

ADAPTATION



Mitigating physical risk: Where we expect to see investment tailwinds and why

Rising/more volatile temperatures and extreme weather events are further raising considerations for proactive and/or reactive investment towards physical risk mitigation. In our January 2024 Adaptation report, we highlighted a framework for measuring physical risk as well as companies exposed to proactive and reactive Adaptation mitigants/solutions. In this report, we provide a framework for considering investment ability and willingness among the three key Adaptation constituents -- corporates, individuals and governments -- to address key hazards and the products more likely to see revenue tailwinds. We come away positive on mitigants to hazards that may be deemed by customers as more persistent -- heat and drought in particular -- where we see strong customer financial flexibility based on balance sheet and/or FCF strength. Our "ability-to-pay" analysis suggests potential tailwinds for 26 verticals -- including HVAC, Water/Power Infrastructure, GPS/Mapping, and Building Construction/Maintenance.



Brian Singer, CFA

+1 212 902-8259
brian.singer@gs.com
Goldman Sachs & Co. LLC

Brendan Corbett

+1 415 249-7440
brendan.corbett@gs.com
Goldman Sachs & Co. LLC

Xavier Zhang

+852 2978-6681
xavier.zhang@gs.com
Goldman Sachs (Asia) L.L.C.

Dan Duggan, Ph.D

+1 212 902-4726
dan.duggan@gs.com
Goldman Sachs & Co. LLC

Robert Cox

+1 212 902-9813
rob.cox@gs.com
Goldman Sachs & Co. LLC

Varsha Venugopa

+1 415 393-7554
varsha.venugopal@gs.com
Goldman Sachs & Co. LLC

Dhruv Goyal

+1 332 245-7854
dhruv.goyal@gs.com
Goldman Sachs India SPL

Evan Tylenda, CFA

+44 20 7774-1153
evan.tylenda@gs.com
Goldman Sachs International

Michael Mennona

+1 212 357-9856
michael.mennona@gs.com
Goldman Sachs & Co. LLC

Grace Chen

+44 20 7774-5119
grace.j.chen@gs.com
Goldman Sachs International

Shubham Jain

+1 332 245-7652
shubham.jain@gs.com
Goldman Sachs India SPL

Goldman Sachs does and seeks to do business with companies covered in its research reports. As a result, investors should be aware that the firm may have a conflict of interest that could affect the objectivity of this report. Investors should consider this report as only a single factor in making their investment decision. For Reg AC certification and other important disclosures, see the Disclosure Appendix, or go to www.gs.com/research/hedge.html. Analysts employed by non-US affiliates are not registered/qualified as research analysts with FINRA in the U.S.

Table of Contents

PM Summary: Where Adaptation investment is more likely and potential beneficiaries	3
More extreme temperatures/weather events raising focus on physical risk...	8
... And on an investment response via proactive and/or reactive solutions	15
Three boxes needed to be checked for proactive investment	19
Persistent vs. Transient: Some hazards may see greater likelihood of proactive investment	21
Adaptation solutions likely to see greater revenue tailwinds	23
Corporate financial flexibility: What sectors and geographies have spare capacity for proactive Adaptation investment?	30
What Federal Governments have more financial flexibility for proactive Adaptation investment?	35
What US state/local governments have more financial flexibility for Adaptation investment?	42
What countries' households have financial flexibility?	46
Air Conditioning case study: Significant potential demand growth at intersection of Adaptation + No Poverty goals	49
Insurance case study: Cyclical pricing relief may improve affordability, drive greater demand	53
Disclosure Appendix	57

PM Summary: Where Adaptation investment is more likely

We are more positive on revenue tailwinds for 26 Adaptation Prioritized Verticals — including HVAC, Water/Power Infrastructure, GPS/Mapping, and Building Construction/Maintenance — on new analysis of where and what customers are likely able and may be willing to invest capital to mitigate physical risk from rising/more volatile temperatures and extreme weather events.

ADAPTATION in numbers



Source: Goldman Sachs Global Investment Research

As investor attention towards risk and investment opportunities to physical hazards associated with higher and more volatile temperatures rises, there remains a healthy debate over whether corporates, individuals or governments will ultimately decide to invest proactively in solutions to mitigate physical risk, invest reactively, or not have the financial flexibility to invest at all. In this report, we provide a framework for physical risks and specific verticals that may see more tailwinds from investment based on:

- Perceived persistency vs. transiency among five categories of hazards.
- An analysis of customer ability to pay based on balance sheet strength and/or free cash flow for corporates by sector/region, households, federal governments and US state/local governments.
- Proactive and reactive Adaptation verticals that may see revenue tailwinds — with a focus on Adaptation Prioritized Verticals that our analysis suggests meet the overlap of customer willingness and ability to invest. We provide case studies on HVAC and Insurance.

Five key takeaways

(1) Where we see ability to pay. Our “ability-to-pay” analysis shows significant spare capacity to allocate capital towards proactive or reactive Adaptation solutions from the following constituents:

- Corporates in US, greater China, Western Europe and in the Middle East.
- Corporates in the Oil & Gas, Electric Utilities, Capital Goods, Semiconductors, and Tech Hardware sectors.
- Federal Governments — broader fiscal challenges globally may be a limiting factor, though Japan screens relatively favorably.
- Households in US, Australia, UK, BeNeLux and Canada.

(2) Which hazards could see more proactive investment. We see a greater likelihood for proactive investment towards potential hazards that are deemed more persistent as opposed to transient — relatively more supportive for proactive heat- and drought-related physical risk mitigation.

(3) Products that could see revenue tailwinds. Our overlay of hazard risk and geographical/sectoral customer financial flexibility is most supportive for revenue tailwinds for the following product categories: HVAC, Water/Power Infrastructure, GPS/Mapping and Building Construction/Maintenance.

Exhibit 1: Our analysis of financial flexibility for key Adaptation-related customers by region/sector for hazards that we believe will be perceived as more persistent gives us increased confidence in revenue tailwinds for 26 mitigation solutions, including HVAC, Water/Power Infrastructure, GPS/Mapping, and Building Construction/Maintenance

Key Adaptation solutions mapped to the most areal-material hazards by region and across customer types where we see the greatest financial flexibility

	Physical Risk Areal Materiality					Financial Flexibility			✓ Higher ✓ Moderate	
	PERSISTENT TRANSIENT									
	 Drought	 Heat	 Fire	 Flooding	 Hurricane	Gov	Corp	Ind	Investable Products & Services	
US							✓	✓	Air Purification/Filtration Distributed/Backup Power Environmental Control Products GPS/Mapping Technology	Home Building & Maintenance Plumbing & Structural Materials Veterinary Services Water & Waste Management Power Transmission/Distribution/Generation
Europe							✓	✓	Air Purification/Filtration Diagnostic/Analytical Testing Distributed/Backup Power Environmental Control Products	GPS/Mapping Technology Home Building & Maintenance Power Transmission/ Distribution Veterinary Services Water & Waste Management
China							✓	✓	Air Purification/Filtration Distributed/Backup Power Environmental Control Products GPS/Mapping Technology	Home Building & Maintenance Industrial Construction/ Maintenance Power Transmission/Distribution Veterinary Services
India							✓		Distributed/Backup Power Environmental Control Products GPS/Mapping Technology Power Transmission/Distribution	Water & Waste Management Water Infrastructure
Japan						✓		✓	Diagnostic/Analytical Testing Distributed/Backup Power GPS/Mapping Technology	Power Transmission/Distribution/Generation Water & Waste Management
Other Asia							✓		Air Purification/Filtration Distributed/Backup Power Water & Waste Management	Water Infrastructure Power Transmission/Distribution
ANZ								✓	Diagnostic/Analytical Testing Distributed/Backup Power Veterinary Services	Water & Waste Management Power Transmission/Distribution/Generation
Latin America								✓	Diagnostic/Analytical Testing Distributed/Backup Power Environmental Control Products	GPS/Mapping Technology Home Building & Maintenance Water Infrastructure
CEEMEA						✓	✓		Diagnostic/Analytical Testing Distributed/Backup Power Environmental Control Products	GPS/Mapping Technology Home Building & Maintenance Water Infrastructure

Source: Goldman Sachs Global Investment Research

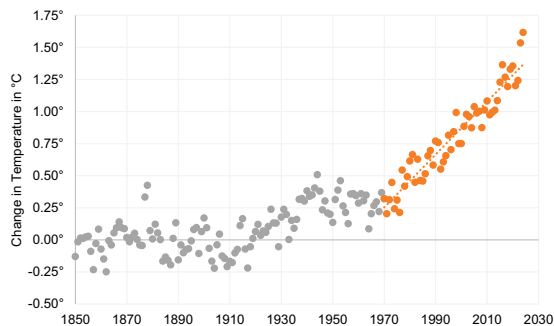
More extreme temperatures/weather events raising focus on physical risk...

Damages from natural disasters were \$318 bn in 2024. Swiss Re [highlights](#) that economic losses from natural catastrophes¹ were \$318 bn in 2024, with 57% of these losses not insured. These losses represent 0.3% of global GDP. Secondary perils, characterized by higher frequency and generally lower loss severity (e.g. severe storms, floods, droughts, wildfire, landslides, snow & freezes) accounted for 59% of 2024 damages (\$81.5 bn).² Regionally, Australia/Oceania, North America, and Europe and continue to have a higher share of insured losses, while less than 20% of the natural disaster losses in Asia, Latin America/Caribbean and Africa were covered by insurance.

We believe the continued increase in temperatures as well as elevated (though below record) levels of natural disaster damages are driving discussions among regulators, policymakers, corporates, consumers and investors on how aggressively to mitigate, prepare for or prepare to react to future extreme weather events and potential implications from rising temperatures.

Exhibit 3: Global temperatures have been on a rising trajectory since the 1970s

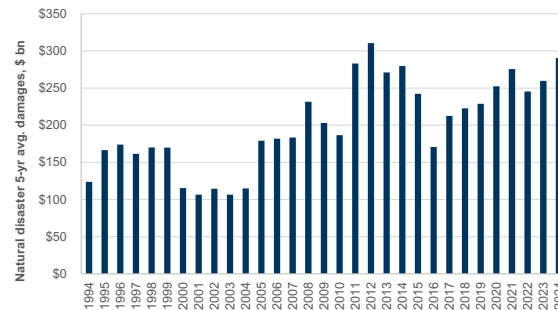
Global temperatures vs. 1850-1900 average, 1850-2024



Source: Berkeley Earth, Goldman Sachs Global Investment Research

Exhibit 4: Natural disaster damages were \$318 bn in 2024 per Swiss Re, with five-year moving average of \$290 bn

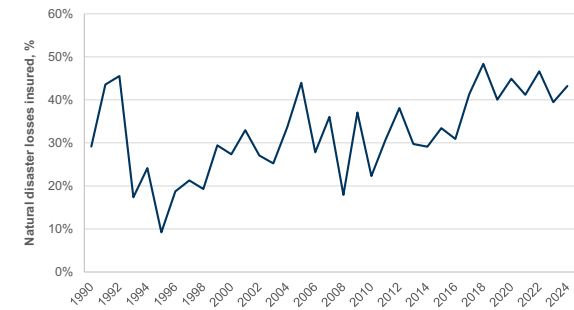
5-year moving average natural disaster damages, 1994-2024, bn of US dollars



Source: Swiss Re, Goldman Sachs Global Investment Research

Exhibit 5: Natural disaster damages were about 43% insured in 2024 vs. range of about 40%-50% in recent years

Percentage of natural disaster economic losses insured, 1990-2024



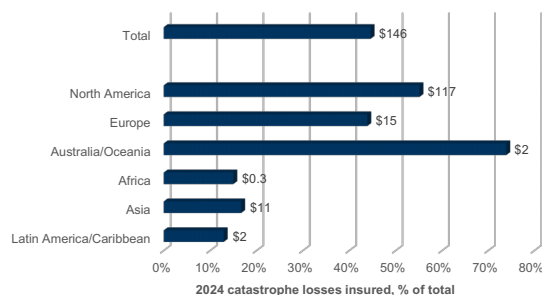
Source: Swiss Re, Goldman Sachs Global Investment Research

¹ The term “natural catastrophe” refers to an event caused by natural forces, including but not limited to: floods, storms, earthquakes, droughts/forest fires/heat waves, cold waves/frost, hail and tsunamis.

² Primary perils are hazards that have higher event loss potential and for which risk modeling is more advanced (e.g., earthquakes, tropical cyclones and European windstorms).

Exhibit 6: Latin America/Caribbean, Asia and Africa had the lowest shares of catastrophe losses covered by insurance in 2024

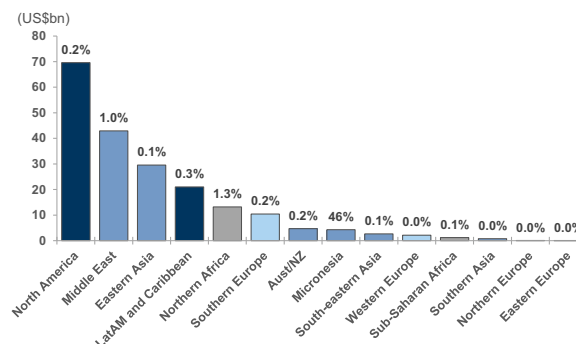
Percent of catastrophe losses insured, 2024; bar labels show insured losses in bn USD



Source: Swiss Re, Goldman Sachs Global Investment Research

Exhibit 7: North America had the greatest economic exposure to disasters in 2023, with \$70 bn in direct losses, though these only represented a relatively modest share (0.2%) of GDP

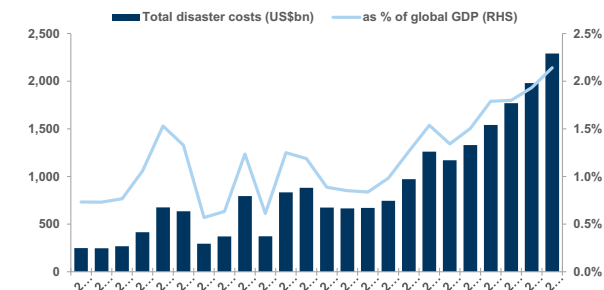
Disasters direct losses (bn of USD) and % of GDP impact in 2023



Source: United Nations Office for Disaster Risk Reduction, World Bank, Goldman Sachs Global Investment Research

Exhibit 8: When including not just direct damages but also indirect costs (supply chain, education, livelihood, debt, etc), disaster impact globally exceeded \$2.3 trillion annually in 2023 based on UN data, representing 2% of global GDP

Billions of US dollars of total disaster cost (LHS); percent of global GDP (RHS)



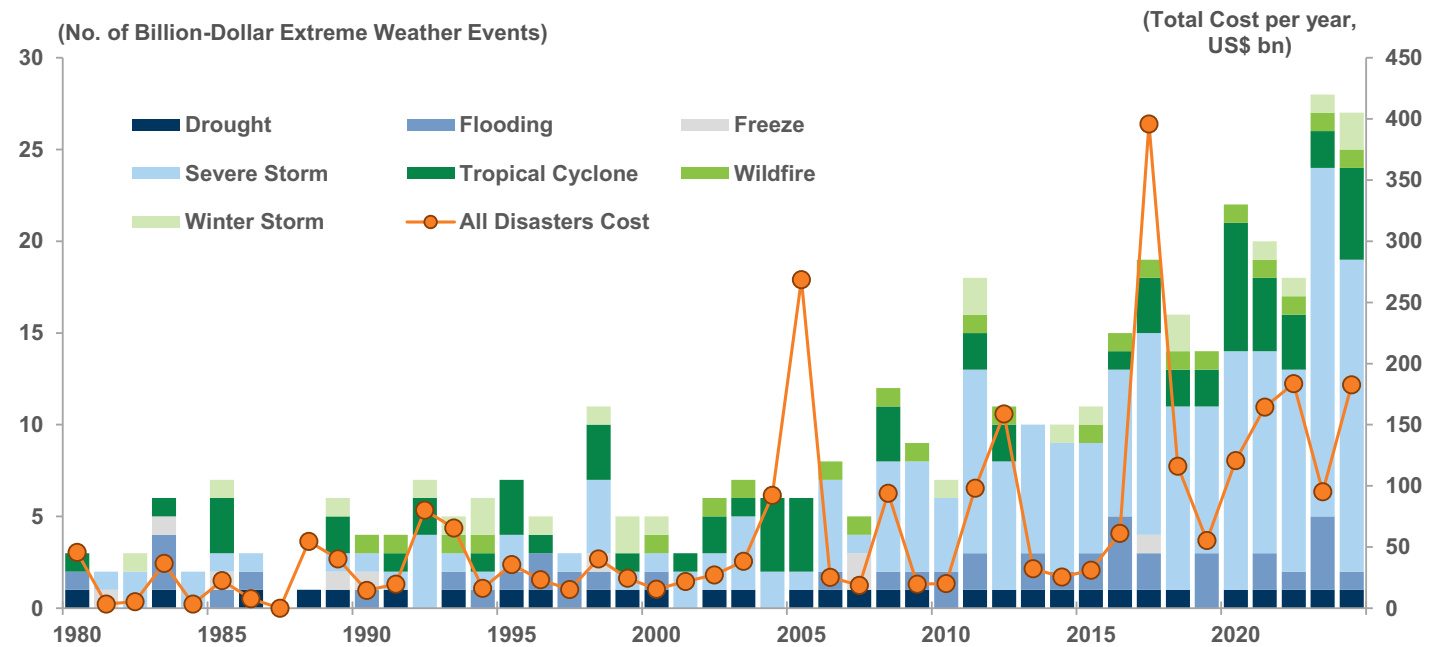
Source: United Nations Office for Disaster Risk Reduction, World Bank, Goldman Sachs Global Investment Research

We believe investors continue to increase focus on physical risk as a factor in investment decisions, but are debating approach and granularity. In our January 2024 report, *Adaptation: Physical Risk, Financial Risk, Opportunity*, we highlighted our framework for considering and weighting geographical exposure to nine hazards: Wildfires, Hurricanes & Typhoons, Seismic Events, Sea Level Rise/Coastal Floods, Non-Coastal Floods, Frequency of Extreme Temperature, Water Stress, Heat Stress and a surge in Energy Consumption. In the report, we deployed a physical risk model that considers the areal risk assessment to these nine hazards.

Exhibit 10, Exhibit 13 and Exhibit 11 show how the United States, China and India are potentially exposed to the various rungs of physical risk by sub-area (counties in the US, counties in China and taluks in India) as defined above.

