exports plus imports) as a percent of global GDP has largely stalled since the global financial crisis (GFC) after a 30+ years of rising globalization (Figure 2).

Figure 2: Global trade and the share of Gross Domestic Product (GDP)



Source: World Bank (2024)

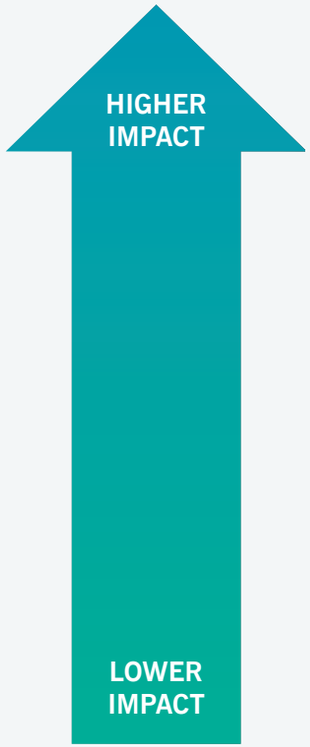
WHAT DOES THE FUTURE HOLD?

While data up to this point suggests international trade remains an important part of supply chains, there is mounting evidence these trends may be a catalyst for deglobalization, shifting production to domestic and regional locations. Reshoring has been popular among politicians since the GFC because of the potential job creation opportunities. World governments have enacted a variety of measures such as tax credits, subsidies, carbon pricing and regulation to incentivize reshoring efforts and foreign direct investment in domestic manufacturing over the last 15 years.

In the U.S., interest in reshoring production surged following the CHIPS and Science Act and the Inflation Reduction Act. In the E.U. the Covid €2 trillion NextGenerationEU and a raft of subsidies for car batteries, green technology and semiconductor manufacturing are moving in the same direction.

In Asia, Japan introduced the Economic Security Promotion Law, aiming to make the country less dependent on China, while China is working on economic decoupling plans, with some notable success in accelerating its own chip design and manufacturing capabilities.

Unlike previous periods where reshoring job announcements were floated, the most recent surge in announcements has been followed by an equally impressive jump in construction spending on manufacturing plants and facilities, which have more than doubled since mid-2022 in the U.S. alone.



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Transformative technology	**Protectionism drives decoupling**	Growth of global South and East
Growth of global South and East	Urbanization and the evolution of cities	**Protectionism drives decoupling**
Urbanization and the evolution of cities	Transformative technology	Urbanization and the evolution of cities
Changing climate and nature loss	Rising inequality	Aging population
Protectionism drives decoupling	Aging population	Rising inequality

Real estate

The retooling of global supply chains will not reduce the demand for logistics space, but rather shift trading patterns with a greater emphasis on regional and domestic networks.

Coastal markets in Northern Europe as well as the West Coast of the U.S. face particularly tough challenges because of how closely tied demand for warehousing space is to China-led port volumes. According to a recent report from CBRE, net absorption trends in the Los Angeles market have historically been correlated with import volume into the Los Angeles and Long Beach ports, and the downturn in absorption in late 2022 through 2023 is part the result of slumping port volumes during that time.

Port markets may not enjoy the tailwinds that benefitted demand in the early 2000s as China took on a dominant role as the leading import source for developed economies. Much of the existing space in Rotterdam, Antwerp, Nagoya, Melbourne or Southern California have capitalized on the warehousing demand associated with growing globalized supply chains. As the world retreats from this model, retailers and manufacturers will face less pressure to expand their presence at the ports.

Instead, regional nodes within countries and their immediate "friendly" neighbors may gain traction. Investors are best advised to analyze the flow of goods between newly expanding manufacturing locations in Europe, developed Asia-Pacific and the U.S. with existing domestic facilities and consumers.

Natural capital

In many agricultural crop and timber markets, globally competitive producing regions with scale and productivity advantages have emerged as major centers of production, serving consumers worldwide.