Exhibit 9: In the US, total annual cost from extreme weather disasters that each exceed \$1 billion has been on the rise in recent years

Counts and costs of extreme weather events that each exceed \$1 billion in cost (1980-2024), CPI-Adjusted



Source: National Centers for Environmental Information, Data compiled by Goldman Sachs Global Investment Research

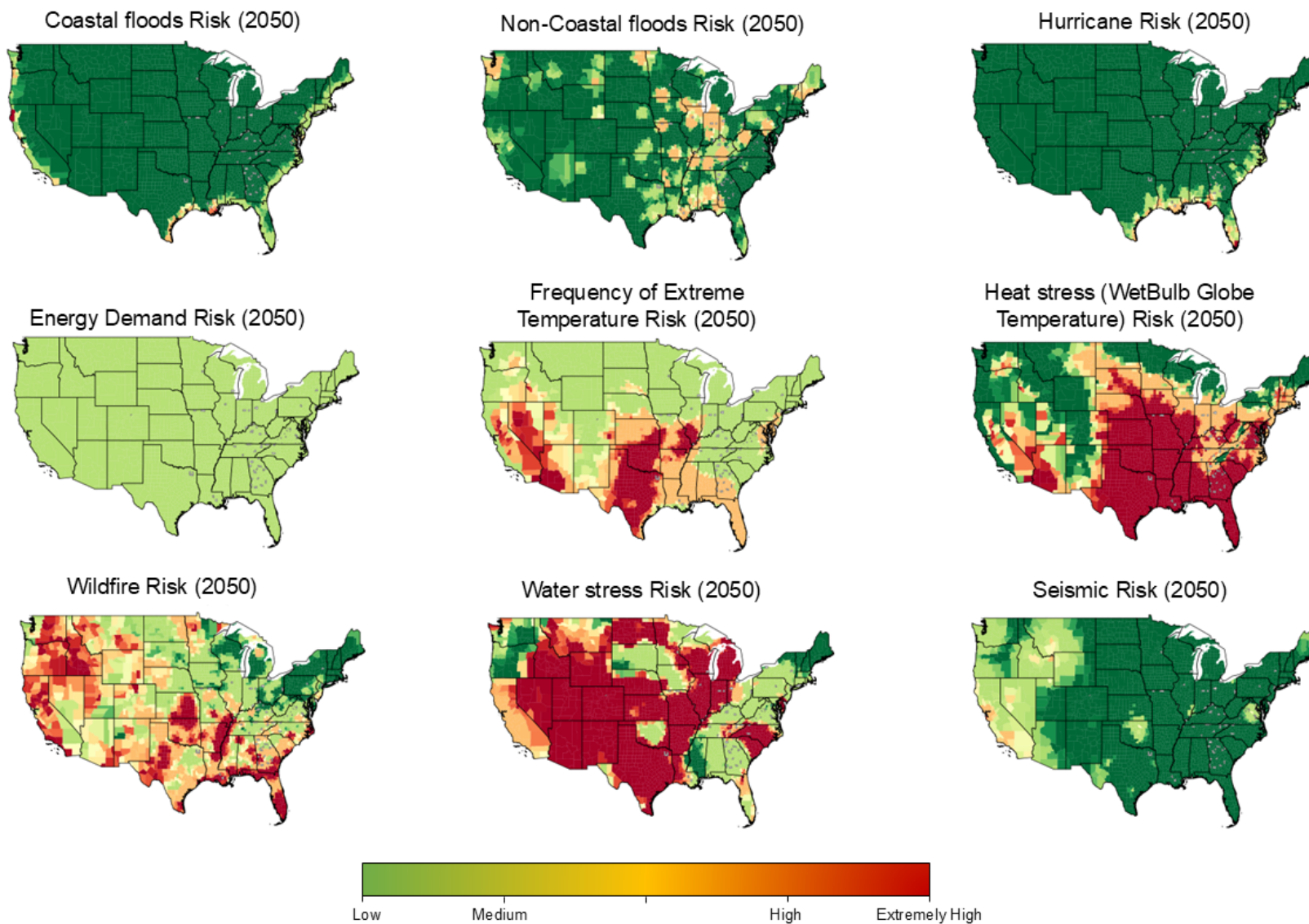


GS Data Works leverages alternative data sources and advanced analysis techniques to create unique data-driven insights across Global Investment Research.

GS Data Works analysis provided by Dan Duggan, Ph.D and Dhruv Goyal.

Exhibit 10: Physical Risk: How the US Lower 48 could be exposed

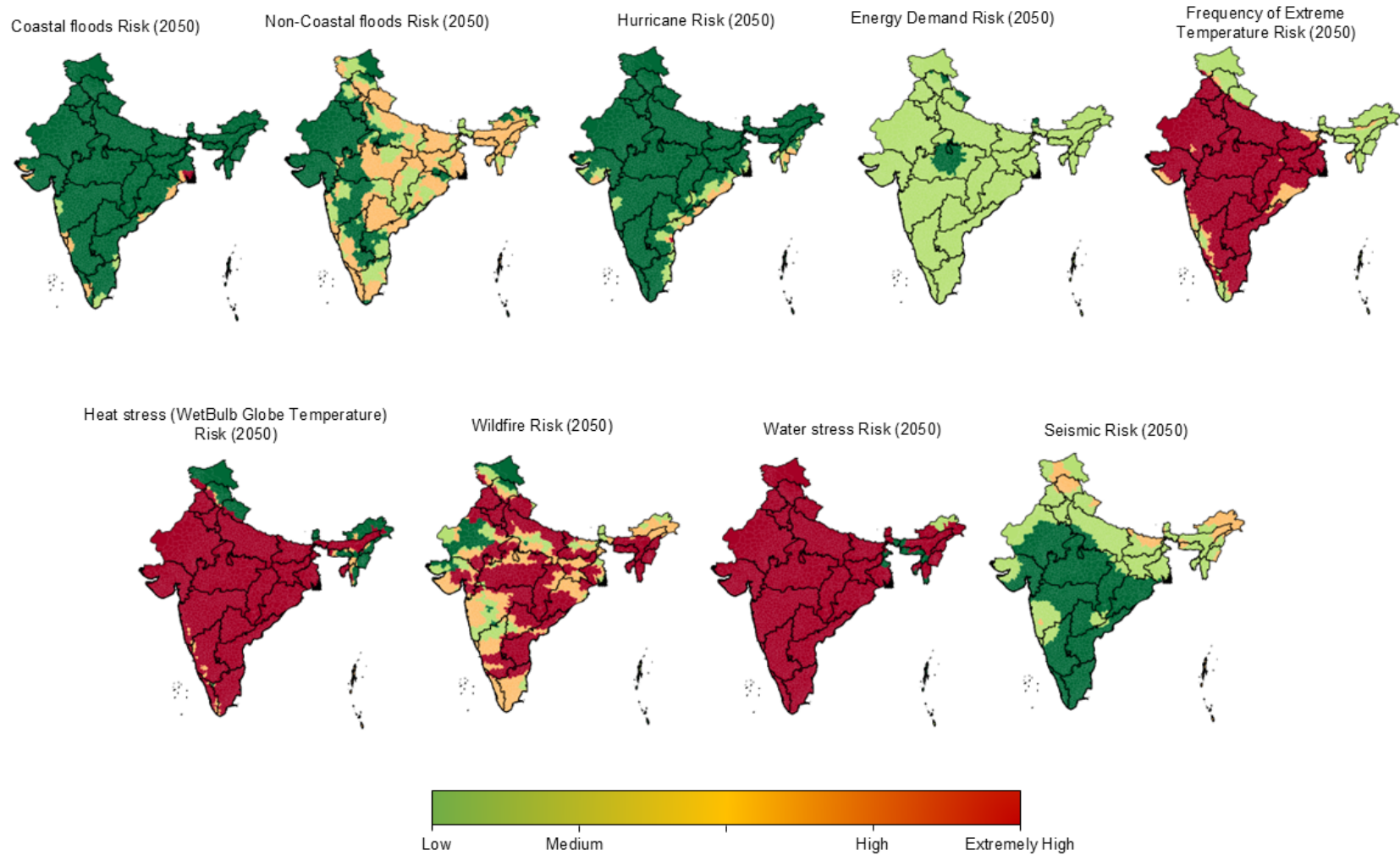
Potential exposure to Sea Level Rise (coastal floods), Non-Coastal floods, Energy Demand rise, Extreme Temperature, Heat Stress, Water Stress, and Wildfires in RCP 8.5 scenario, 2050; risk exposure for Hurricanes and Earthquakes



Source: Goldman Sachs, Goldman Sachs Global Investment Research

Exhibit 11: Physical Risk: How India could be exposed

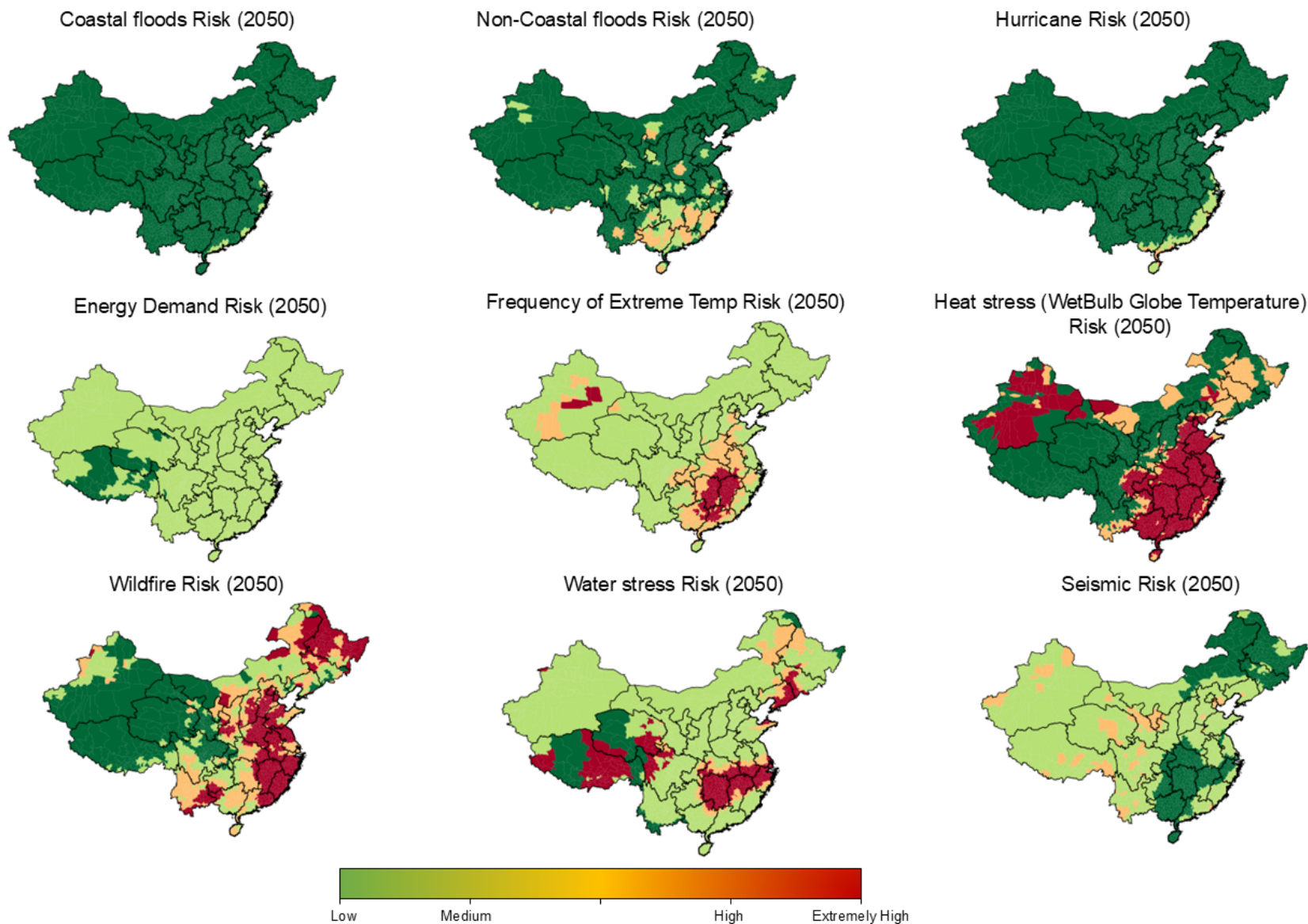
Potential exposure to Sea Level Rise (coastal floods), Non-Coastal floods, Energy Demand rise, Extreme Temperature, Heat Stress, Water Stress, and Wildfires in RCP 8.5 scenario, 2050; risk exposure for Hurricanes and Earthquakes



Source: Goldman Sachs, Goldman Sachs Global Investment Research

Exhibit 12: Physical Risk: How China could be exposed

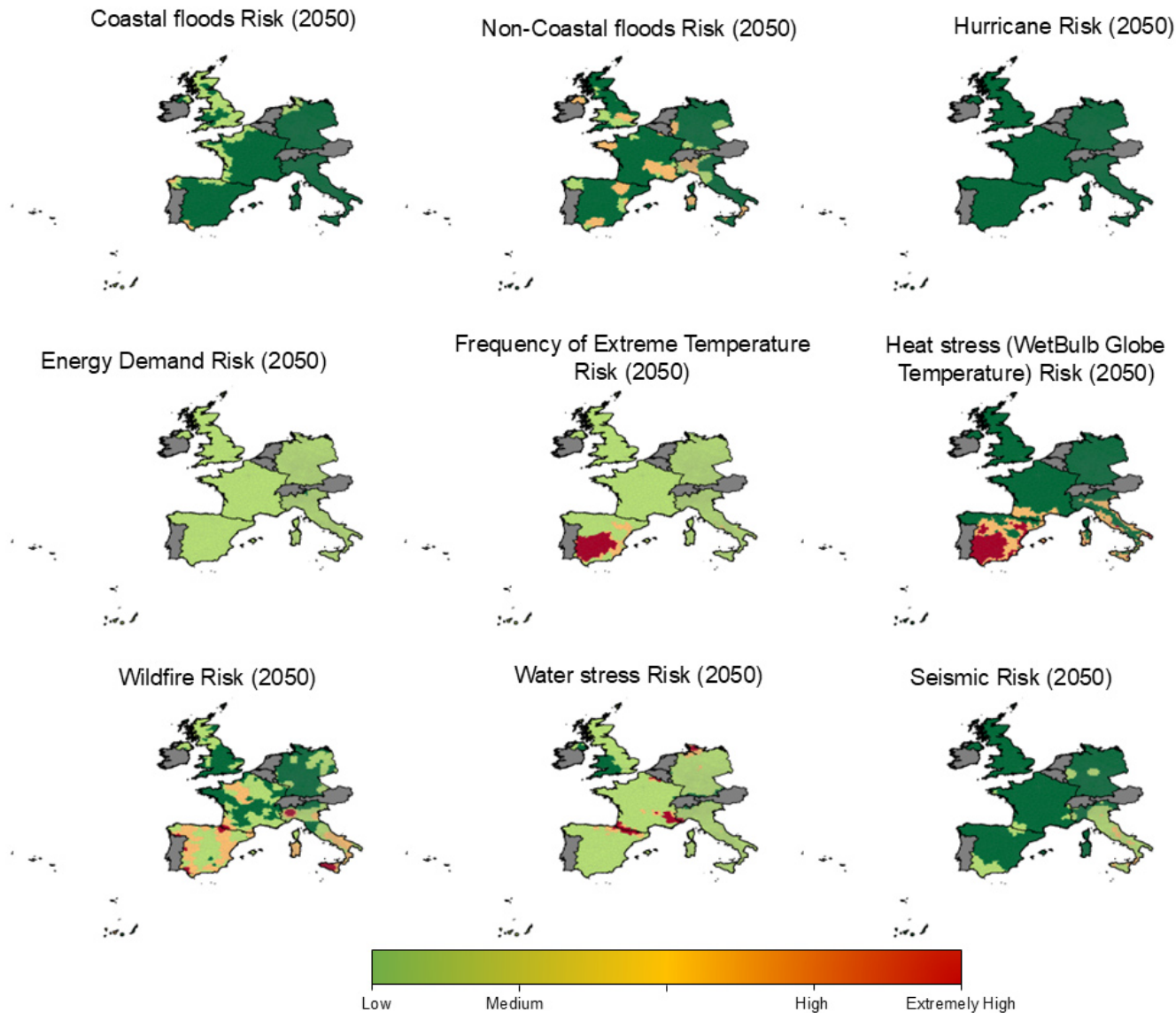
Potential exposure to Sea Level Rise (coastal floods), Non-Coastal floods, Energy Demand rise, Extreme Temperature, Heat Stress, Water Stress, and Wildfires in RCP 8.5 scenario, 2050; risk exposure for Hurricanes and Earthquakes



Source: Goldman Sachs, Goldman Sachs Global Investment Research

Exhibit 13: Physical Risk: How Europe could be exposed

Potential exposure to Sea Level Rise (coastal floods), Non-Coastal floods, Energy Demand rise, Extreme Temperature, Heat Stress, Water Stress, and Wildfires in RCP 8.5 scenario, 2050; risk exposure for Hurricanes and Earthquakes



Source: Goldman Sachs, Goldman Sachs Global Investment Research

... And on an investment response via proactive and/or reactive solutions

We believe the growing realization of potential risks/impacts/opportunities from more extreme and rising global temperatures will serve to further investor and corporate focus on Adaptation. This is a function of the realization of potential risks/impacts/opportunities, driven by both the visible impacts of rising temperatures/more extreme weather events and an improving ability to quantify its financial risks. This Adaptation focus should grow regardless of whether global temperatures remain at 1.5^o-1.6^o C above pre-industrial levels or if temperatures rise further. In the absence of sufficient investment from governments, companies and consumers towards Decarbonization and Proactive Adaptation, we believe the result could be an increase in Adaptation investment towards reactive verticals.

We see opportunity for both Proactive and Reactive Adaptation investments. We see investment needs in Adaptation-related verticals that are:

- **Proactive** — investments made in advance of physical impacts.
- **Reactive** — those made after physical impacts have manifested.
- **Both** — some solutions will likely be deployed both proactively and reactively.

Where does investment need to be made?

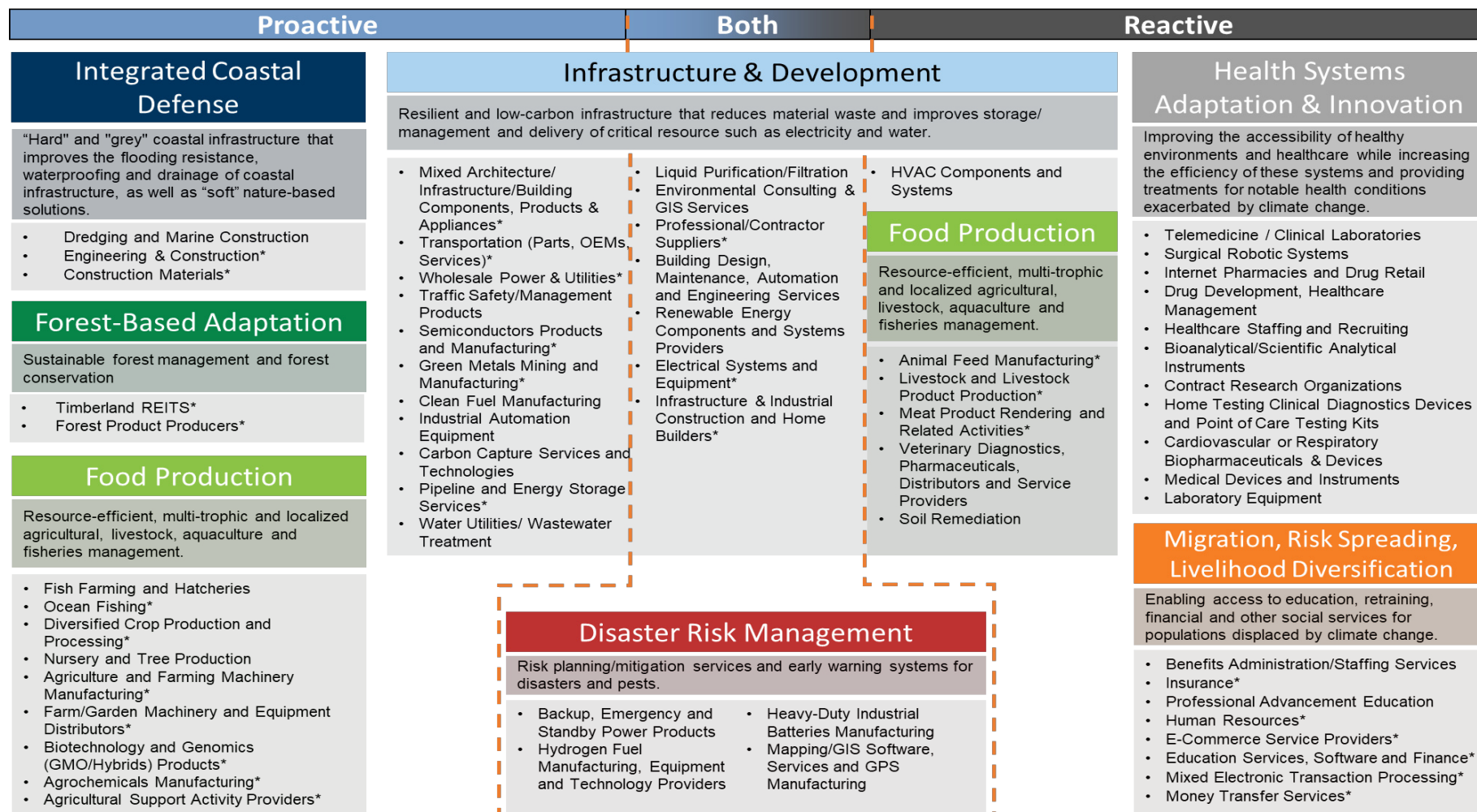
In its 2022 report, the IPCC highlights multiple key risks and related Adaptation options/responses. We group these into the following categories:

- **Integrated Coastal Defense — largely Proactive investment.** Adaptation options include **coastal defense/hardening** and **integrated coastal zone management**. These involve physical and nature-based solutions — seawalls, embankments, levees, wet- and dry-proofing buildings, mangrove stands, widening riverbeds for flood retention, upstream forest restoration for upstream retention, beach nourishment, raising of structures and coastal roads, improved drainage and amphibious building designs.
- **Water Infrastructure and Development — both Proactive and Reactive.** Adaptation options for water include **water use efficiency, water resource management** and **sustainable urban water management**. Solutions/mitigants we highlight as more specifically Proactive include water storage, multi-purpose water reservoirs and dams, efficient water transport and irrigation infrastructure and leakage mitigation. Solutions/mitigants we highlight as both Proactive & Reactive include liquid purification and filtration equipment/agents, water utilities, wastewater treatment, desalination and water metering.