According to FAO data, the value of global agricultural exports in 2022 was about three times higher in nominal terms than in 2005, while the share of agriculture in total trade value increased from 6% in 2005 to almost 8% in 2022. As countries revise supply chains and seek alternative sources of crops or forest products, directly or through policy, trade flows may shift which is likely to put upward pressure on both local and global market prices.

Past periods of trade conflict and restrictive policies show their impact on agricultural producers and trade flows.

- Many U.S. agricultural producers struggled to find replacement markets for grain and oilseeds when China shifted its purchases to other countries.
- U.S. farmer margins, specifically annual crop margins, were impacted, resulting in flat valuations and lower farmland investment returns.
- China shifted grain and oilseeds purchases from the U.S. to Brazil, resulting in strong pricing and margins for Brazilian growers and generating strong investment returns for Brazilian farmland investors.

In addition to impacts on markets, higher prices for crops may have unintended, negative impacts on food security. This is because as production shifts to higher-cost or lower-productivity suppliers, we would expect global supply to decrease in the near term. The IMF reports that a 1% drop in global harvests increases food commodity prices by 8.5%. Price spikes resulting from shifting production could be a major risk to food security among vulnerable populations worldwide.

As geopolitical alignment has entrenched since the 2018-20 U.S.-China trade conflict, in the current environment a similar conflict has the potential to accelerate the fracturing of global goods supply chains into US-aligned and China-aligned blocs. Given current alignments, impacts to timber markets would depend on their location and the markets they serve.

Here, we would expect:

- Negatively impacted timber markets export to China from the U.S. and its allies (e.g., U.S. softwood log and hardwood lumber exports to China)
- Neutral or positively impacted markets export to China from countries that “lean on” China or are unaligned (e.g., Brazil and Uruguay pulp exports to China)

From an investment managers’ perspective, these types of policies reiterate core investment principles, namely, diversification. Nuveen Natural Capital believes a global investment portfolio helps mitigate the potential negative impacts of tariffs and changes in global trade flows. Farmland and timberland portfolios with investments in various countries tend to be more insulated from the negative impacts of more protectionist trade policies.

Infrastructure

Globally, we see demand for local production of critical supply chain materials only increasing for infrastructure assets in the future.

The Ukraine war, alongside China's dominance as a provider of solar and wind turbines have led to a renewed focus on energy independence and onshoring clean energy supply chains. Decoupling global supply chains and an increased focus on energy security and decarbonization will drive opportunity sets, taking multiple forms across regions.

Europe's approach to the energy transition aims for a coexistence of solutions from outside the EU and technologies developed and manufactured domestically. The Solar Power Europe Association and the European Manufacturing Council recommended the European Commission take action to facilitate the incorporation of local supply chains into key technologies within renewable energies, specifically in the value chain of the photovoltaic solar sector. These moves support the adoption of the Net Zero Industry Act and the incorporation of strict sustainability and resilience criteria in public auctions. Installed solar energy in Europe annually has reached volumes that have allowed the consolidation of a European internal market with multiple applications and new niches.

The EU is also taking steps to tighten control over foreign investments in strategic sectors. The energy sector, considered strategic, should be able to build an industry based on the current competitiveness of technology, even with institutional support. The strategy aims to foster economic growth and improves the overall sustainability of the energy sector. This implies integrating components, materials, and knowledge from European suppliers and manufacturers. This boost to domestic supply chains will be the basis for consolidating European technological leadership, strengthening regional economies, creating jobs and reducing the carbon footprint associated with long-distance material transport.