- **Broader Infrastructure and Development — both Proactive and Reactive.** Adaptation options include **resilient power systems, energy reliability, green infrastructure/ecosystem services and sustainable land use/urban planning.** Solutions/mitigants we highlight as more specifically Proactive include low-carbon/resilient building materials, products and appliances, low carbon transportation solutions and parts providers, reliable power production and transmission, green metals mining & manufacturing, clean fuel producers, industrial automation, carbon capture technologies, waste-to-energy services and pipeline & energy storage services. Solutions/mitigants we highlight as more specifically Reactive include HVAC components and systems. Solutions/mitigants we highlight as both Proactive & Reactive include environmental consulting & GIS/GPS services, professional contractor suppliers, building design, maintenance, automation and engineering services, renewable energy components and systems providers, electrical reliability/safety systems and equipment and resilient infrastructure, industry & residential construction.
- **Food Production — largely Proactive.** Adaptation options include **improved cropland management and efficient livestock systems.** This includes integrated soil management, reduced tillage, conservation agriculture, planting of stress-resistant or early-maturing crop varieties, mulching, crop diversification, improved livestock diets, enhanced animal health, breeding and manure management, grassland management, local food production integrated multi-trophic aquaculture, polyculture, aquaponics, mangrove-integrated culture and sustainable fishing practices. Solutions/mitigants we highlight as more specifically Reactive include soil remediation, veterinary services and food safety adjustments made across the animal feed, livestock production and meat product rendering value chain.
- **Health Systems Adaptation & Innovation — largely Reactive.** Adaptation options include **health and health systems** such as providing access to safe water/sanitation, enhancing access to vaccinations, developing or strengthening integrated surveillance systems and changing the timing/location of vector-control measures, temperature-controlled low-income housing, health care clinics, place-specific health care/nutrition infrastructure/access and telemedicine. The IPCC expects exacerbated respiratory diseases, allergies and cardiovascular disease.
- **Forest-Based Adaptation — largely Proactive.** Adaptation options include forest-based solutions, sustainable aquaculture/fisheries, agroforestry and biodiversity management/ecosystem connectivity. This includes sustainable forest management and forest conservation.
- **Migration, Risk Spreading, Livelihood Diversification — largely Reactive.** This includes education/training for those looking to change their occupation, **human migration** and planned relocation/resettlement, money transfer services, electronic transaction processing, and insurance.
- **Disaster Risk Management — both Proactive and Reactive.** These include **disaster risk management**, and **climate services (including early warning systems).**

Exhibit 14: We see multiple business lines that are likely to be the recipient of greater Adaptation-related investment by governments, corporates and individuals; uncertainty over capex Reprioritization may be more supportive of Reactive over Proactive verticals

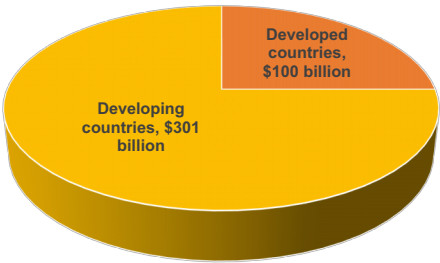
Business lines levered to various Adaptation sub-themes; not all activities in the categories marked with an asterisk are Adaptation-aligned; business lines divided into those Proactive (actions to mitigate future impact), Reactive (actions to respond to present impact), or Both



*indicates business activity is not automatically designated as adaptation-aligned

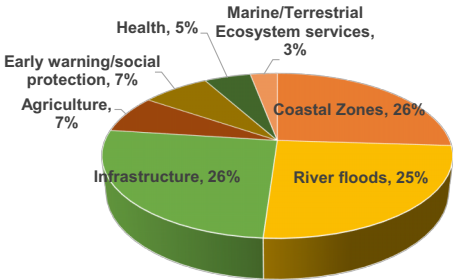
Source: IPCC, Goldman Sachs Global Investment Research

Exhibit 15: We see proactive investment requirements to address Adaptation of \$400 billion annually this decade, with about 75% for developing economies
Midpoint of range of annual proactive investment needed in the 2020s to address Adaptation, billions of US dollars



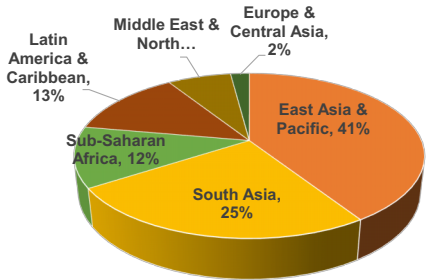
Source: United Nations, IPCC, Goldman Sachs Global Investment Research

Exhibit 16: Bulk of Adaptation costs highlighted by UN are for energy and transportation Infrastructure resiliency, coastal protection and river flood protection
Percentage breakdown of estimated Adaptation costs by sector/theme



Source: United Nations (UN), Goldman Sachs Global Investment Research

Exhibit 17: Gap needed for Adaptation financing within developing economies largest in APAC
Climate Adaptation financing gap in developing economies, 2021-30, percent of total



Source: United Nations, Goldman Sachs Global Investment Research

Three boxes needed to be checked for proactive investment

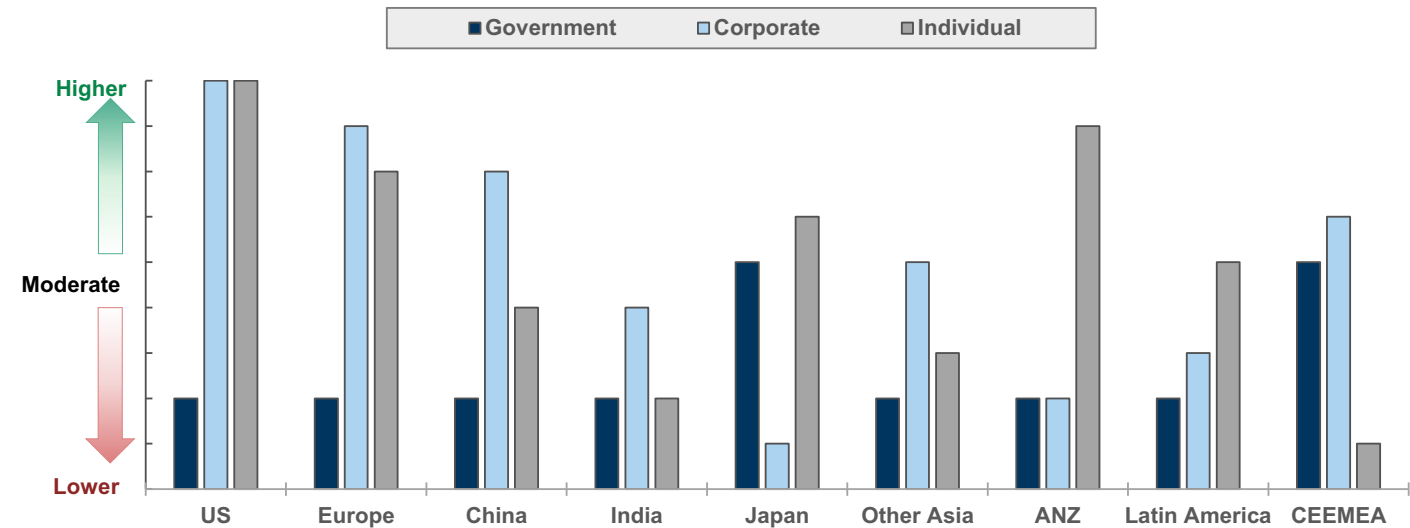
Our industry discussions suggest less confidence among investors and corporates over how aggressive Adaptation investment will actually be and whether we will see meaningful proactive investment in particular from corporates, governments and households. We believe to receive support, a given Adaptation vertical needs to meet three conditions:

- **Recognition of risk:** Sufficient consensus that a physical risk exists and that mitigation efforts should be considered.
- **Support for the mitigation plan:** Whether a proposed plan competes with other non-financial priorities (movement of properties, re-routing of roads, view impairments, etc).
- **Sufficient financial resources:** Whether there are sufficient funds and financial priorities by individuals, corporates or governments to direct on a proactive or reactive basis.

We have seen examples of projects moving forward that do check these boxes — desalination in the Philippines, water reclamation in Southern California and coastal erosion mitigation in Southern California as examples. And we also see projects not moving forward as initially planned as they meet some, but not all, of the prerequisites — protective seawall in Norfolk, VA (lack of support for mitigation plan), reservoir expansion in Santa Clara County, CA (cost/affordability concerns as well as lack of transparency on water sourcing) and refurbished seawall in Long Beach, CA (debates over sufficiency of financial resources) as examples — or are under debate based in part on costs (power line undergrounding in wildfire-hit parts of Southern California at potential cost of \$8K-\$10K per household).

Much of our below analysis is considering the financial flexibility among corporates, households and governments to invest incremental capital, based on balance sheet strength, free cash flow and other measures of spare capacity.

Exhibit 18: We see US corporates/households, ANZ/Japan households, Europe corporates/households, China/CEEMEA corporates with the greatest financial flexibility to accommodate Adaptation investment
Financial flexibility of Government, Corporate and Individuals of major economies



Levels of financial flexibility are measured by government balance as % of GDP and debt/GDP for Government (2025, GSe); total investment spare capacity for Corporate; gross disposable income per capita for Individuals

Source: Goldman Sachs Global Investment Research

Persistent vs. Transient: Some hazards may see greater likelihood of proactive investment

We believe hazards deemed by key constituents to be more persistent (vs. transient) are more likely to see proactive Adaptation investment. While there may be recognition of risk across the nine hazards we highlight — Hurricanes, earthquakes, non-coastal flood, sea level rise, wildfires, heat stress, water stress, frequency of extreme temperatures, and energy demand surge — we believe households, governments and corporates may not treat each of these hazards equally in determining interest in making proactive investment towards mitigation solutions.

Exhibit 19: We believe physical risks perceived to be more persistent may be more likely to attract proactive mitigation investment than physical risks perceived to be more transient

Physical Hazards		Potential Financial Impact	Tailwinds for Adaptation Investment		
			Proactive	Both	Reactive
Persistent (Chronic Physical Risk)	 Water Stress	- Reduced revenue from decreased production capacity (e.g., transport difficulties, supply chain interruptions) - Reduced revenue and higher costs from negative impacts on workforce (e.g., health, safety, absenteeism) - Increased operating costs (e.g., inadequate water supply for hydroelectric plants or to cool nuclear and fossil fuel plants) - Reduced revenues from lower sales/output	✓		
	 Heat Stress		✓		
	 Extreme Temperatures		✓		
	 Sea level rise/ Costal floods		✓		
Transient (Acute Physical Risk)	 Wildfire	- Write-offs and early retirement of existing assets (e.g., damage to property and assets in "high-risk" locations) - Increased capital costs (e.g., damage to facilities) - Increased insurance premiums and potential for reduced availability of insurance on assets in "high-risk" locations			✓
	 Hurricane				✓
	 Non-coastal Flood			✓	
	 Seismic			✓	
	 Energy Demand Surge			✓	

Source: US EPA, Data compiled by Goldman Sachs Global Investment Research

In particular, we see potential for differentiation based on the perception of hazards that are:

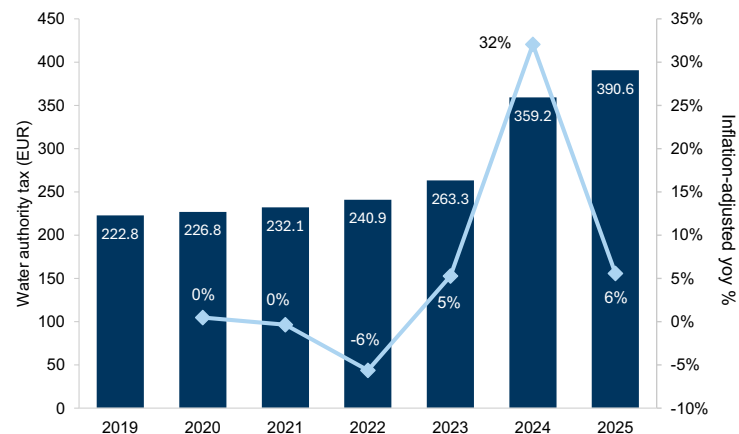
- **Transient:** Even as physical risk models suggest an increase in the number of 1-in-50- and 1-in-100-year events, we believe there may be more debates towards investing proactively in hazards that are more infrequent. While we would

put hurricanes, earthquakes, non-coastal floods, wildfires and energy demand surge into this category, in certain areas greater frequency may prompt some part proactive, part reactive response (California wildfires).

- **Persistent:** We see heat, drought and coastal floods (sea level rise) as hazards that are likely to be regarded by households, governments and corporates as more persistent which we believe is more likely to prompt proactive investment. Regional regulators and policymakers are very focused on reliability of the water and power supply, and the Reliability Imperative will likely make them more likely to approve projects (with costs passed onto customers).

Inflationary pressure most noticeable in water rates in areas where new infrastructure is being deployed. Amsterdam has been an area of longstanding water management needs driven by elevation and the series of canals in and outside the city. Amsterdam average water rates have risen ~40% above inflation in the past two years after rising cumulatively only modestly in aggregate for the prior three years. We have also seen water rates rise in San Diego to passthrough costs surrounding water procurement and infrastructure.

Exhibit 20: We believe water (and power) infrastructure is more likely to receive proactive investment to mitigate risks of floods/drought with costs passed through to customers; in Amsterdam, water taxes have moved risen meaningfully in recent years
Water authority tax in Netherlands, single tenant home (EUR)



Source: Waternet, World Bank, Goldman Sachs Global Investment Research

Adaptation solutions likely to see greater revenue tailwinds

Adaptation investments will likely be made, in our view, regardless of achieving mitigation/decarbonization goals, but we expect certain products and services to see greater short-to-mid-term support driven by:

- 1. Hazard Recognition.** Certain hazards are likely to be more widely acknowledged by affected parties the more persistent they are, e.g., heat and drought. More transient hazards, e.g., floods, fires and hurricanes, do not impact most populations on a consistent basis and therefore may be less likely to trigger recognition of a need to invest in resilience. The perception of persistence and transience of these risks is likely to vary not just by hazard, but also by location.
- 2. Cost/Benefit Analysis.** Solutions which cost the least relative to the perceived risk of the hazards they address are likely to see greater demand, in our view. Solutions that require large infrastructure-scale investments with long pay-back periods and/or have marginal perceived benefits are likely to face greater hurdles to investment. For many customers, the willingness to pay for a given adaptation solution will likely vary according the perceived frequency and scale of a hazard and can fluctuate over time. Products and services whose incremental demand is driven by a need to rebuild/recover after hazards will have the most inelastic demand, in our view.
- 3. Capacity to Pay.** The financial capacity to pay of prospective customers (Governments/Corporates/Individuals) is a critical consideration in determining which solutions are most likely to see near-term investment. Customers without the financial capacity to invest in adaptation solutions, despite their needs, will not drive demand for these products and services. Conversely, capacity to pay does not inherently guarantee that a customer will invest in adaptation solutions should they not recognize the reality of a hazard or the benefit of the solution.

We expect Adaptation solutions to see strong demand across a variety of hazards, customer verticals and geographies. Across our three customer verticals, we expect a higher likelihood of investment for the following adaptation solutions based on the above criteria.

Governments

Across all three of the below geographies we see Flooding and rising temperatures (Heat/Drought) as the most prevalent hazards that governments are likely to prioritize spending to improve resilience. Our analysis of financial flexibility based on our Economics team's forecasts implies fiscal challenges that could limit Adaptation investment from most regions. Countries/regions with relative strength include:

- **Japan:** Supportive for Diagnostic/Analytical Testing, Distributed/Backup Power, GPS/Mapping Technology, Power Transmission/Distribution, Water & Waste Management

- **CEEMEA:** Supportive for Diagnostic/Analytical Testing, Distributed/Backup Power, Environmental Control Products, GPS/Mapping Technology, Building Maintenance & Engineering, Water Infrastructure

Corporates

We see a handful of sectors (O&G Producers, Semiconductors, Tech Hardware, Capital Goods, Electric Utilities and Pharma & Biotech) as having the greatest spare capacity — from a combination of greater leverage and increased reinvestment — to invest in adaptation solutions. Given the footprints of these sectors, we believe Power and Water Infrastructure-related solutions are particularly well positioned to benefit from increased corporate spending on adaptation ([Exhibit 27](#)).