In 2022, the U.S. passed both the CHIPS and the Inflation Reduction Act (IRA), which collectively represent nearly $900 billion of federal funding.[35]

The two aim to bolster semiconductor and clean energy components manufacturing domestically, which are poised for growth based on future U.S. digital and energy infrastructure demand. Primarily from wind and solar additions, power generation capacity is expected to rise almost 50% in the next 10 years, compared to the previous decade which only observed a 16% increase.[36,37] In turn, power demand is projected to be driven by transportation electrification, semiconductor manufacturing, and above all, data centers for cloud and AI – forecast to account for 40% of electricity demand's growth rate through 2030.[38]

Post-IRA, the overwhelming majority of commissioned factory investment have been for batteries.[39] This is in line with expected demand, between now and the end of the decade anticipated storage installation will require annual investment of $8 billion in the U.S. and $35 billion globally.[40] This highlights the need for batteries to tackle intermittency and facilitate the adoption of renewables.

In Asia, India has committed to triple renewable energy capacity to 500GW by 2030, with more than half expected to come from solar power. In line with Prime Minister Narenda Modi's vision for a "self-reliant India" and motivated by rocketing solar panel demand and concerns over the concentration of the supply chain in China, the government has taken steps to support domestic solar manufacturing.

India's focus on solar manufacturing began in earnest following the Covid-19 pandemic when disruptions to global trade exposed the risks of concentrated supply chains at a time when energy security concerns had come to the fore. The Institute for Energy Economics and Financial Analysis (IEEFA) foresees that India could become the world's second-largest solar PV manufacturer by 2026, with enough production capacity to make it self-sufficient, and able to target the export market.

India has committed to **triple renewable energy capacity to 500GW** by 2030, with more than half expected to come from solar power.

The bigger picture

Protectionism has wide-ranging implications for the structure and direction of the global economy, as well as a direct impact on investments. Rising global trade helped push down goods-price inflation, increased the proliferation of innovation and ideas and facilitated a more efficient division of labor. Unraveling those arrangements, built over decades, could make many consumer products more expensive and slow GDP growth as well as technical innovation globally.

Growth of the East

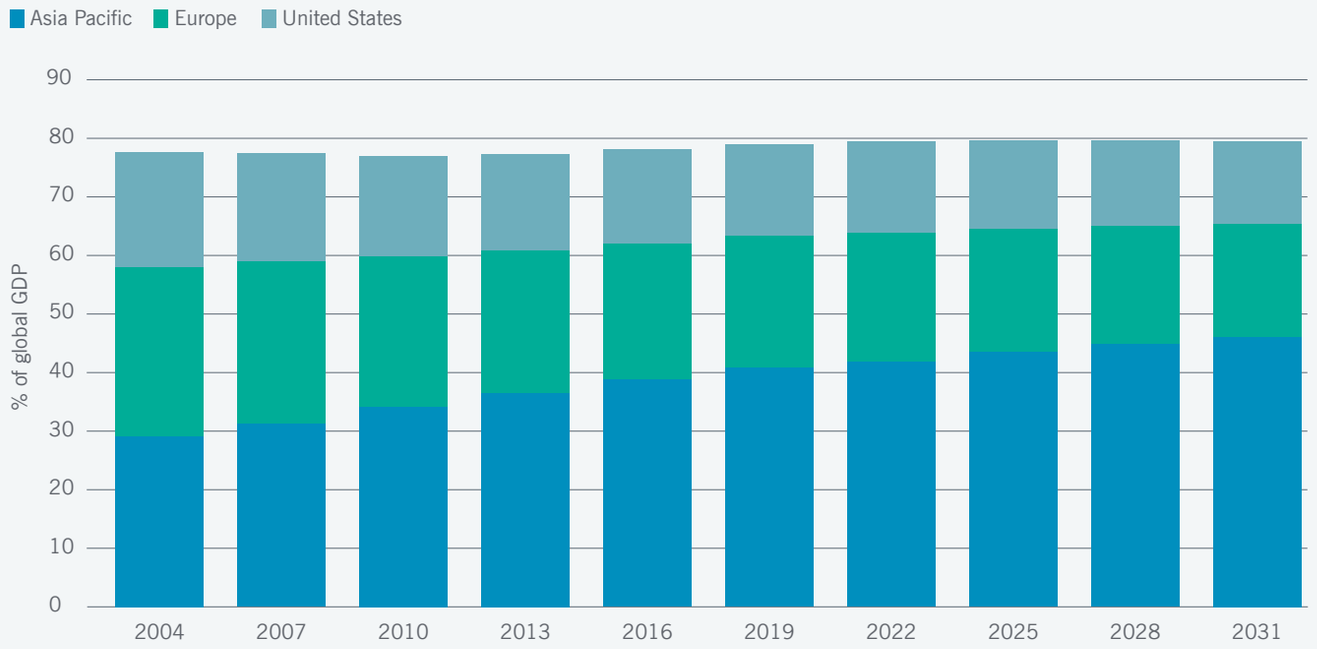
Demographics, wealth accumulation, supply chain reorientation and the expansion of the regions' emerging markets bolster APAC's long-term prospects.

The East's economic power has been building for decades. Buoyed initially by Japan's industrialization, the region was boosted further by the modernization of Hong Kong, Singapore, South Korea and Taiwan, alongside the rapid rise of China (Figure 1).

India, Vietnam and other Southeast Asian countries have stepped up to anchor the region's growth and importance, moving away from over-reliance on China and creating new investment opportunities into and out of Asia Pacific (APAC).

Over the coming decades, an increasing number of people will move to cities in APAC, driving the ongoing rise of the middle class, wealth and consumption. The services sector will continue to expand across the region, and a better educated workforce will also drive innovation and upgrading of the industrial value chain. The factors will help drive opportunities across real asset classes in APAC.

Figure 1: Share of global GDP



Source: Oxford Economics, June 2024
Note: GDP, purchasing power parity, real terms

The East: Growing and broadening...

China's current downturn is emblematic of both cyclical, structural and geopolitical headwinds. Its growth slowed from 9% in the early 2000s to around 5% currently. While this will take time to resolve, other emerging economies are rising to the fore to continue APAC's march in the 21st century.

India and Southeast Asia are expected to strengthen, accounting for an estimated 42% of regional GDP by 2040, from 33% currently. These countries are backed by a youthful and sizeable population, adding up to more than 2 billion people.

Domestic demand, on top of a reconfiguration of global supply chains due to geopolitical tensions, will continue to draw foreign direct investments into the region, underscored by relatively attractive total factor cost of production.

APAC presents attractive opportunities in real estate...

Across APAC, the youth demographic will help increase the long-term demand for real estate, underscoring unique and multifaceted investment opportunities for institutional investors. Different sectors and locations will become more attractive over time as various long-term structural demographic trends, such as urbanization with greater mobility and growing middle class, unfold.

1 Young demographic profile

Half of the world's Generation Z population is expected to reside in Asia Pacific by 2030. This digitally savvy and youthful population will help to further accelerate e-commerce penetration and propagate demand for **logistics** assets, particularly last-mile facilities already buoyed by increasing consumer demand for fast delivery before, during and post the pandemic. Rising demand for internet usage from this user base also supports **data centers.** That said, APAC is rapidly aging with higher life expectancy than the majority of advanced economies in North America and Europe. This bodes well for **senior living.** Japan has a high proportion of people aged 75 and above, which is projected to reach 20% of the total population by 2040. This makes it a primary focus for the senior living strategy. The country also provides a highly supportive insurance pension covering 90% of costs, alongside a persistent demand-supply gap across key regional capital cities.

2 Rising urban population

With many regional gateway cities experiencing strong population growth post-pandemic, the influx of people moving to cities to work, live and play is raising the demand for **multifamily housing.** Japan remains an appealing market for this sector due to its positive yield spread, increasing household numbers and relatively restricted supply due to high construction costs and land values. Rising real wage growth will probably continue in the coming years, supporting rental growth. However, opportunities also exist to develop institutional grade multifamily in other nascent markets. In Australia and South Korea, for example, a growing number of renters are seeking centrally managed rental apartments featuring modern facilities that individual landlords are typically unable to provide.