- **US:** Air Purification/Filtration, Distributed/Backup Power, Environmental Control Products, GPS/Mapping Technology, Water & Waste Management, Power Transmission/Distribution
- **Europe:** Air Purification/Filtration, Diagnostic/Analytical Testing, Distributed/Backup Power, Environmental Control Products, GPS/Mapping Technology, Power Transmission/Distribution, Water & Waste Management
- **China:** Air Purification/Filtration, Distributed/Backup Power, Environmental Control Products, GPS/Mapping Technology, Industrial Construction/ Maintenance, Power Transmission/Distribution

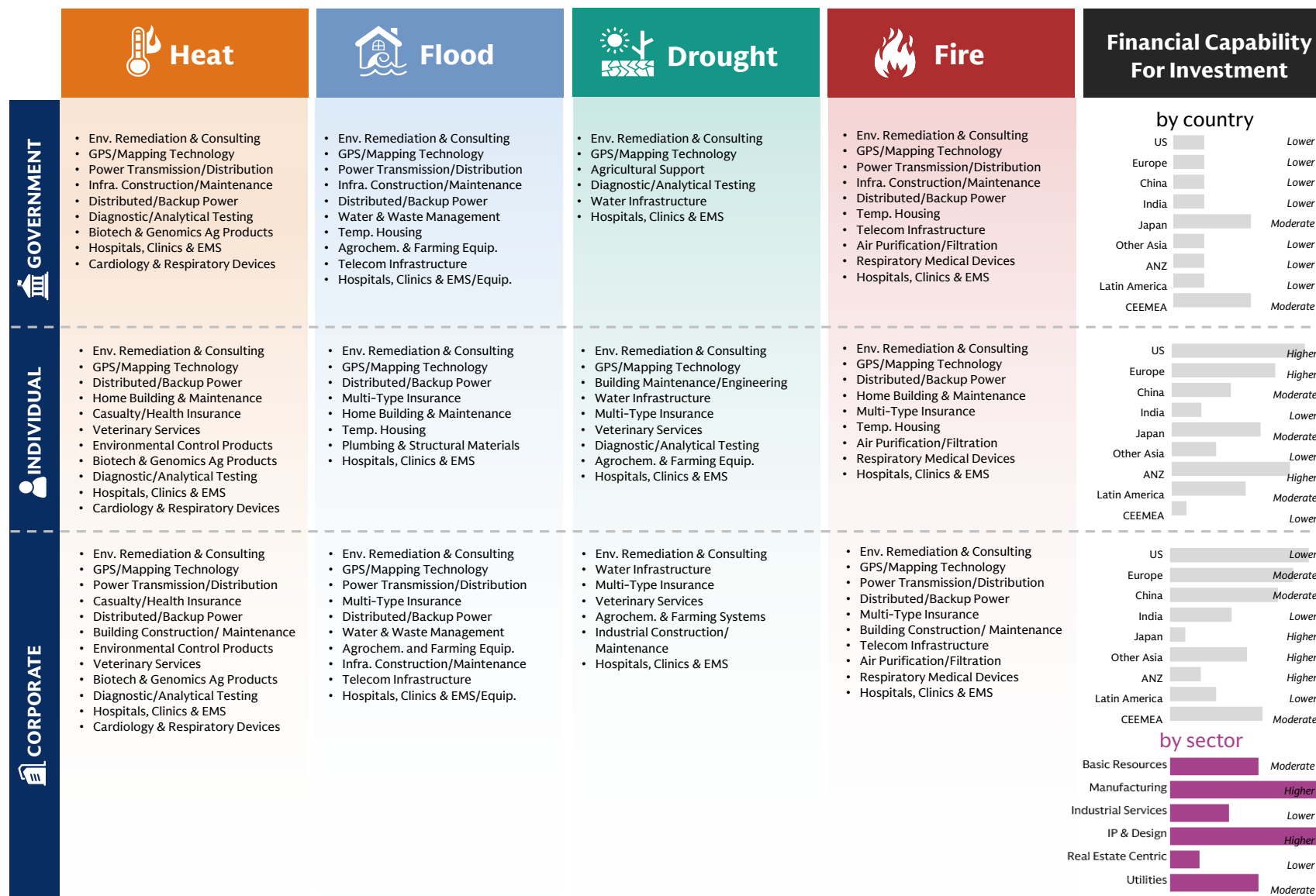
Individuals

Heat and Fire are the primary hazards that are likely to be faced by individuals across all three of the below geographies.

- **US:** Air Purification/Filtration, Distributed/Backup Power, Environmental Control Products, GPS/Mapping Technology, Home Building & Maintenance, Plumbing & Structural Materials, Veterinary Services
- **Europe:** Air Purification/Filtration, Diagnostic/Analytical Testing, Distributed/Backup Power, Environmental Control Products, GPS/Mapping Technology, Home Building & Maintenance, Veterinary Services
- **ANZ:** Diagnostic/Analytical Testing, Distributed/Backup Power, Veterinary Services

Exhibit 21: Our analysis of financial flexibility for key Adaptation related customers by region/sector for hazards that we believe will be perceived as more persistent gives us increased confidence in revenue tailwinds for mitigation solutions such as HVAC, Water/Power Infrastructure, GPS/Mapping, and Building Construction/Maintenance

Key Adaptation solutions mapped to hazard and customer type; financial flexibility by customer type by region/sector



Source: Goldman Sachs Global Investment Research

Corporate financial flexibility: What sectors and geographies have spare capacity for proactive Adaptation investment?

Leverage, Reinvestment and Spare Capacity by sector

We believe the level of corporate free cash flow and balance sheet strength are key measures of corporate financial flexibility and can help quantify how active companies could be investing to mitigate physical risks proactively or to invest once physical hazards have occurred. In our Green Capex research, we have for almost four years estimated annual “spare capacity” for corporates in relevant sectors to allocate to Green Capex without taking on new debt or issuing equity.

- Reinvestment rate: Our framework for measuring spare capacity looks at the percentage of operating cash flow + R&D reinvested back into Capex + R&D. This reinvestment rate was historically 65%-70% but has fallen in the last 10 years. Our framework considers how much more annual investment is available if companies were to reinvest 70%.
- Leverage: Our framework measuring spare capacity considers how much more annual investment is available of over a multi-year period net debt/EBITDA would move to 1.5x.

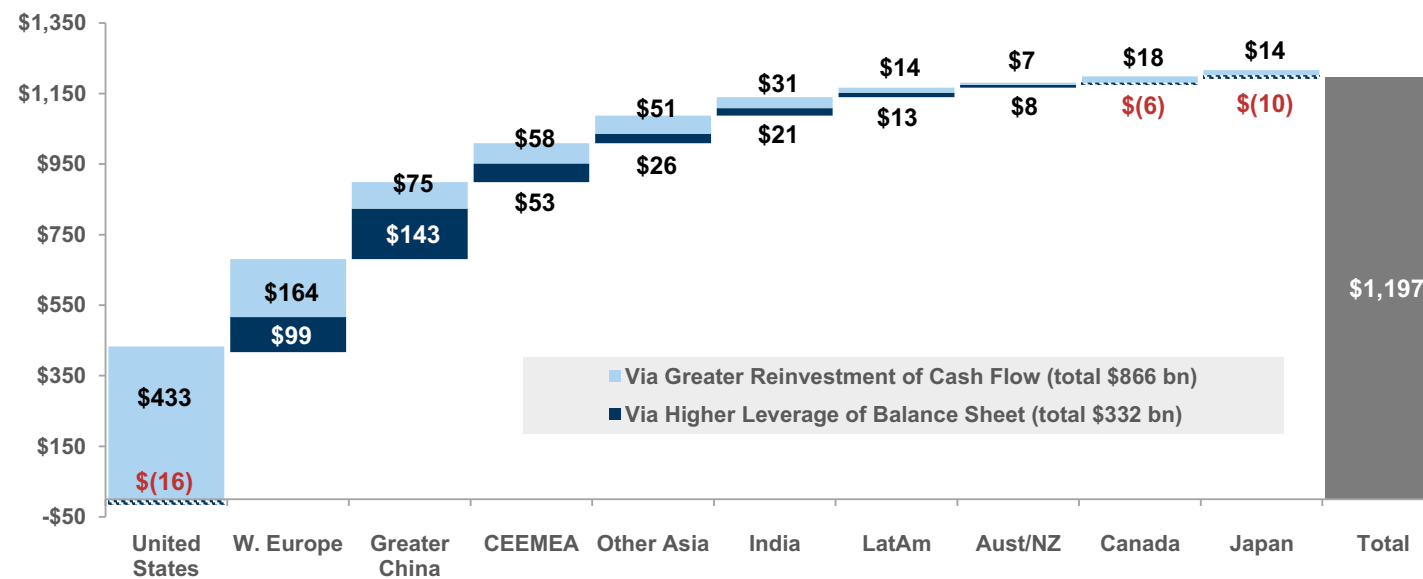
We make exceptions for the Utilities and midstream sectors given their more regulated operations which changes risk and investor tolerance for leverage and/or reinvestment rate.

Through this framework, we see corporate annual spare capacity at more than \$1 trillion. Before digging in for geographic and sectoral differentiation, this gives us confidence that corporates broadly have financial capabilities to invest proactively if they recognize a risk exists and support the mitigation plan. This also gives us confidence in the ability for corporates to react and harden infrastructure after hazards/extreme weather events occur.

We do see meaningful sectoral and geographic differentiation, however. As we show in below exhibits, corporate spare capacity is not evenly spaced sector-wise and geographically. We see greater spare capacity among sectors like **Oil & Gas, Electric Utilities, Capital Goods, Semiconductors, and Tech Hardware** among sectors heavy on fixed assets. Geographically, we see greater corporate spare capacity in the **US, greater China, Western Europe and in the Middle East.**

Exhibit 25: We see more than \$1 trillion of spare capacity for increased investment by corporates in sectors with high fixed asset intensity

Spare capacity for additional investment based on 1.5x net debt/EBITDA and 70% reinvestment rate of operating cash flow into capex + R&D (a); billions of US dollars



Spare capacity for additional investment considers potential for shift in reinvestment and tolerance for leverage. Reinvestment capacity is based on incremental capex/R&D capacity to achieve a 70% 2025E reinvestment rate of cash flow. Leverage capacity is based on incremental spending per year over remainder of decade based on difference between 2025E Net Debt/EBITDA and 1.5x. Exceptions include Utilities sector (140% reinvestment rate, 5.0x net debt/EBITDA) and Midstream (50% reinvestment rate, 5x net debt/EBITDA)

Source: Factset, Goldman Sachs Global Investment Research

Exhibit 26: Public companies domiciled in all regions are, on average, investing less than 70% of operating cash flow back into capex + R&D
 Spare capacity based on 1.5x net debt/EBITDA and 70% reinvestment rate of operating cash flow into capex + R&D; billions of US dollars

Region	Financial Strength		Spare Capacity, \$ bn		
	Leverage (2025 Net Debt to 2026 EBITDA)	Reinvestment Rate (2025)	From Rising Leverage	From Increasing Reinvestment	Total Spare Capacity
United States	1.7x	55%	-16	433	417
Canada	2.1x	62%	-6	18	12
LatAm	1.2x	66%	13	14	27
W. Europe	1.1x	63%	99	164	263
CEEMEA	0.3x	58%	53	58	111
Greater China	0.5x	67%	143	75	218
India	0.9x	59%	21	31	52
Japan	1.7x	69%	-10	14	4
Other Asia	1.3x	67%	26	51	78
Aust/NZ	0.7x	67%	8	7	15

Source: Factset, Goldman Sachs Global Investment Research

Exhibit 27: Public companies in the Oil & Gas Producers, Electric Utilities, Capital Goods, Semis and Tech Hardware sectors have the most spare capacity in aggregate

Financial strength and spare capacity for adaptation investment by sectors (1/2)

GS SUSTAIN Sector		Median Gross Fixed Asset to Revenue	Financial Strength		Spare Capacity, \$bn			Adaptation Investment		
			Leverage (2025 Net Debt to 2026 EBITDA)	Reinvestment Rate (2025)	From Rising Leverage	From Increasing Reinvestment	Total Spare Capacity	Proactive	Both	Reactive
Basic Resources	Oil & Gas Producers	5x	0.6x	60%	105	75	181	✓		
	Oil Refiners	4x	1.8x	76%	-4	-5	-9			✓
	Mining & Metals	5x	0.5x	61%	34	19	53	✓		
	Construction Materials	15x	1.5x	54%	0	8	8	✓		
	Steel	10x	1.4x	83%	2	-9	-8		✓	
	Paper & Packaging	2x	2.4x	60%	-6	4	-2		✓	
	Chemicals	20x	1.7x	69%	-5	3	-2		✓	
Manufacturing	Auto Parts	26x	0.1x	66%	17	4	21	✓		
	Automobile Manufacturers	14x	0.8x	73%	28	-14	14		✓	
	Consumer Durables	1x	0.1x	48%	11	18	29			
	Household & Personal Care	7x	0.9x	29%	8	33	41	✓		
	Food & Beverage	4x	1.7x	41%	-6	54	49		✓	
	Alcohol & Tobacco	6x	1.1x	21%	7	60	67	✓		
	Capital Goods	4x	0.8x	48%	45	99	144	✓		
Industrial Services	Airlines	7x	1.9x	89%	-6	-16	-22			✓
	Logistics & Shipping	5x	1.9x	55%	-8	20	12		✓	
	Marine Shipping	10x	-1.2x	66%	11	2	13	✓		
	Transport Infrastructure	18x	2.5x	78%	-5	-2	-7			✓
	Engineering & Construction	1x	2.1x	58%	-11	15	4			
	Oil Services	2x	0.7x	43%	5	12	17			
	Oil & Gas Midstream	3x	5.5x	53%	-21	-3	-24		✓	
Business & Consumer Services	Multi-industry Services	1x	1.6x	55%	-1	8	7			
	Professional Services	0x	1.0x	27%	5	27	33			
	Distributors	0x	2.5x	40%	-15	29	14			
	IT Services	2x	0.4x	28%	14	38	51	✓		
	Software	0x	0.0x	56%	60	52	112			
	Internet	1x	0.0x	66%	64	17	81			
	E-Commerce	0x	-0.7x	75%	65	-16	49			
	Telecom Services	8x	2.0x	55%	-43	81	38		✓	
	Media	1x	0.5x	33%	17	42	59			

Source: Factset, Goldman Sachs Global Investment Research

Exhibit 28: Public companies in the Oil & Gas Producers, Electric Utilities, Capital Goods, Semis and Tech Hardware sectors have the most spare capacity in aggregate

Financial strength and spare capacity for adaptation investment by sectors (2/2)

GS SUSTAIN Sector		Median Gross Fixed Asset to Revenue	Financial Strength		Spare Capacity, \$bn			Adaptation Investment		
			Leverage (2025 Net Debt to 2026 EBITDA)	Reinvestment Rate (2025)	From Rising Leverage	From Increasing Reinvestment	Total Spare Capacity	Proactive	Both	Reactive
IP & Design	Aerospace & Defense	1x	1.1x	50%	6	23	29			
	Semiconductors	5x	0.1x	53%	85	91	177	✓		
	Tech Hardware	5x	-0.1x	54%	89	84	174	✓		
	Brands	1x	-0.2x	30%	29	46	75			
	Med Tech	1x	1.1x	50%	10	33	43			
	Pharma & Biotech	3x	0.8x	58%	40	78	118	✓		
Real Estate Centric	Healthcare Services	1x	1.9x	35%	-5	31	26			
	Retail - Staples	3x	0.8x	57%	16	18	34	✓		
	Retail - Multiline & Specialty	1x	1.6x	35%	-1	32	31			
	Hospitality	8x	2.2x	48%	-6	13	7		✓	
	Restaurants	1x	1.6x	38%	-1	14	13			
	Gaming	3x	2.1x	50%	-4	7	3		✓	
	Real Estate	11x	6.1x	55%	-126	21	-105		✓	
Utilities	Utilities - Electric	14x	4.1x	117%	44	75	120			✓
	Utilities - Gas	9x	3.2x	79%	10	22	32			✓
	Utilities - Multi	4x	4.0x	134%	14	5	19			✓
	Utilities - Water	6x	4.5x	136%	1	0	1			✓

Source: Factset, Goldman Sachs Global Investment Research

What Federal Governments have more financial flexibility for proactive Adaptation investment?

While our physical risk mapping helps identify countries at greater physical risk in the coming years, this does not automatically build confidence in a proactive federal government investment response. For this we look for measure federal government financial flexibility based on three key measures:

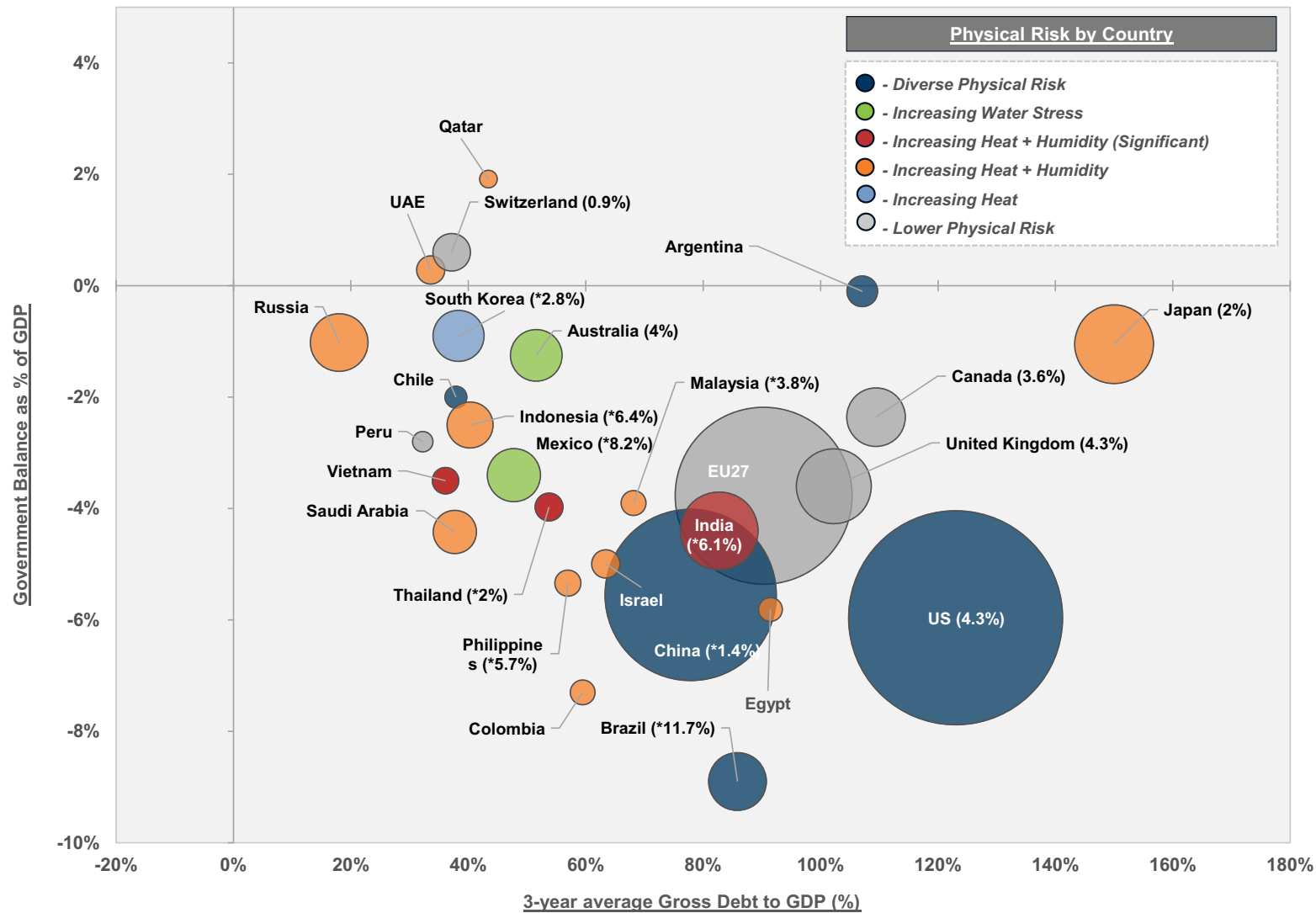
- 3-year debt to GDP.
- Extent of budget deficit or surplus spending as a % of GDP.
- Forecasted long-term 10-year government bond yield.

We believe countries with lower levels of debt/GDP, minimal deficit spending and low interest rates may be relatively more likely to proactively invest capital towards mitigating physical risk.