3 Growing middle classes

Chinese consumers are already the top spenders on luxury products globally.[41] Increasing consumer spending power means that Asia Pacific is projected to make up over 30% of global consumption by 2030. The growing number of affluent consumers will entice international retailers to open new stores in the region, particularly in emerging Asian markets, to meet growing retail demand for modern and well-managed malls. **Student housing** is also benefiting from rising affluence. While Chinese students have long made up the bulk of Australia's international students, a more diversified mix of student origins have emerged post pandemic — such as from India. This is broadening the appeal of Australian purpose built student accommodation (PBSA), ensuring high occupancy and positive rental growth. Similar phenomenon has also been seen in European markets, especially in the U.K.

4 Rise in nearshoring

Less costly but highly efficient manufacturing hubs in Southeast Asia with access to natural resources will also benefit from supply chain diversification due to rising geopolitical tensions. Industrial value chain upgrading will result in greater demand for modern **industrial** facilities. However, the availability of investible stocks is limited, highlighting the importance of collaborating with trustworthy local partners to secure development sites from the government.

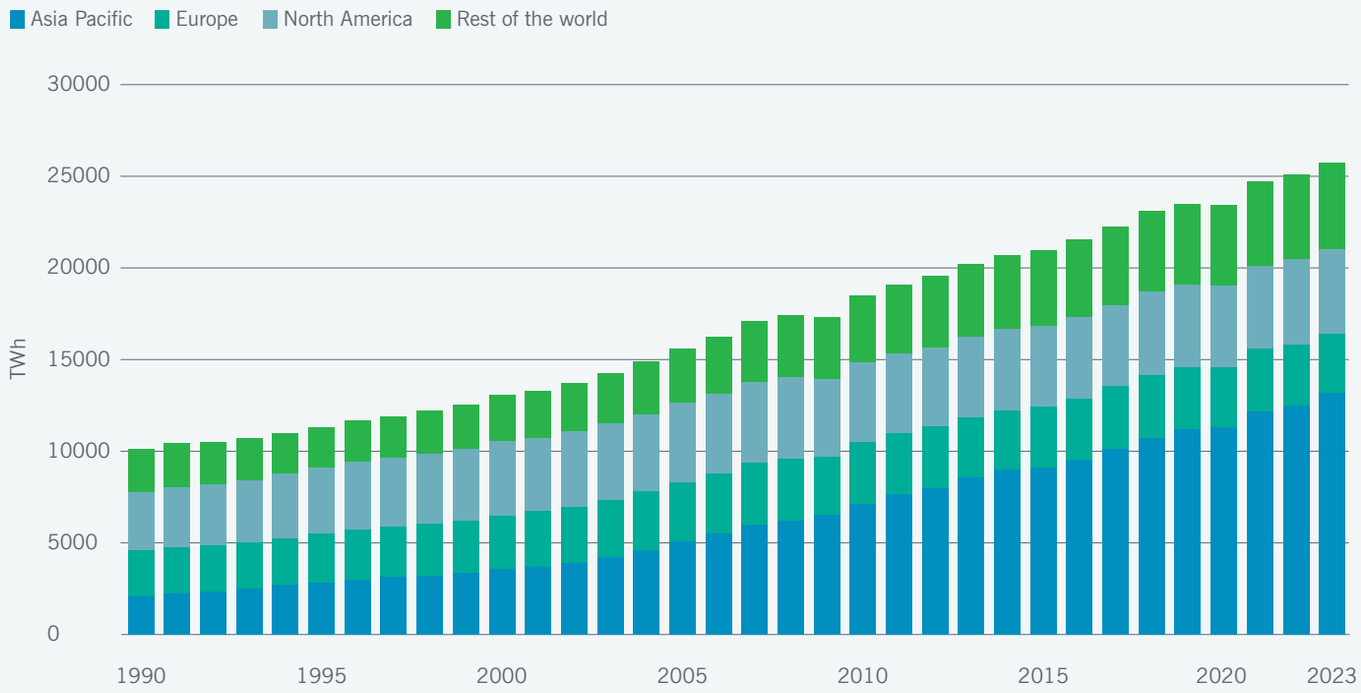
...and energy infrastructure

Home to half of the world's population, APAC is already the world's largest energy consumer (Figure 2). Future economic and demographic expansion — along with commitments on net zero carbon targets — will create even more investment and business opportunities, particularly in green energy. The Energy Transition Commission estimates that around $3.5 trillion[42] of annual capital investment is required until 2050 to drive an effective energy transition.

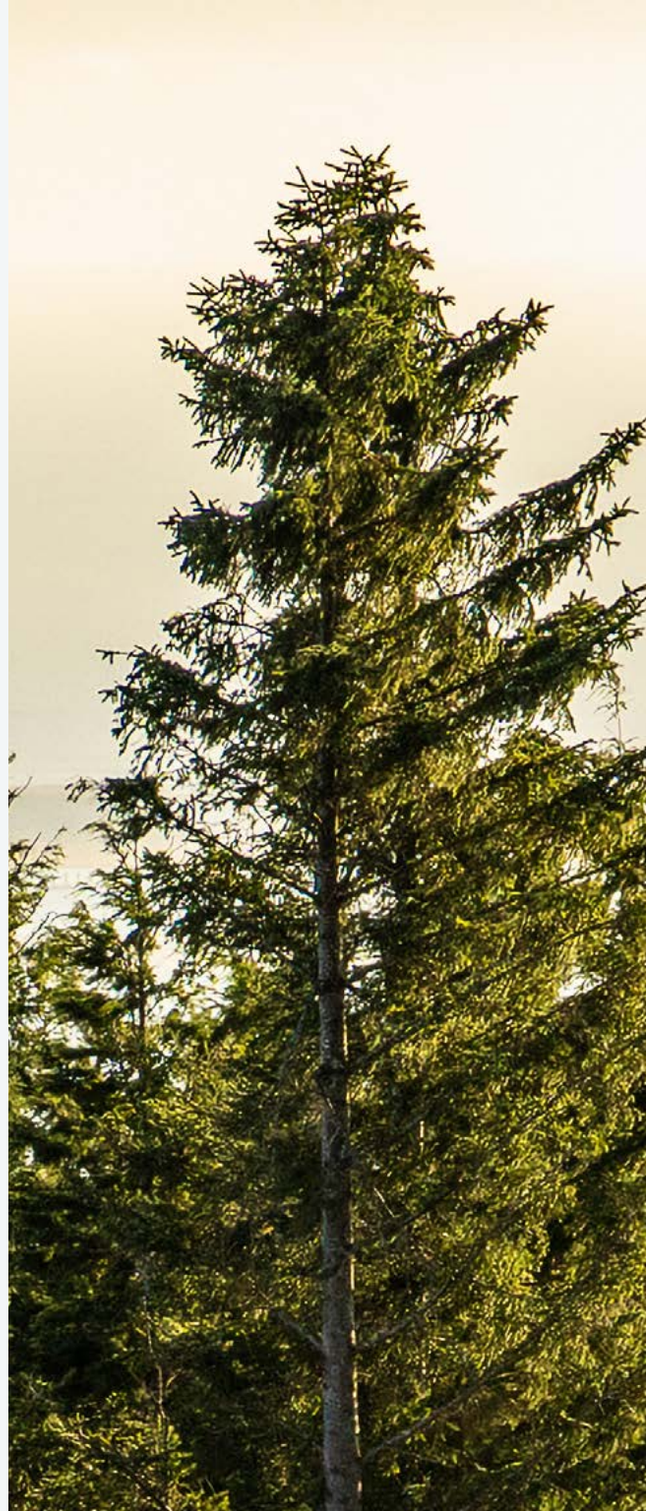
Alternative energy will become increasingly important in this shift. Solar PV and wind are the primary focus since they are at or close to grid parity with fossil fuels. Nuclear energy is important to achieving a carbon neutral agenda, and Asia is a major region for pursuing this, with around two-thirds[43] of the nuclear plants under development worldwide in the region.

Being at the vanguard of global renewable energy expansion does not yet equate to ease of access and purchase of green energy in the region. Some countries may not be self-sufficient in renewables,

Figure 2: Global electricity consumption by region



Source: World Energy & Climate Statistics – Yearbook 2024, April 2024.



and/or their power networks are not connected to neighboring countries' grids. This, makes it impossible to import green electricity, which in turn creates demand for energy storageand clean fuels, such as green hydrogen/ammonia.

China and South Korea are major markets in the battery industry since they have a strong manufacturing base along the full value chain. Battery technology is already starting to play a critical role in short-term storage to stabilize the grid.

For transporting green energy over long distances, green hydrogen/ammonia molecules are a more cost-effective option than transporting electricity. Their higher energy density than battery technology and suitability for long-term storage are distinct features considered a key solution to decarbonizing the industry, long-haul flights and long-range shipping.

Australia is a highly promising market for the development of green hydrogen/ ammonia. Its abundant land and renewable resources allow it to produce green hydrogen more affordably than anywhere else in the world. Therefore, it is expected that Australia will become the largest exporter of green hydrogen/ammonia in the world in the next several years.

UNIQUE OPPORTUNITIES FOR NATURAL CAPITAL

Over the past few decades, APAC's rapid economic development has lifted large groups of people out of poverty. Consumers now spend more on food — particularly protein rich food — and consume a wide range and increasing volume of wood products, from lumber for construction and housing, to wood pulp for basic consumer products like tissue and packaging.

Countries in the region, and many around the world, face the challenge of meeting growing demand for food and timber in an environmentally friendly and socially responsible way.