However, few countries screen relatively well positioned for federal government Adaptation capital allocation. Our analysis focuses on countries which are at rising physical risk of heat, heat + humidity, water stress, or multiple (diverse) among these. We consider debt/GDP as well as a screen based on government deficit spending as % of GDP vs. the 2025 forecasts of our Economics Research teams relative to 20-year country averages (excluding 2008-10 and 2020-22 to remove impact from the global financial crisis and COVID-19 pandemic, respectively); for CEEMEA economies with historical strong budget surpluses driven by oil revenues, we apply the 20-year emerging market average. **This implies that there is a relatively limited spare capacity for federal government investment, with Japan and CEEMEA areas of relative strength among countries with rising physical risk relative to the US and China.**

Exhibit 29: We see debt/GDP, annual government deficit/surplus as % of GDP and 10-year government bond yield as critical factors which can drive financial flexibility for potential proactive Adaptation investment

3-year historical average gross debt to GDP (%) vs. 2025E government balance as % of GDP by country

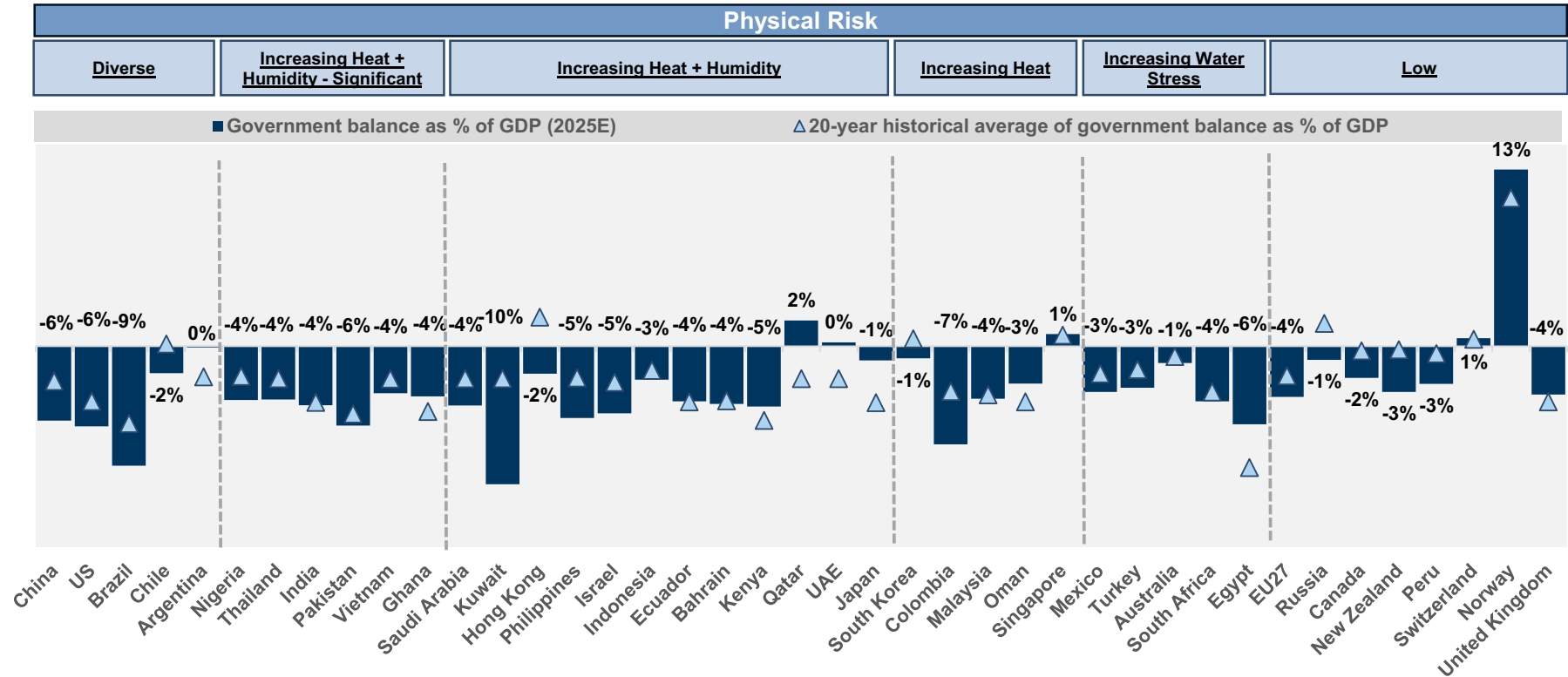


Size of the bubble indicates the scale of country's latest GDP; Country label includes 2028E 10-yr treasury yield in the brackets where GS estimates are available; *denotes Bloomberg consensus estimates of 10-yr treasury yields by 4Q27

Source: McKinsey, World Bank, Bloomberg, Goldman Sachs Global Investment Research

Exhibit 30: Our economists forecasts imply most governments globally are operating under wider deficits in 2025 than 20-year historical averages

Government balance as % of GDP, 2025, GSe

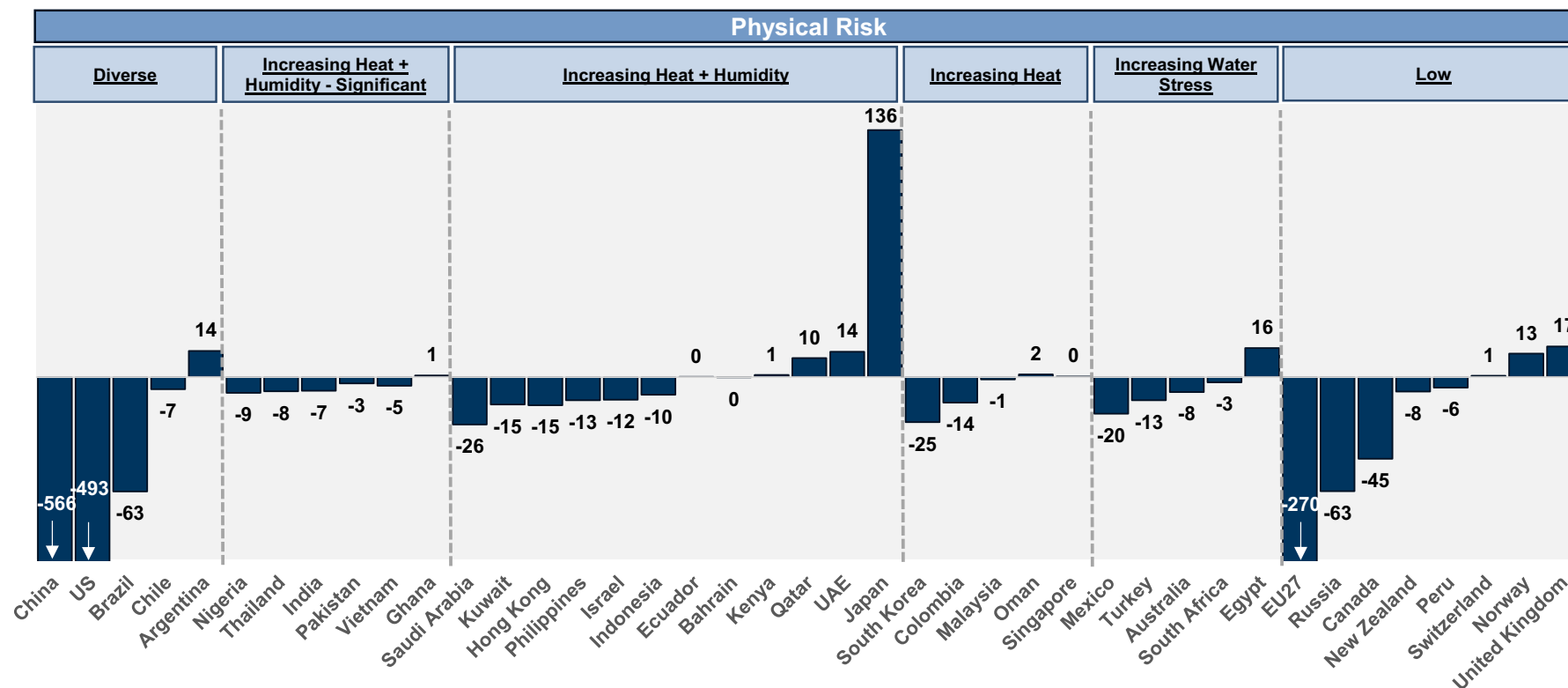


For Qatar, UAE, Kuwait and Saudi Arabia, triangles represent 20-year average government balance % of broader EM. We exclude 2008-2010 and 2020-2022 periods to mitigate the distortion caused by global financial crisis and COVID

Source: McKinsey, World Bank, Goldman Sachs Global Investment Research

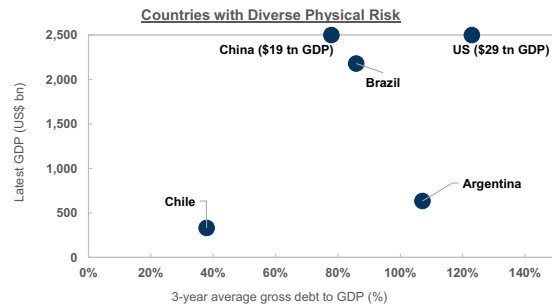
Exhibit 31: A scenario where countries were to run deficits based on 20-year historical averages implies more substantial spare capacity for proactive federal government Adaptation investment by Japan than for the US, China and EU27

Implied annual spare capacity available for investments from global governments (billions of US dollars) based on parameters of 20-year average government deficits as % of GDP, 2025

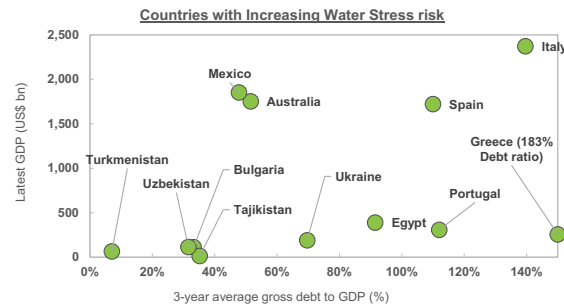


For Qatar, UAE, Kuwait and Saudi Arabia, we calculate spare capacity assuming government deficit reached 20-year average for broader EM; for all countries, we exclude 2008-2010 and 2020-2022 periods from calculating historical averages to mitigate the distortion caused by global financial crisis and COVID.

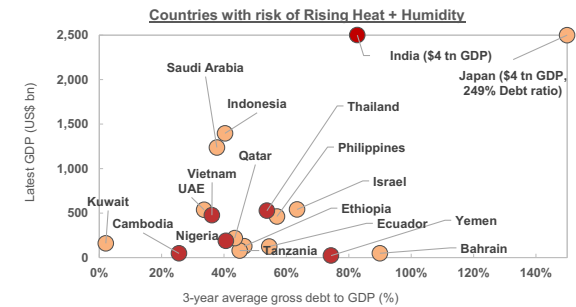
Source: McKinsey, World Bank, Goldman Sachs Global Investment Research

Exhibit 32: Countries with diverse physical risk: Latest GDP (current) and gross debt to GDP ratio

Source: McKinsey, World Bank, Goldman Sachs Global Investment Research

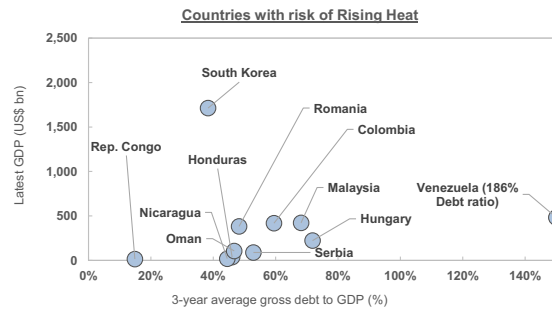
Exhibit 33: Countries with increasing Water Stress risk: Latest GDP (current) and gross debt to GDP ratio

Source: McKinsey, World Bank, Goldman Sachs Global Investment Research

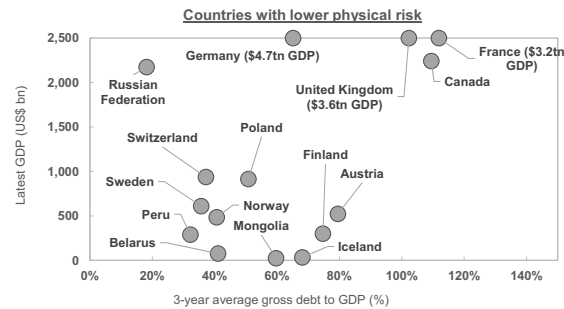
Exhibit 34: Countries with varying levels of risk of Rising Heat + Humidity: Latest GDP (current) and gross debt to GDP ratio

Red dots represent countries with significant risks of Rising Heat and Humidity.

Source: McKinsey, World Bank, Goldman Sachs Global Investment Research

Exhibit 35: Countries at risk of Increased Heat: Latest GDP (current) and gross debt to GDP ratio

Source: McKinsey, World Bank, Goldman Sachs Global Investment Research

Exhibit 36: Countries with lower physical risk: Latest GDP (current) and gross debt to GDP ratio

Source: McKinsey, World Bank, Goldman Sachs Global Investment Research

Country Level Physical Risk Categorization

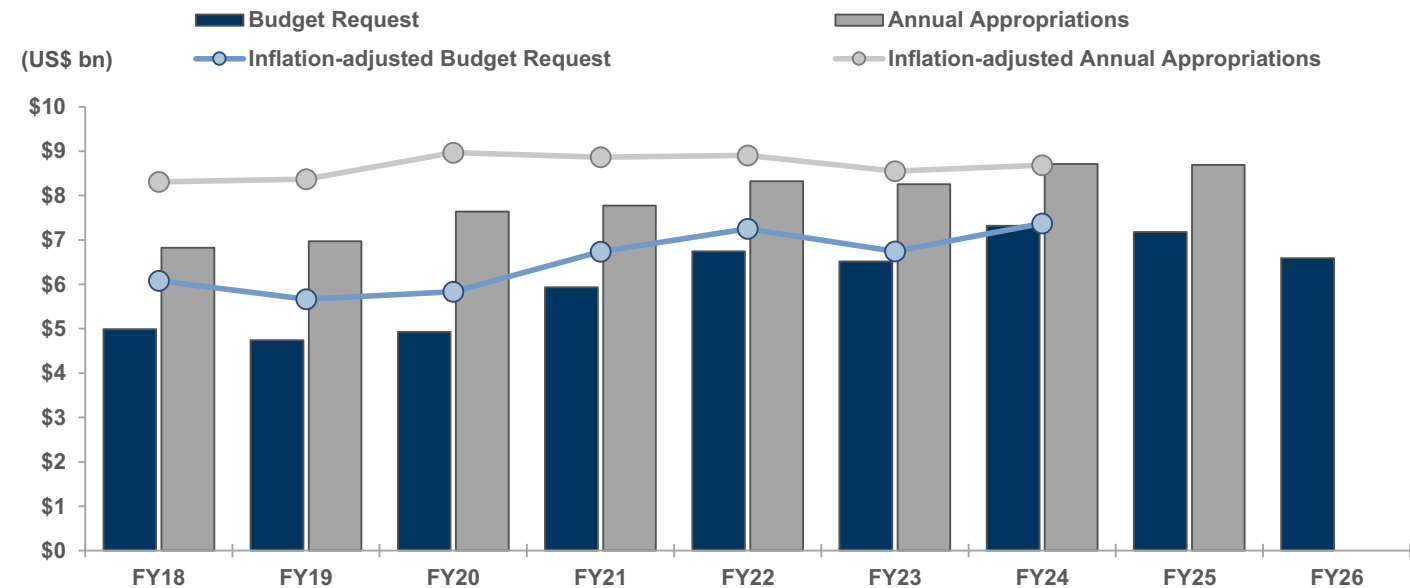
Our country level physical risk analysis leveraged the categorization from **McKinsey Global Institute's 2020 report: Climate risk and response: Physical hazards and socioeconomic impacts**, which grouped global countries into six cohorts depending on the patterns of physical risk increase under RCP 8.5 Climate Scenario.

- **Countries with risk of significant heat and humidity:** Countries located near the equator in Asia, Africa and Persian Gulf, which are expected to experience extreme increases in heat and humidity by 2050. Both the workability and livability would be at risk for the significant increase of heat and humidity. Typical countries include India, Thailand, Vietnam and Cambodia.
- **Countries with risk of heat and humidity:** Countries typically sit between the equator and the 30-degree north and 30-degree south lines of latitude, that would face material increase in heat and humidity which potentially draws impact on workability but may not become so hot or humid that exceed livability thresholds. Typical countries include Japan, the Philippines, Indonesia and Saudi Arabia.
- **Countries with risk of increased heat:** Countries located near the equator that would face material increasing temperature but not necessarily increasing humidity. Some countries could become substantially drier and see increased water stress. Typical countries include Japan, the Philippines, Indonesia and Saudi Arabia. Typical countries include South Korea, Colombia, the Democratic Republic of Congo, and Malaysia.
- **Countries with risk of water stress:** Countries intersect the 30-degree north or south line of latitude, that would face a large increase in water stress and drought frequency, as well as the largest increases in biome change. Typical countries include Southern European countries i.e. Spain, Italy, Portugal, Greece, as well as Australia, Egypt and Mexico.
- **Countries with lower physical risk:** Most of the Western European countries would fall into lower-risk increase group, as well as Russia, Canada and Peru. These countries are expected a very low levels of heat and humidity impacts and many countries are also expected to see decreases in water stress and drought duration. They are also potentially at risk of biome change if polar and boreal climates retreat.
- **Countries with diverse drivers of risk:** US, China, Argentina, Brazil and Chile are climatically heterogeneous since their lands span a large range of latitudes. Despite on average numbers may suggest small risk increases, they could mask wide regional variations. The United States, for example, has a hot and humid tropical climate in the Southeast, which could see dramatic increases in heat risk to outdoor work but is not projected to struggle with water scarcity. The West Coast region, however, may not see a big increase in heat risk to outdoor work, but could struggle with water scarcity and drought. In Alaska, a primary risk is the shifting boreal biome and the attendant ecosystem disruptions.

At the US federal government level, proactive Adaptation investment comes largely from the Army Corps of Engineers. As seen below, on an inflation adjusted basis, USACE appropriations have historically been around \$8-\$9 bn, funded via the federal budget and subsequent appropriations (in recent years, the budget has funded about 80%-85% of total). The 2026 FY budget request of \$6.7 bn represents a decrease yoy vs. the budget request and would require a larger

supplemental appropriations adjustment to accommodate flat or rising yoy total on a nominal basis.

Exhibit 37: US Army Corps of Engineers FY26 budget is down meaningfully yoy; as a result significant additional appropriations would be needed to be flat or up yoy
Annual USACE Budget Requests and Appropriations, FY2018-FY2026, billions of US dollars



Source: USACE, Congressional Research Service (CRS), Goldman Sachs Global Investment Research

What US state/local governments have more financial flexibility for Adaptation investment?

We believe there will be pressure on state and local governments with physical risk — particularly to manage heat and flood control — to consider Adaptation related investment, but financial flexibility varies significantly. Our analysis of state and local government financial flexibility by state is based on US Census Bureau data from 2022. We look at two key metrics — debt/GDP and the interest expense to service debt as a percentage of tax revenues. We see substantial disparities between state and local governments, with financial flexibility for states largely better relative to localities in the same state based on the metrics above.

- California, New York, Hawaii and Colorado, are largely above the US average at both the state and local level for both debt/GDP and interest as percentage of tax revenue.
- Among states with higher physical risk or where we have seen recent extreme weather events, we see lower debt/GDP among states/localities in Arizona, Florida, North Carolina and, at the state level, Texas and Nevada ([Exhibit 38](#)).
- Among states with higher physical risk or where we have seen recent extreme weather events, we see relatively more flexibility to service more debt vs. tax revenue among states/localities in Arizona, North Carolina and Mississippi and, at the state level, Texas and Kentucky ([Exhibit 39](#)).