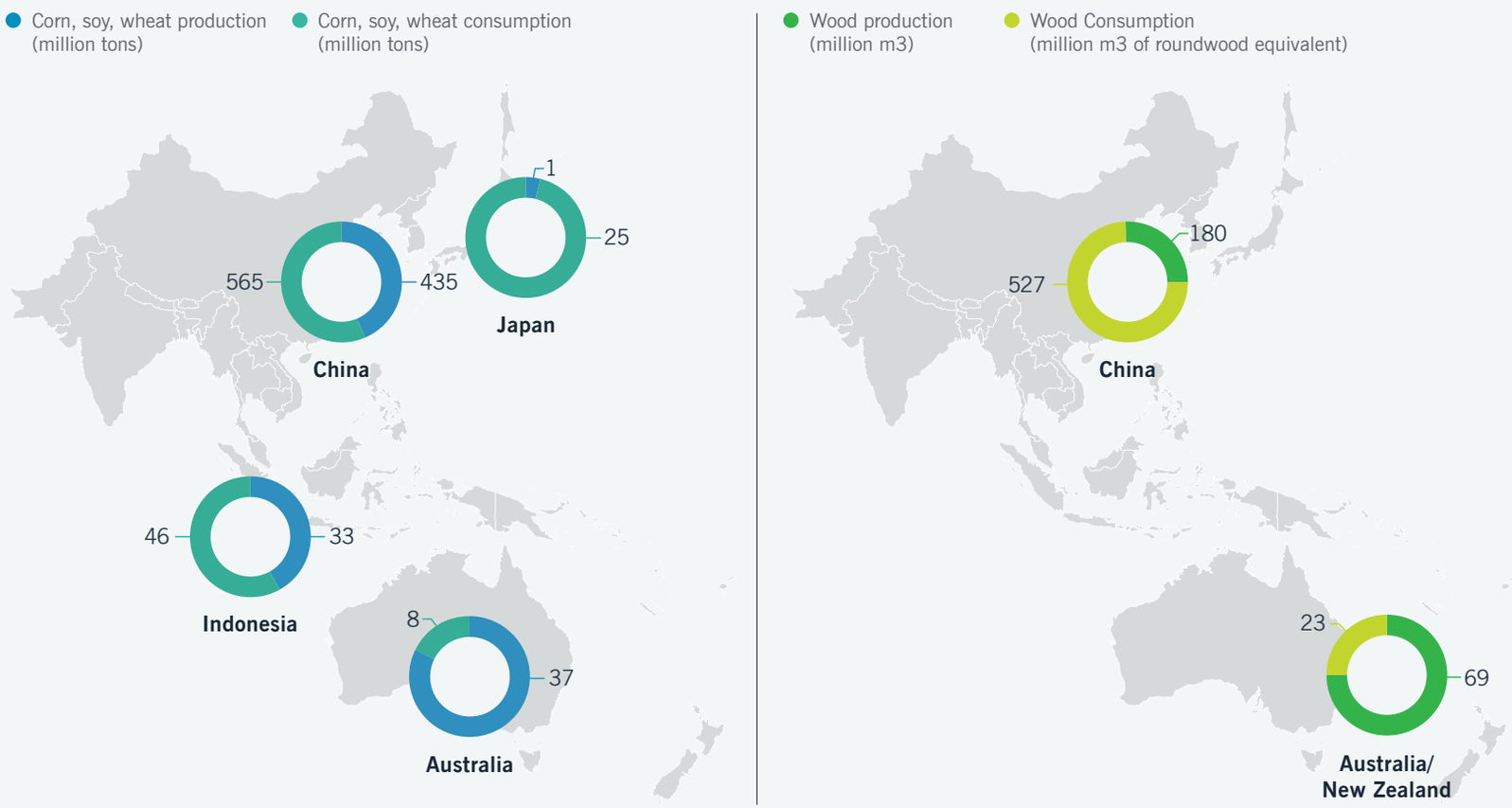
Adding to the challenge, extreme weather, water scarcity, pollution, climate change, unsustainable land management practices, the need to protect shrinking natural areas, and restrictions on land use conversion have further constrained supply. This opens up an opportunity for the private sector to fill the gap.

Around **$3.5 trillion of annual capital investment** is required until 2050 to drive an **effective energy transition.**

Imports are an important way to address the demand and supply imbalances of natural resources. China imports more agricultural products than any other country and its dependency on food imports is an example of the challenges and risks posed by food insecurity.[44]

In contrast, Australia and New Zealand stand to gain from exporting agricultural and wood products because of their highly productive timberland and farmland base and close proximity to major importing countries in Asia such as Japan and Indonesia. Favorable logistics allow them to compete on price with other exporters outside the region.

Figure 3: Agricultural and timber production and consumption in select countries



Source: Food and Agriculture Organization of the United Nations. Production and Trade for agricultural crops using 2022 data. Trade balance for wood products computed as exports less imports for sawnwood, wood-based panels, and wood pulp converted to m^3 roundwood equivalents (RWE) using 2020 data.

APAC's rise is a long-term journey

The East's growth continues to be supported by positive structural tailwinds. Demographics, wealth accumulation, supply chain reorientation and the expansion of the regions' emerging markets bolster its long-term prospects.

This will provide investors with greater opportunities to tap into APAC's growing economic dominance. However, it is not all about real estate opportunity. The acceleration of the transition to a low carbon economy presents attractive opportunities in energy infrastructure. And greater disposable income and the switch to higher value consumption creates compelling investment thesis for natural capital. These trends will enable global institutional investors to build a well-diversified portfolio across different sectors and asset classes.

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