Exhibit 38: Among states with higher physical risk or where we have seen recent extreme weather events, we see lower debt/GDP among states/localities in Arizona, Florida, North Carolina and, at the state level, Texas and Nevada; California's state debt/GDP is modestly above country average
 State and local level total debt as % of GDP (current price), 2022

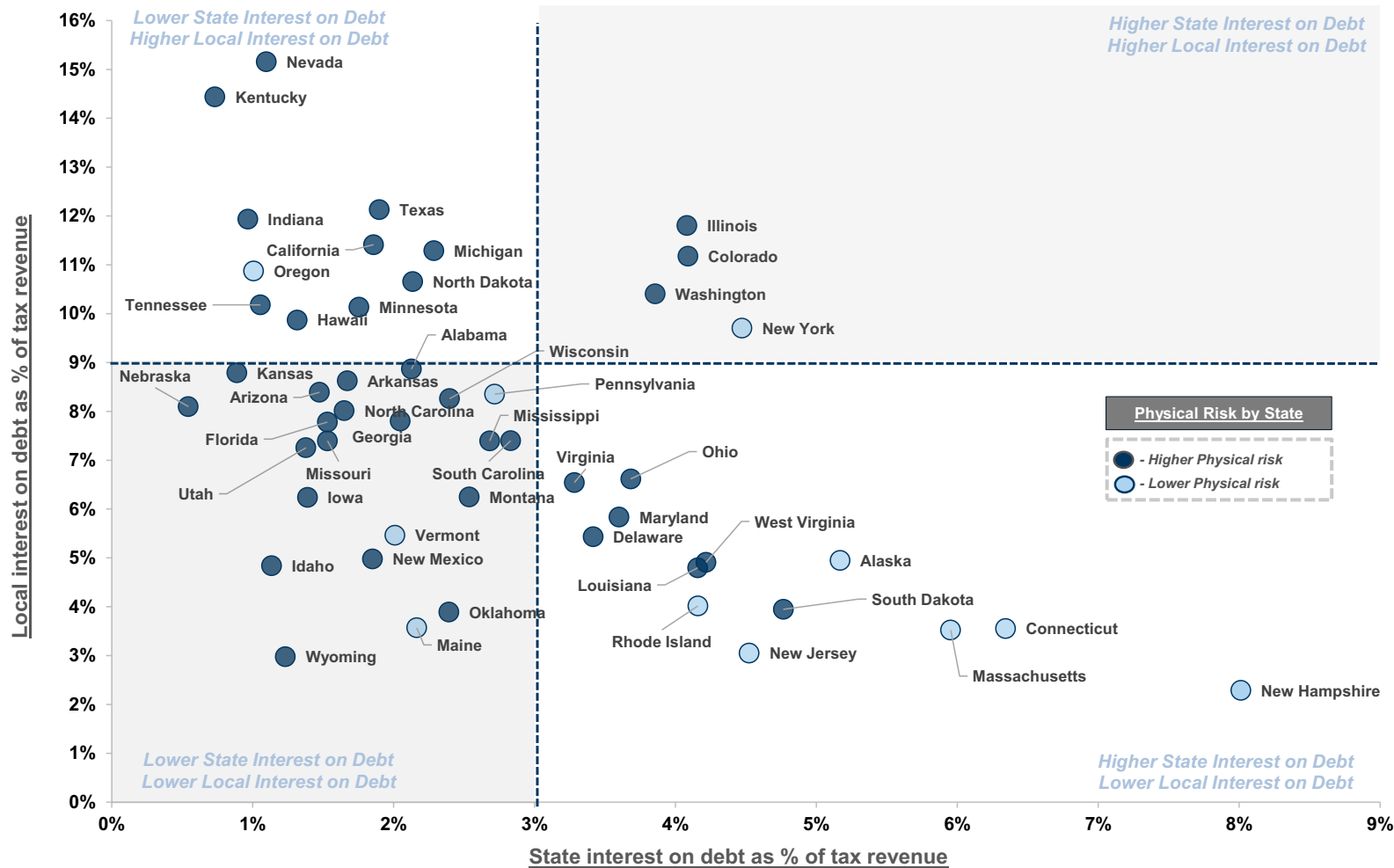


Dotted lines represent US average; higher physical risk includes states where risk levels are extremely high to at least one physical hazard for 50% or more of counties by area. *West Virginia state-level debt is 20% of GDP.

Source: Census Bureau, U.S. Bureau of Economic Analysis (BEA), Goldman Sachs Global Investment Research

Exhibit 39: Among states with higher physical risk or where we have seen recent extreme weather events, we see relatively more flexibility to service more debt vs. tax revenue among states/localities in Arizona, North Carolina and Mississippi and Florida

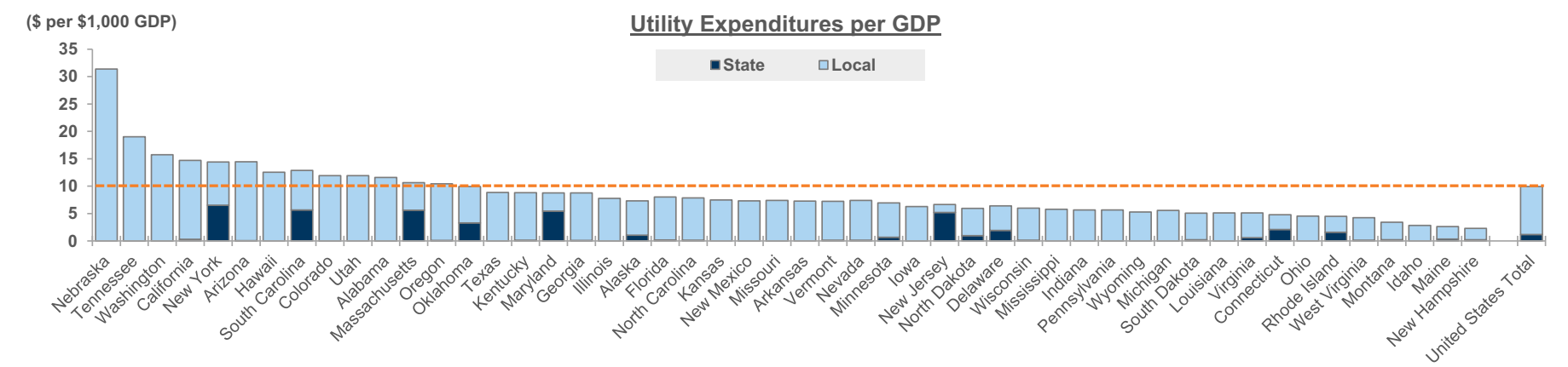
State and local level total interest expense on debt as a percentage of tax revenue, 2022



Dotted lines represent US average; higher physical risk includes states where risk levels are extremely high to at least one physical hazard for 50% or more of counties by area.

Source: Census Bureau, U.S. Bureau of Economic Analysis (BEA), Goldman Sachs Global Investment Research

Exhibit 40: Relative to GDP, state/local expenditures on utilities are highest in Nebraska, Tennessee, Washington (state), California and New York; lowest in New Hampshire, Maine, Idaho, Montana and West Virginia
State and local level utility expenditures per thousand \$ of GDP (current price), 2022



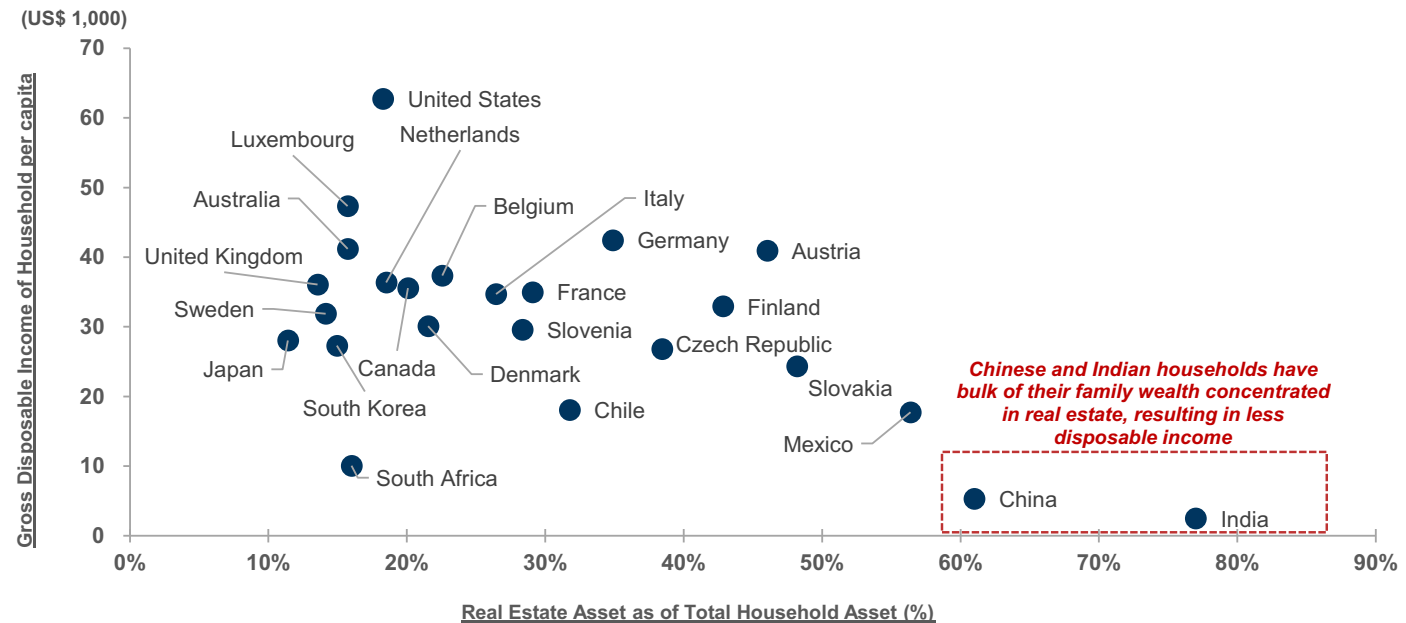
Source: Census Bureau, U.S. Bureau of Economic Analysis (BEA), Goldman Sachs Global Investment Research

What countries' households have financial flexibility?

The third key customer base to potentially invest in proactive and/or reactive Adaptation verticals is households. We expect household Adaptation investment may favor less capital-intensive projects/verticals vs. highly capital intensive projects. To analyze ability to pay, we look at disposable income per capita trends as well as the percentage of household assets that are in real estate. We believe more liquid assets and greater disposable income is likely to drive greater financial flexibility.

Exhibit 41: We see households in the US, Australia and much of Europe as having relatively more financial flexibility based on percentage of assets in real estate combined with disposable income

Real estate asset as of total household asset, 2023 Gross disposable income of household per capita by country, 2023, US\$ 1,000 per capita for y axis, PPP converted, current prices



Source: OECD, National Bureau of Statistics of China, Goldman Sachs Global Investment Research

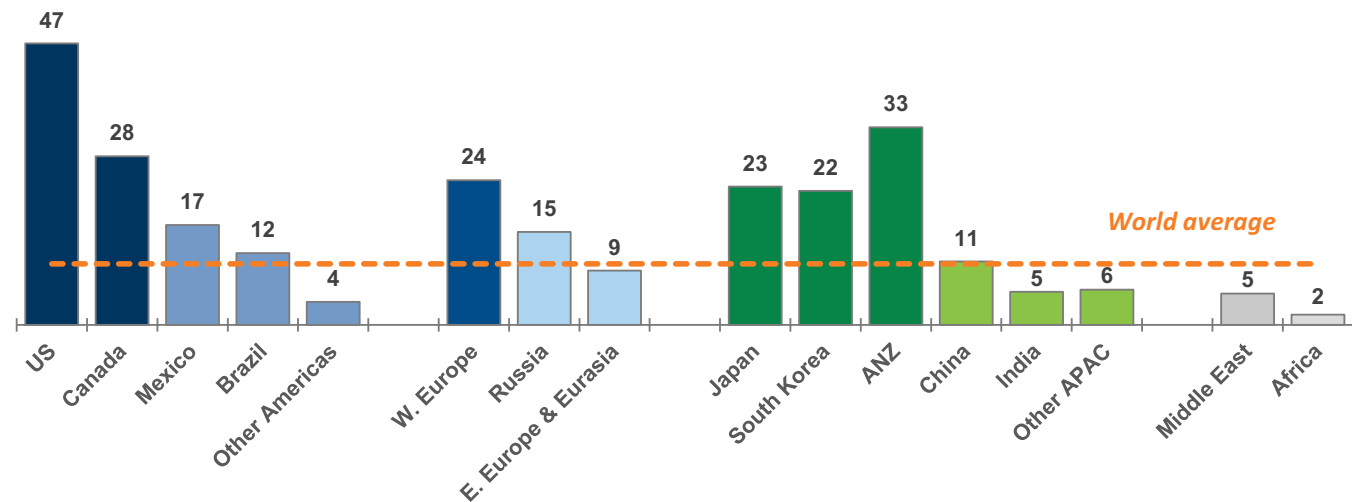
Our analysis suggests the US, Australia, UK, BeNeLux and Canada have greater flexibility relative to China, India and much of the rest of the OECD. We believe this is likely to make consumers in these regions more likely to spend proactively or reactively on Adaptation initiatives.

Notably, in the US there is a wide income gap which could result in differentiated willingness to invest proactively. In the US, 37% of home maintenance, repairs and insurance expenditures in 2023 were from the top 20% income earning households vs. 9% from the bottom 20%. This represented 2% of household income for the top 20% of income earning households vs. 8% for the bottom 20%. We see even wider disparities in food and energy costs as percent of household income.

Exhibit 42: We see large disparity of gross disposable income per capita between developed and emerging economies

World disposable income per capita by region (2022), US dollars per capita

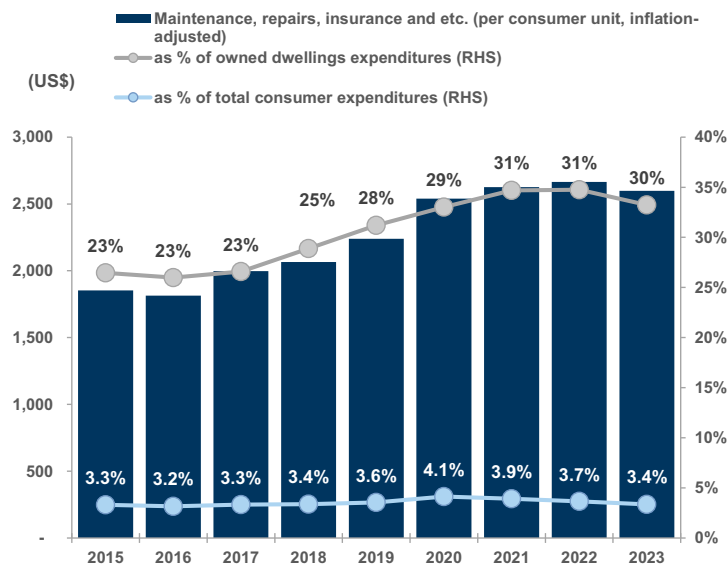
(US\$ 1,000 per capita)



Source: U.S. Energy Information Administration, Data compiled by Goldman Sachs Global Investment Research

Exhibit 43: Expenditures on owned dwellings' maintenance, repairs and insurance typically represent 3%-4% of total consumer expenditures for US households and about 30% of owned dwellings housing expenditures, relatively consistent in recent years

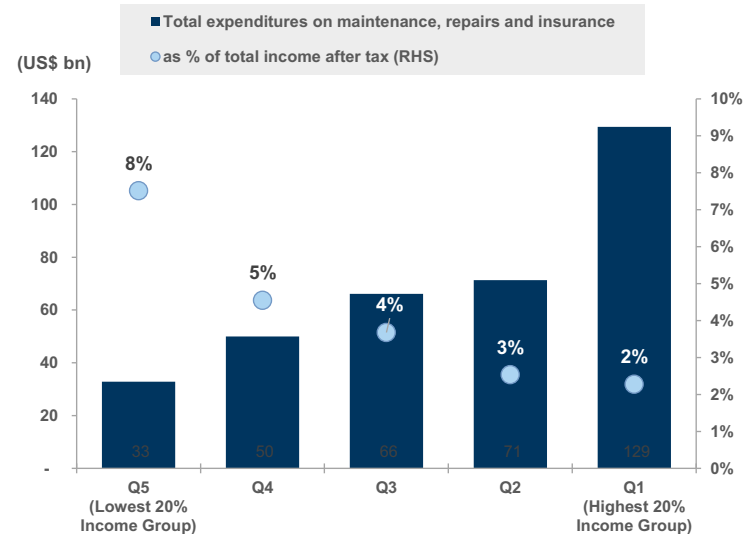
Annual owned dwellings' maintenance, repairs and insurance expenditures per consumer unit in the US, 2023 price



Source: US Bureau of Labor Statistics, Goldman Sachs Global Investment Research

Exhibit 44: Expenditures on home maintenance, repairs and insurance represent 4 times higher portion of total incomes for the lowest income quintile versus the highest

Total expenditures on maintenance, repairs and insurance, US billion, 2023



Source: US Bureau of Labor Statistics

Air Conditioning case study: Significant potential demand growth at intersection of Adaptation + No Poverty goals

Adaptation — along with broader EM economic growth — should add tailwinds for secular HVAC demand growth.

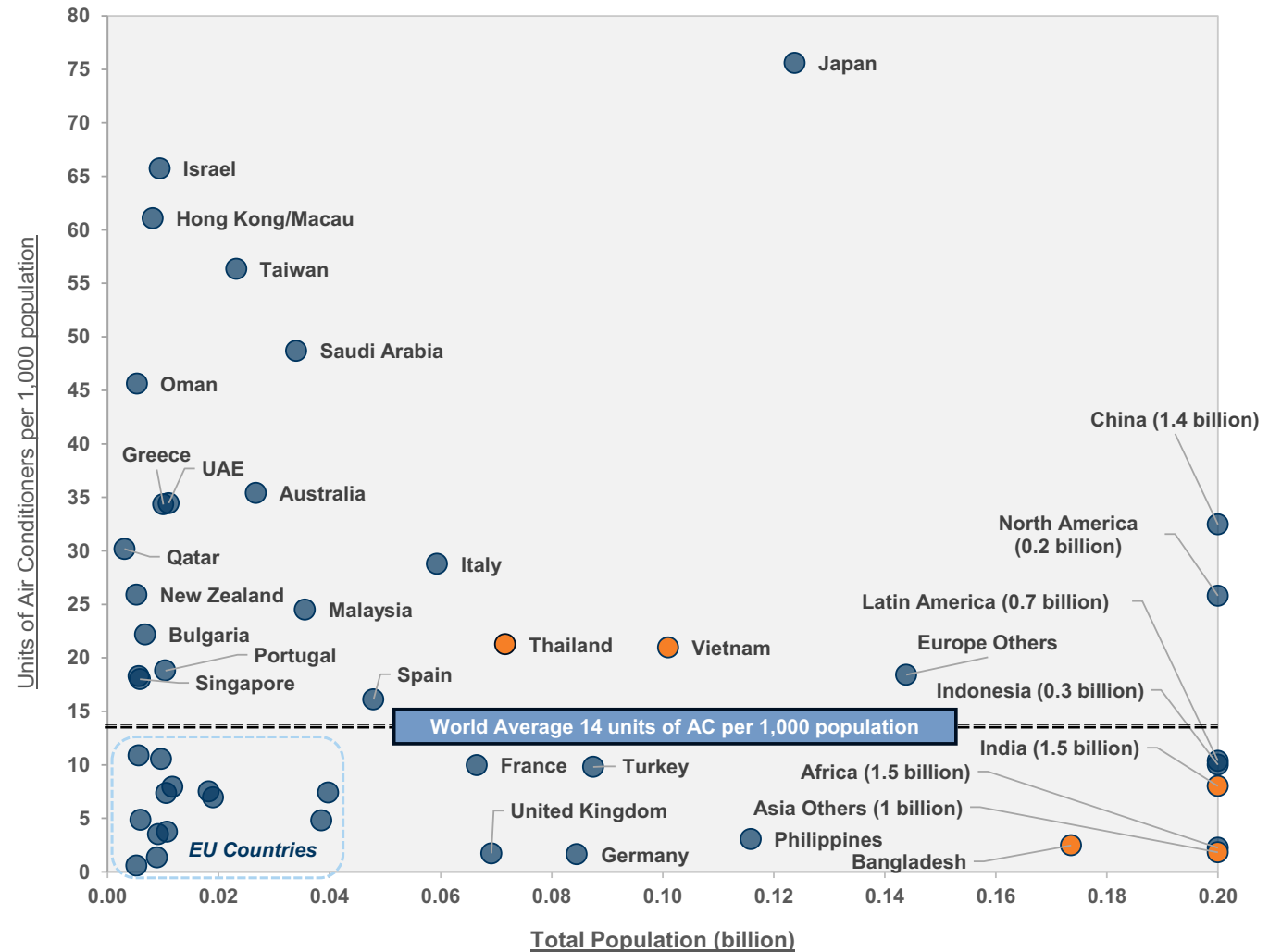
Rising global temperatures and the potential for more frequent heat waves is likely to be a key contributing factor to a significant increase in demand for HVAC systems, particularly air conditioning, in our view. This trend is expected to lead to incremental energy consumption in the residential sector and puts further upward pressure on power demand growth with risks of straining power grids during peak heatwave periods. Statistics from the [Japan Refrigeration and Air Conditioning Industry Association \(JRAIA\)](#) suggests the number of household HVAC units increased to 114 million units in 2024 (+7% yoy), and the HVAC density rose to 13.9 units per 1,000 capita globally (+6% yoy).

Asia is the largest residential HVAC consumer globally, accounting for ~60% of global demand in 2024. We see multiple factors driving tailwinds for HVAC demand in Asia — higher/more volatile temperatures, progress of urbanization, household disposable income and population growth could drive greater HVAC density per capita. We currently see a significant disparity in HVAC intensity between developed and developing Asian economies, which could narrow if the key drivers mentioned above are seen disproportionately in emerging markets.

- **Developed Asia** stands out with the highest household HVAC units ownership globally. Japan, for instance, boasted an HVAC per 1,000 capita of 76 in 2024 ([Exhibit 45](#)), followed by Hong Kong/Macau (61) and Taiwan (56).
- **Developing Asian economies** like mainland China, Vietnam, and Thailand, while starting with lower HVAC densities, showcased a rapid increase in adoption. China's HVAC per 1,000 capita ascended significantly from 28 in 2022 to 35 in 2024, rising as the largest market in terms of absolute HVAC units consumption with swift urbanization and prosperity over the years.
- **India and Bangladesh**, on the other hand, despite rapid momentum in HVAC density, remain significantly lower than global averages (8.0 in India and 2.5 in Bangladesh versus 13.9 globally). As we previously discussed, India faces risk of extreme increases in heat and humidity by 2050 that have the potential to impact both workability and livability. **If India and Bangladesh were to see air conditioning intensity rise to the level of Thailand/Vietnam, this would imply 46 TWh of additional electricity demand. This would be the equivalent of adding another New Zealand, the 60th largest power-consuming country.**

Exhibit 45: We see rising temperatures potentially driving increased HVAC demand in Europe and Asia; India and Bangladesh, which both face significant temperature and humidity rises, could see material increases also driven by broader economic/wage growth

Units of household air conditioners per 1,000 population by country, 2024

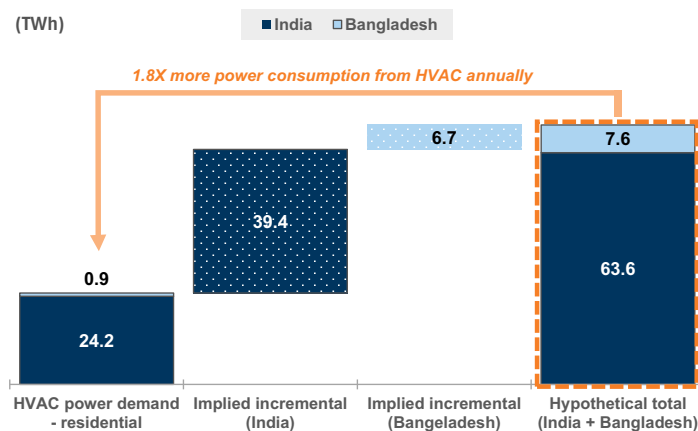


Orange dots represent countries that would face significant temperature and humidity rises

Source: Japan Refrigeration and Air Conditioning Industry Association, United Nations, McKinsey, Goldman Sachs Global Investment Research

Exhibit 46: India and Bangladesh's residential HVAC power consumption would increase 1.8x if their HVAC per capita level reached to same as Thailand & Vietnam's average

Current (2024) and hypothetical power consumption from HVAC in India and Bangladesh, TWh



We assume 1,600 hours annual running time for HVAC unit and 1,300 watts of rated cooling capacity per AC

Source: Japan Refrigeration and Air Conditioning Industry Association, IEA, Electrical & Mechanical Services Department of Hong Kong, Goldman Sachs Global Investment Research

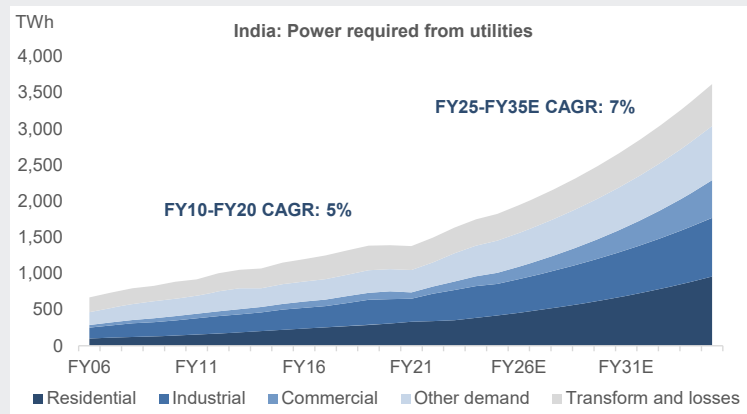
India: The Great Energy Climb

Our APAC Energy team raised India's power demand outlook in its June 2025 report, The Great India Energy Climb. Our analysts re-examined India's power demand potential and raise the FY25-FY35E demand growth CAGR to 7.2% (vs. prior 5.6%) for power required from utilities ([Exhibit 47](#)). In the team's view, this mainly reflects higher power-to-GDP elasticity assumption now at an average of 1.06 (vs. prior 0.85) over FY26-FY35, while our economists view long-term GDP growth potential at 6.7%. Compared with the team's previous approach which assumed the power-to-GDP elasticity to stay around the historical average level, our analysts establish new anchors for residential and industrial demand growth expectations, based on historical experience of economies at similar GDP per capita levels to those of India.

Residential power demand: Adoption an S-shape curve approach. Utilizing data from 60 economies, our analysts derive the S-shaped curve for residential power demand ([Exhibit 48](#)). The team notes residential power demand has a tighter relationship with GDP per capita than industrial demand (across the sample economies, 1 standard deviation is around 40%-50% of average for residential power demand vs. 60%-70% for industrial), potentially because residential power demand is subject to fewer variables other than household income accumulation. Our analysts conservatively assume India's residential power demand growth path to trace below the typical S-curve, considering the near-term macro

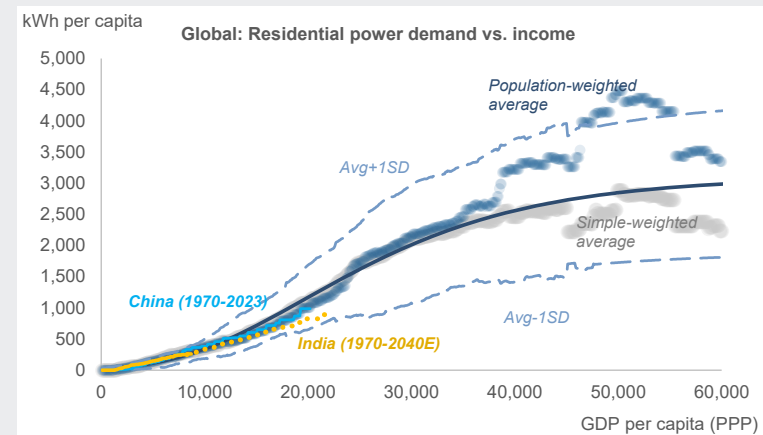
uncertainty, and reach 690 TWh by 2030 and 956 TWh by 2034 from 353 TWh in 2023.

Exhibit 47: Our APAC energy team sees FY25-FY35E demand growth CAGR of 7.2% for India power required from utilities



Source: CEA, Goldman Sachs Global Investment Research

Exhibit 48: Utilizing data from 60 economies forms our APAC Energy team's S-shaped curve for residential power demand



Source: Respective government statistics agencies, Maddison Project Database 2023, CEIC, Goldman Sachs Global Investment Research

Insurance case study: Cyclical pricing relief may improve affordability, drive greater demand

This section is authored by
Robert Cox and Michael
Mennona, North America
Insurance Analysts

Cyclical pricing relief may drive greater interest to mitigate transient physical risks, but longer term catastrophe cost trendline could be above CPI. Pricing deceleration and/or declines for certain property insurance products could allow business' and/or households to purchase more protection near-term, but they could also elect to harvest savings after years of pricing increases. Longer term, pricing will be determined by loss (weather/catastrophe) activity, which has resulted in above-CPI insured claim costs over the past 30+ years.

Following several years of pricing increases, property insurance and reinsurance (insurance for insurance companies) is generally seeing lighter pricing conditions. This is resulting in pricing declines for large companies, wind exposed property, earthquake insurance, and high hazard property insurance (excess & surplus lines). The pricing declines are being driven by increased competition amongst insurance companies, which have seen above-average actual and expected underwriting profitability ([Exhibit 51](#)). Since 2019, these products have generally been in a firming or hard market ([Exhibit 49](#)), characterized by pricing increases and tightened terms and conditions, and supported by rising catastrophe losses and higher average replacement cost inflation. Today, replacement cost inflation has decelerated from heightened levels, and pricing actions taken have restored profitability. **Looking forward in 2026, we generally see property insurance prices continuing to soften absent changes in the replacement cost trajectory or an above-average level of catastrophe losses.**

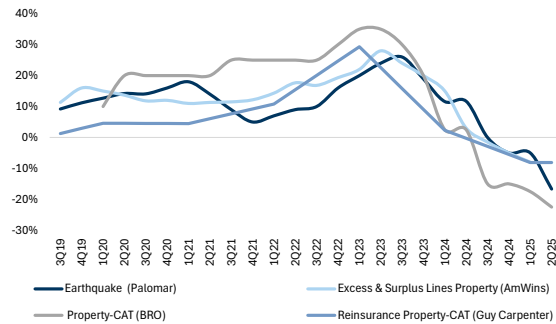
We think businesses (versus consumers) are most likely to buy increased insurance protections in this environment considering steeper pricing relief, but we have also heard commentary from insurance industry participants that many businesses are electing to harvest savings after years of pricing pressure on insurance. From a consumer perspective, prices are generally still increasing, and combined with a generally lower focus on risk management, we would expect less incremental buying. From a peril perspective:

- U.S. southeast wind exposed property is seeing amongst the greatest pricing decreases (20%+ declines in some cases, according to insurance broker BRO).
- Earthquake insurance is also seeing price decreases in the 10%+ range, supported by strong profitability due to several years without a significant U.S. earthquake losses.
- Wildfire pricing is currently mixed, with strong price increases in California following the [LA Fires](#) earlier in the year - but our sense is these pricing conditions have generally not sparked a greater view of risk or increased pricing in other states.
- Flood Insurance in the United States is primarily issued by the National Flood Insurance Program (NFIP) which is managed by the Federal Emergency Management Agency (FEMA). Flood insurance prices have been deemed to be

actuarially under-priced and currently undergoing a multiyear effort to increase prices to reflect risk. As such we expect flood insurance prices to increase MSD+ for the foreseeable future.

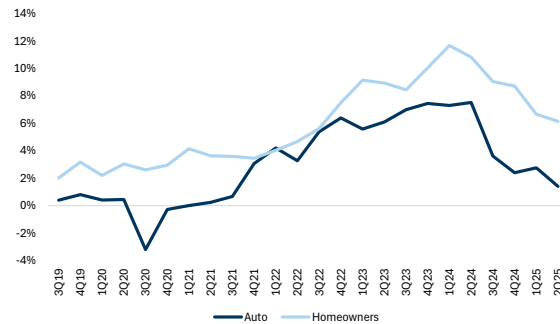
Exhibit 49: Business insurance pricing for weather-related protection has generally seen pricing relief in recent periods ...

Business Insurance Pricing YoY % for various property insurance protection



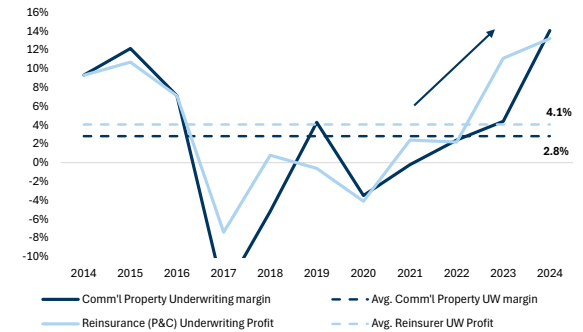
Source: Company data, Data compiled by Goldman Sachs Global Investment Research

Exhibit 50: ... While consumer insurance (particularly home) is still seeing price increases, but at a decelerating rate
Consumer (auto + home) Insurance Pricing with catastrophe exposure



Source: S&P Global Market Intelligence, Goldman Sachs Global Investment Research

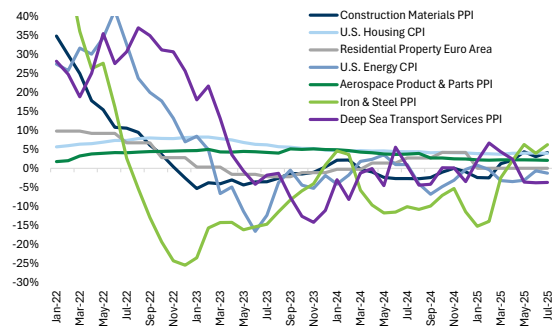
Exhibit 51: Pricing is decelerating due to improvements in insurer profitability, above longer-term average levels
Underwriting profit % (as a % of premium) for Commercial property Insurance and Reinsurance Compared to 10-year average



Source: S&P Global Market Intelligence, Company data, Goldman Sachs Global Investment Research

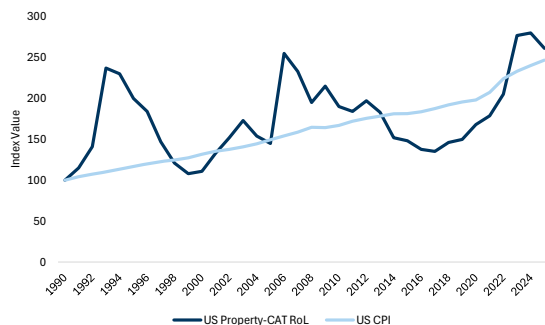
Exhibit 52: This has been supported by decelerating replacement costs

Underlying Property Claim Cost Components



Source: BLS, Bank for International Settlements, Goldman Sachs Global Investment Research

Exhibit 55: ... Which has resulted in above-CPI increases to Property CAT Reinsurance costs, albeit with pricing volatility

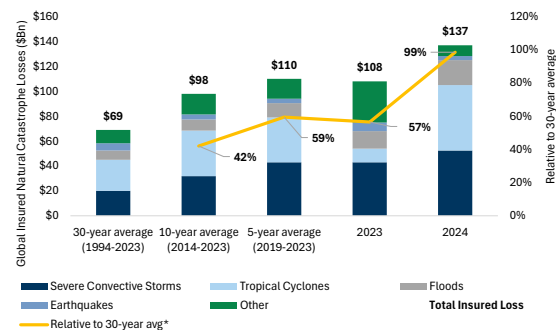


Guy Carpenter Global Property Catastrophe Rate-on-line index.

Source: BLS, Company data, Goldman Sachs Global Investment Research

Exhibit 53: Longer term, insured losses from catastrophes have increased materially, driven by increasing frequency/severity of weather and population shifts to CAT prone geographies

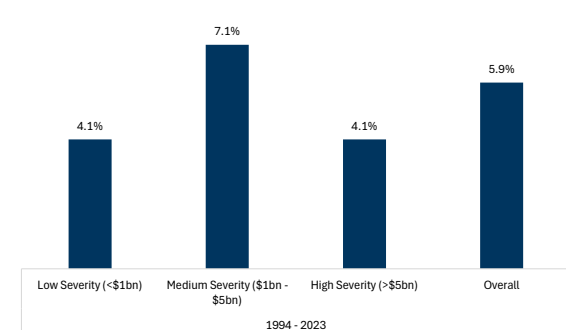
Global Insured Natural Catastrophe losses (USD \$ bn, 2024 prices)



Source: Swiss Re Institute, Data compiled by Goldman Sachs Global Investment Research

Exhibit 54: Global Insured Catastrophe losses have increased at a ~6% long term rate ...

Global Insured Catastrophe Losses Annual Growth Rate



Source: Swiss Re Institute, Goldman Sachs Global Investment Research

Disclosure Appendix

Reg AC

We, Brian Singer, CFA, Brendan Corbett, Xavier Zhang, Robert Cox, Varsha Venugopal, Evan Tylenda, CFA, Michael Mennona, Grace Chen and Shubham Jain, hereby certify that all of the views expressed in this report accurately reflect our personal views about the subject company or companies and its or their securities. We also certify that no part of our compensation was, is or will be, directly or indirectly, related to the specific recommendations or views expressed in this report.

We, Dan Duggan, Ph.D. and Dhruv Goyal, hereby certify that all of the views expressed in this report accurately reflect our personal views, which have not been influenced by considerations of the firm's business or client relationships.

Unless otherwise stated, the individuals listed on the cover page of this report are analysts in Goldman Sachs' Global Investment Research division.

GS Factor Profile

The Goldman Sachs Factor Profile provides investment context for a stock by comparing key attributes to the market (i.e. our universe of rated stocks) and its sector peers. The four key attributes depicted are: Growth, Financial Returns, Multiple (e.g. valuation) and Integrated (a composite of Growth, Financial Returns and Multiple). Growth, Financial Returns and Multiple are calculated by using normalized ranks for specific metrics for each stock. The normalized ranks for the metrics are then averaged and converted into percentiles for the relevant attribute. The precise calculation of each metric may vary depending on the fiscal year, industry and region, but the standard approach is as follows:

Growth is based on a stock's forward-looking sales growth, EBITDA growth and EPS growth (for financial stocks, only EPS and sales growth), with a higher percentile indicating a higher growth company. **Financial Returns** is based on a stock's forward-looking ROE, ROCE and CROCI (for financial stocks, only ROE), with a higher percentile indicating a company with higher financial returns. **Multiple** is based on a stock's forward-looking P/E, P/B, price/dividend (P/D), EV/EBITDA, EV/FCF and EV/Debt Adjusted Cash Flow (DACF) (for financial stocks, only P/E, P/B and P/D), with a higher percentile indicating a stock trading at a higher multiple. The **Integrated** percentile is calculated as the average of the Growth percentile, Financial Returns percentile and (100% - Multiple percentile).

Financial Returns and Multiple use the Goldman Sachs analyst forecasts at the fiscal year-end at least three quarters in the future. Growth uses inputs for the fiscal year at least seven quarters in the future compared with the year at least three quarters in the future (on a per-share basis for all metrics).

For a more detailed description of how we calculate the GS Factor Profile, please contact your GS representative.

M&A Rank

Across our global coverage, we examine stocks using an M&A framework, considering both qualitative factors and quantitative factors (which may vary across sectors and regions) to incorporate the potential that certain companies could be acquired. We then assign a M&A rank as a means of scoring companies under our rated coverage from 1 to 3, with 1 representing high (30%-50%) probability of the company becoming an acquisition target, 2 representing medium (15%-30%) probability and 3 representing low (0%-15%) probability. For companies ranked 1 or 2, in line with our standard departmental guidelines we incorporate an M&A component into our target price. M&A rank of 3 is considered immaterial and therefore does not factor into our price target, and may or may not be discussed in research.

Quantum

Quantum is Goldman Sachs' proprietary database providing access to detailed financial statement histories, forecasts and ratios. It can be used for in-depth analysis of a single company, or to make comparisons between companies in different sectors and markets.

Disclosures

Logo disclosure

Third party brands used in this report are the property of their respective owners, and are used here for informational purposes only. The use of such brands should not be viewed as an endorsement, affiliation or sponsorship by or for Goldman Sachs or any of its products/services.

Distribution of ratings/investment banking relationships

Goldman Sachs Investment Research global Equity coverage universe

	Rating Distribution			Investment Banking Relationships		
	Buy	Hold	Sell	Buy	Hold	Sell
Global	49%	34%	17%	62%	57%	40%

As of July 1, 2025, Goldman Sachs Global Investment Research had investment ratings on 2,968 equity securities. Goldman Sachs assigns stocks as Buys and Sells on various regional Investment Lists; stocks not so assigned are deemed Neutral. Such assignments equate to Buy, Hold and Sell for the purposes of the above disclosure required by the FINRA Rules. See 'Ratings, Coverage universe and

related definitions' below. The Investment Banking Relationships chart reflects the percentage of subject companies within each rating category for whom Goldman Sachs has provided investment banking services within the previous twelve months.

Regulatory disclosures

Disclosures required by United States laws and regulations

See company-specific regulatory disclosures above for any of the following disclosures required as to companies referred to in this report: manager or co-manager in a pending transaction; 1% or other ownership; compensation for certain services; types of client relationships; managed/co-managed public offerings in prior periods; directorships; for equity securities, market making and/or specialist role. Goldman Sachs trades or may trade as a principal in debt securities (or in related derivatives) of issuers discussed in this report.

The following are additional required disclosures: **Ownership and material conflicts of interest:** Goldman Sachs policy prohibits its analysts, professionals reporting to analysts and members of their households from owning securities of any company in the analyst's area of coverage. **Analyst compensation:** Analysts are paid in part based on the profitability of Goldman Sachs, which includes investment banking revenues. **Analyst as officer or director:** Goldman Sachs policy generally prohibits its analysts, persons reporting to analysts or members of their households from serving as an officer, director or advisor of any company in the analyst's area of coverage. **Non-U.S. Analysts:** Non-U.S. analysts may not be associated persons of Goldman Sachs & Co. LLC and therefore may not be subject to FINRA Rule 2241 or FINRA Rule 2242 restrictions on communications with a subject company, public appearances and trading in securities covered by the analysts.

Distribution of ratings: See the distribution of ratings disclosure above. **Price chart:** See the price chart, with changes of ratings and price targets in prior periods, above, or, if electronic format or if with respect to multiple companies which are the subject of this report, on the Goldman Sachs website at <https://www.gs.com/research/hedge.html>.

Additional disclosures required under the laws and regulations of jurisdictions other than the United States

The following disclosures are those required by the jurisdiction indicated, except to the extent already made above pursuant to United States laws and regulations. **Australia:** Goldman Sachs Australia Pty Ltd and its affiliates are not authorised deposit-taking institutions (as that term is defined in the Banking Act 1959 (Cth)) in Australia and do not provide banking services, nor carry on a banking business, in Australia. This research, and any access to it, is intended only for "wholesale clients" within the meaning of the Australian Corporations Act, unless otherwise agreed by Goldman Sachs. In producing research reports, members of Global Investment Research of Goldman Sachs Australia may attend site visits and other meetings hosted by the companies and other entities which are the subject of its research reports. In some instances the costs of such site visits or meetings may be met in part or in whole by the issuers concerned if Goldman Sachs Australia considers it is appropriate and reasonable in the specific circumstances relating to the site visit or meeting. To the extent that the contents of this document contains any financial product advice, it is general advice only and has been prepared by Goldman Sachs without taking into account a client's objectives, financial situation or needs. A client should, before acting on any such advice, consider the appropriateness of the advice having regard to the client's own objectives, financial situation and needs. A copy of certain Goldman Sachs Australia and New Zealand disclosure of interests and a copy of Goldman Sachs' Australian Sell-Side Research Independence Policy Statement are available at: <https://www.goldmansachs.com/disclosures/australia-new-zealand/index.html>. **Brazil:** Disclosure information in relation to CVM Resolution n. 20 is available at <https://www.gs.com/worldwide/brazil/area/gir/index.html>. Where applicable, the Brazil-registered analyst primarily responsible for the content of this research report, as defined in Article 20 of CVM Resolution n. 20, is the first author named at the beginning of this report, unless indicated otherwise at the end of the text. **Canada:** This information is being provided to you for information purposes only and is not, and under no circumstances should be construed as, an advertisement, offering or solicitation by Goldman Sachs & Co. LLC for purchasers of securities in Canada to trade in any Canadian security. Goldman Sachs & Co. LLC is not registered as a dealer in any jurisdiction in Canada under applicable Canadian securities laws and generally is not permitted to trade in Canadian securities and may be prohibited from selling certain securities and products in certain jurisdictions in Canada. If you wish to trade in any Canadian securities or other products in Canada please contact Goldman Sachs Canada Inc., an affiliate of The Goldman Sachs Group Inc., or another registered Canadian dealer. **Hong Kong:** Further information on the securities of covered companies referred to in this research may be obtained on request from Goldman Sachs (Asia) L.L.C. **India:** Further information on the subject company or companies referred to in this research may be obtained from Goldman Sachs (India) Securities Private Limited, Research Analyst - SEBI Registration Number INH000001493, 951-A, Rational House, Appasaheb Marathe Marg, Prabhadevi, Mumbai 400 025, India, Corporate Identity Number U74140MH2006FTC160634, Phone +91 22 6616 9000, Fax +91 22 6616 9001. Goldman Sachs may beneficially own 1% or more of the securities (as such term is defined in clause 2 (h) the Indian Securities Contracts (Regulation) Act, 1956) of the subject company or companies referred to in this research report. Investment in securities market are subject to market risks. Read all the related documents carefully before investing. Registration granted by SEBI and certification from NISM in no way guarantee performance of the intermediary or provide any assurance of returns to investors. Goldman Sachs (India) Securities Private Limited compliance officer and investor grievance contact details can be found at this link: <https://publishing.gs.com/disclosures/hedge.html> - /general/equity. **Japan:** See below. **Korea:** This research, and any access to it, is intended only for "professional investors" within the meaning of the Financial Services and Capital Markets Act, unless otherwise agreed by Goldman Sachs. Further information on the subject company or companies referred to in this research may be obtained from Goldman Sachs (Asia) L.L.C., Seoul Branch. **New Zealand:** Goldman Sachs New Zealand Limited and its affiliates are neither "registered banks" nor "deposit takers" (as defined in the Reserve Bank of New Zealand Act 1989) in New Zealand. This research, and any access to it, is intended for "wholesale clients" (as defined in the Financial Advisers Act 2008) unless otherwise agreed by Goldman Sachs. A copy of certain Goldman Sachs Australia and New Zealand disclosure of interests is available at: <https://www.goldmansachs.com/disclosures/australia-new-zealand/index.html>. **Russia:** Research reports distributed in the Russian Federation are not advertising as defined in the Russian legislation, but are information and analysis not having product promotion as their main purpose and do not provide appraisal within the meaning of the Russian legislation on appraisal activity. Research reports do not constitute a personalized investment recommendation as defined in Russian laws and regulations, are not addressed to a specific client, and are prepared without analyzing the financial circumstances, investment profiles or risk profiles of clients. Goldman Sachs assumes no responsibility for any investment decisions that may be taken by a client or any other person based on this research report. **Singapore:** Goldman Sachs (Singapore) Pte. (Company Number: 198602165W), which is regulated by the Monetary Authority of Singapore, accepts legal responsibility for this research, and should be contacted with respect to any matters arising from, or in connection with, this research. **Taiwan:** This material is for reference only and must not be reprinted without permission. Investors should carefully consider their own investment risk. Investment results are the responsibility of the individual investor. **United Kingdom:** Persons who would be categorized as retail clients in the United Kingdom, as such term is defined in the rules of the Financial Conduct Authority, should read this research in conjunction with prior Goldman Sachs research on the covered companies referred to herein and should refer to the risk warnings that have been sent to them by Goldman Sachs International. A copy of these risks warnings, and a glossary of certain financial terms used in this report, are available from Goldman Sachs International on request.

European Union and United Kingdom: Disclosure information in relation to Article 6 (2) of the European Commission Delegated Regulation (EU) (2016/958) supplementing Regulation (EU) No 596/2014 of the European Parliament and of the Council (including as that Delegated Regulation is implemented into United Kingdom domestic law and regulation following the United Kingdom's departure from the European Union and the European Economic Area) with regard to regulatory technical standards for the technical arrangements for objective presentation of investment recommendations or other

information recommending or suggesting an investment strategy and for disclosure of particular interests or indications of conflicts of interest is available at <https://www.gs.com/disclosures/europeanpolicy.html> which states the European Policy for Managing Conflicts of Interest in Connection with Investment Research.

Japan: Goldman Sachs Japan Co., Ltd. is a Financial Instrument Dealer registered with the Kanto Financial Bureau under registration number Kinsho 69, and a member of Japan Securities Dealers Association, Financial Futures Association of Japan Type II Financial Instruments Firms Association, The Investment Trusts Association, Japan, and Japan Investment Advisers Association. Sales and purchase of equities are subject to commission pre-determined with clients plus consumption tax. See company-specific disclosures as to any applicable disclosures required by Japanese stock exchanges, the Japanese Securities Dealers Association or the Japanese Securities Finance Company.

Ratings, coverage universe and related definitions

Buy (B), Neutral (N), Sell (S) Analysts recommend stocks as Buys or Sells for inclusion on various regional Investment Lists. Being assigned a Buy or Sell on an Investment List is determined by a stock's total return potential relative to its coverage universe. Any stock not assigned as a Buy or a Sell on an Investment List with an active rating (i.e., a stock that is not Rating Suspended, Not Rated, Early-Stage Biotech, Coverage Suspended or Not Covered), is deemed Neutral. Each region manages Regional Conviction Lists, which are selected from Buy rated stocks on the respective region's Investment Lists and represent investment recommendations focused on the size of the total return potential and/or the likelihood of the realization of the return across their respective areas of coverage. The addition or removal of stocks from such Conviction Lists are managed by the Investment Review Committee or other designated committee in each respective region and do not represent a change in the analysts' investment rating for such stocks.

Total return potential represents the upside or downside differential between the current share price and the price target, including all paid or anticipated dividends, expected during the time horizon associated with the price target. Price targets are required for all covered stocks. The total return potential, price target and associated time horizon are stated in each report adding or reiterating an Investment List membership.

Coverage Universe: A list of all stocks in each coverage universe is available by primary analyst, stock and coverage universe at <https://www.gs.com/research/hedge.html>.

Not Rated (NR). The investment rating, target price and earnings estimates (where relevant) are removed pursuant to Goldman Sachs policy when Goldman Sachs is acting in an advisory capacity in a merger or in a strategic transaction involving this company, when there are legal, regulatory or policy constraints due to Goldman Sachs' involvement in a transaction, and in certain other circumstances.

Early-Stage Biotech (ES). An investment rating and a target price are not assigned pursuant to Goldman Sachs policy when this company neither has a drug, treatment or medical device that has passed a Phase II clinical trial nor a license to distribute a post-Phase II drug, treatment or medical device. **Rating Suspended (RS).** Goldman Sachs Research has suspended the investment rating and price target for this stock, because there is not a sufficient fundamental basis for determining an investment rating or target price. The previous investment rating and target price, if any, are no longer in effect for this stock and should not be relied upon. **Coverage Suspended (CS).** Goldman Sachs has suspended coverage of this company. **Not Covered (NC).** Goldman Sachs does not cover this company.

Global product; distributing entities

Goldman Sachs Global Investment Research produces and distributes research products for clients of Goldman Sachs on a global basis. Analysts based in Goldman Sachs offices around the world produce research on industries and companies, and research on macroeconomics, currencies, commodities and portfolio strategy. This research is disseminated in Australia by Goldman Sachs Australia Pty Ltd (ABN 21 006 797 897); in Brazil by Goldman Sachs do Brasil Corretora de Títulos e Valores Mobiliários S.A.; Public Communication Channel Goldman Sachs Brazil: 0800 727 5764 and / or contatogoldmanbrasil@gs.com. Available Weekdays (except holidays), from 9am to 6pm. Canal de Comunicação com o Público Goldman Sachs Brasil: 0800 727 5764 e/ou contatogoldmanbrasil@gs.com. Horário de funcionamento: segunda-feira à sexta-feira (exceto feriados), das 9h às 18h; in Canada by Goldman Sachs & Co. LLC; in Hong Kong by Goldman Sachs (Asia) L.L.C.; in India by Goldman Sachs (India) Securities Private Ltd.; in Japan by Goldman Sachs Japan Co., Ltd.; in the Republic of Korea by Goldman Sachs (Asia) L.L.C., Seoul Branch; in New Zealand by Goldman Sachs New Zealand Limited; in Russia by OOO Goldman Sachs; in Singapore by Goldman Sachs (Singapore) Pte. (Company Number: 198602165W); and in the United States of America by Goldman Sachs & Co. LLC. Goldman Sachs International has approved this research in connection with its distribution in the United Kingdom.

Goldman Sachs International ("GSI"), authorised by the Prudential Regulation Authority ("PRA") and regulated by the Financial Conduct Authority ("FCA") and the PRA, has approved this research in connection with its distribution in the United Kingdom.

European Economic Area: Goldman Sachs Bank Europe SE ("GSBE") is a credit institution incorporated in Germany and, within the Single Supervisory Mechanism, subject to direct prudential supervision by the European Central Bank and in other respects supervised by German Federal Financial Supervisory Authority (Bundesanstalt für Finanzdienstleistungsaufsicht, BaFin) and Deutsche Bundesbank and disseminates research within the European Economic Area.

General disclosures

This research is for our clients only. Other than disclosures relating to Goldman Sachs, this research is based on current public information that we consider reliable, but we do not represent it is accurate or complete, and it should not be relied on as such. The information, opinions, estimates and forecasts contained herein are as of the date hereof and are subject to change without prior notification. We seek to update our research as appropriate, but various regulations may prevent us from doing so. Other than certain industry reports published on a periodic basis, the large majority of reports are published at irregular intervals as appropriate in the analyst's judgment.

Goldman Sachs conducts a global full-service, integrated investment banking, investment management, and brokerage business. We have investment banking and other business relationships with a substantial percentage of the companies covered by Global Investment Research. Goldman Sachs & Co. LLC, the United States broker dealer, is a member of SIPC (<https://www.sipc.org>).

Our salespeople, traders, and other professionals may provide oral or written market commentary or trading strategies to our clients and principal trading desks that reflect opinions that are contrary to the opinions expressed in this research. Our asset management area, principal trading desks and investing businesses may make investment decisions that are inconsistent with the recommendations or views expressed in this research.

The analysts named in this report may have from time to time discussed with our clients, including Goldman Sachs salespersons and traders, or may discuss in this report, trading strategies that reference

catalysts or events that may have a near-term impact on the market price of the equity securities discussed in this report, which impact may be directionally counter to the analyst's published price target expectations for such stocks. Any such trading strategies are distinct from and do not affect the analyst's fundamental equity rating for such stocks, which rating reflects a stock's return potential relative to its coverage universe as described herein.

We and our affiliates, officers, directors, and employees will from time to time have long or short positions in, act as principal in, and buy or sell, the securities or derivatives, if any, referred to in this research, unless otherwise prohibited by regulation or Goldman Sachs policy.

The views attributed to third party presenters at Goldman Sachs arranged conferences, including individuals from other parts of Goldman Sachs, do not necessarily reflect those of Global Investment Research and are not an official view of Goldman Sachs.

Any third party referenced herein, including any salespeople, traders and other professionals or members of their household, may have positions in the products mentioned that are inconsistent with the views expressed by analysts named in this report.

This research is not an offer to sell or the solicitation of an offer to buy any security in any jurisdiction where such an offer or solicitation would be illegal. It does not constitute a personal recommendation or take into account the particular investment objectives, financial situations, or needs of individual clients. Clients should consider whether any advice or recommendation in this research is suitable for their particular circumstances and, if appropriate, seek professional advice, including tax advice. The price and value of investments referred to in this research and the income from them may fluctuate. Past performance is not a guide to future performance, future returns are not guaranteed, and a loss of original capital may occur. Fluctuations in exchange rates could have adverse effects on the value or price of, or income derived from, certain investments.

Certain transactions, including those involving futures, options, and other derivatives, give rise to substantial risk and are not suitable for all investors. Investors should review current options and futures disclosure documents which are available from Goldman Sachs sales representatives or at <https://www.theocc.com/about/publications/character-risks.jsp> and https://www.goldmansachs.com/disclosures/cftc_fcm_disclosures. Transaction costs may be significant in option strategies calling for multiple purchase and sales of options such as spreads. Supporting documentation will be supplied upon request.

Differing Levels of Service provided by Global Investment Research: The level and types of services provided to you by Goldman Sachs Global Investment Research may vary as compared to that provided to internal and other external clients of GS, depending on various factors including your individual preferences as to the frequency and manner of receiving communication, your risk profile and investment focus and perspective (e.g., marketwide, sector specific, long term, short term), the size and scope of your overall client relationship with GS, and legal and regulatory constraints. As an example, certain clients may request to receive notifications when research on specific securities is published, and certain clients may request that specific data underlying analysts' fundamental analysis available on our internal client websites be delivered to them electronically through data feeds or otherwise. No change to an analyst's fundamental research views (e.g., ratings, price targets, or material changes to earnings estimates for equity securities), will be communicated to any client prior to inclusion of such information in a research report broadly disseminated through electronic publication to our internal client websites or through other means, as necessary, to all clients who are entitled to receive such reports.

All research reports are disseminated and available to all clients simultaneously through electronic publication to our internal client websites. Not all research content is redistributed to our clients or available to third-party aggregators, nor is Goldman Sachs responsible for the redistribution of our research by third party aggregators. For research, models or other data related to one or more securities, markets or asset classes (including related services) that may be available to you, please contact your GS representative or go to <https://research.gs.com>.

Disclosure information is also available at <https://www.gs.com/research/hedge.html> or from Research Compliance, 200 West Street, New York, NY 10282.

© 2025 Goldman Sachs.

You are permitted to store, display, analyze, modify, reformat, and print the information made available to you via this service only for your own use. You may not resell or reverse engineer this information to calculate or develop any index for disclosure and/or marketing or create any other derivative works or commercial product(s), data or offering(s) without the express written consent of Goldman Sachs. You are not permitted to publish, transmit, or otherwise reproduce this information, in whole or in part, in any format to any third party without the express written consent of Goldman Sachs. This foregoing restriction includes, without limitation, using, extracting, downloading or retrieving this information, in whole or in part, to train or finetune a machine learning or artificial intelligence system, or to provide or reproduce this information, in whole or in part, as a prompt or input to any such system.