# MONTHLY RESEARCH DIGEST

An Executive Briefing on New & Notable Sustainability Research

## In This Issue – **July 2025**




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# NET ZERO TRANSITION

## Business Breakthrough Barometer 2025

*By WBCSD, in partnership with the Breakthrough Agenda, the Marrakech Partnership for Global Climate Action, and the Race to Zero, with support from Bain & Co.*

**View the full report here**

## Notable Highlights

- **9 out of 10 business leaders said their company maintained or increased climate transition-related investments and emissions targets** over the past year.
- Companies are **increasingly investing in "bright spot" markets with stable policy environments, affordable clean energy, and rising demand for low-carbon solutions.** 74% of business leaders cite Asia and Europe as attractive markets.
- 56% say **long-term industrial competitiveness** is their company's **primary motivation for investment** in the transition, not just meeting regulatory requirements.
- **61% predict that increased costs from climate-related disruptions** will impact their business in the next year.
- **85% call for stronger international coordination** to unlock cross-border investment and build market scale.
- The report includes **deep dives on seven sectors,** including business confidence in sector transitions, reasons for increasing investment, where businesses progressed or stalled in progress, transition barriers, investment insights, and policy priorities to accelerate the transition (jump to deep dives from report pg. 5).

## Objective

- To assess how businesses leading the net-zero transition are progressing, identify transition barriers, and illustrate how governments can create stronger market incentives for investment.

## Background

- This second annual report covers seven sectors responsible for 50% of global GHG emissions: power, road transport, steel, cement and concrete, buildings, hydrogen, and fertilizer.

- The data is based on surveys, interviews, and consultations with over 300 senior corporate executives and more than 20 business organizations (with a combined membership of over 10,000), as well as industry reports, market studies, BloombergNEF data, and literature review (methodology on pgs. 11 and 63).
- The executives' companies are "leaders in sustainability" (particularly in the energy and industry sectors) with over $2 trillion in combined annual revenue.

# Report Findings

## Global business sentiment toward the net-zero transition (pg. 14-23):

- **50% of business leaders have less confidence in government support** for the net-zero transition over the past 12 months, including 96% in North America.
- Half of business leaders said **the U.S. is a less attractive investment market** compared to a year ago, with **policy uncertainty** a key driver for reducing investments.
- 92% believe that **the cost of inaction will be greater** than the cost of action to achieve net zero for their organization.
- 52% **incorporate adaptation and resilience planning** in their business strategies.

## Business investment in the net-zero transition (pg. 14-23):

- 78% say **they would increase investment** in the transition **if governments implemented targeted, sector-specific policies.**
- The **top three reasons companies increased transition investments** in the past year are increased certainty regarding customer demand (36%), increased access to clean energy (34%), and increased policy support (33%).
- The **top three reasons companies decreased investments** were reduced policy support (57%), uncertainty about customer demand (39%), and rising costs (39%).
- Access to affordable clean energy is playing an increasingly central role in investment decisions due to its ability to lower costs, increase power reliability, and decarbonize operations. **90% prioritize access to renewable-based electricity**, and 50% plan to relocate to markets offering better access to renewables within the next five years.
- **Businesses in hard-to-abate sectors are targeting investments** where they see clear demand signals and the ability to position themselves for long-term competitiveness in the face of evolving regulatory frameworks.

## Energy and industrial sectors summary (pg. 16-18, 20-21):

- **Clean energy investments hit a record $2 trillion** worldwide in 2024. Investments are increasingly focused on solutions where market forces are driving momentum through falling costs, increased economies of scale, improved supply chains, and a heightened focus on energy security.
- **Proven, scalable technologies saw the most significant investment growth in 2024,** with electric vehicles, renewable energy, and power grids accounting for the majority of energy transition investment ($1.88 trillion combined, up 14.2%) (pg. 16-17).
    - **Electrified transport investment grew by 20% from 2023**, with China reaching around 45% EV penetration. Many businesses are concerned that political volatility and trade uncertainty will impact EV growth in their core markets.
    - Investment grew by **8% for renewable energy, 15% for power grids,** and **36% for energy storage.**
- **Investment in emerging technologies declined**, including a **42% decline for hydrogen** (due to rising costs and a lack of clear long-term demand signals), a **56% decline for CCUS** (due to uncertain economics and high interest rates), and a **delay of over 10 Mtpa** (million tons per annum) in planned capacity for **low-carbon steel** (details on pg. 17).
- **Business leaders' assessment of global policy progress over the past 12 months and the most urgent policy needs (see pg. 27 for policy needs for all sectors):**

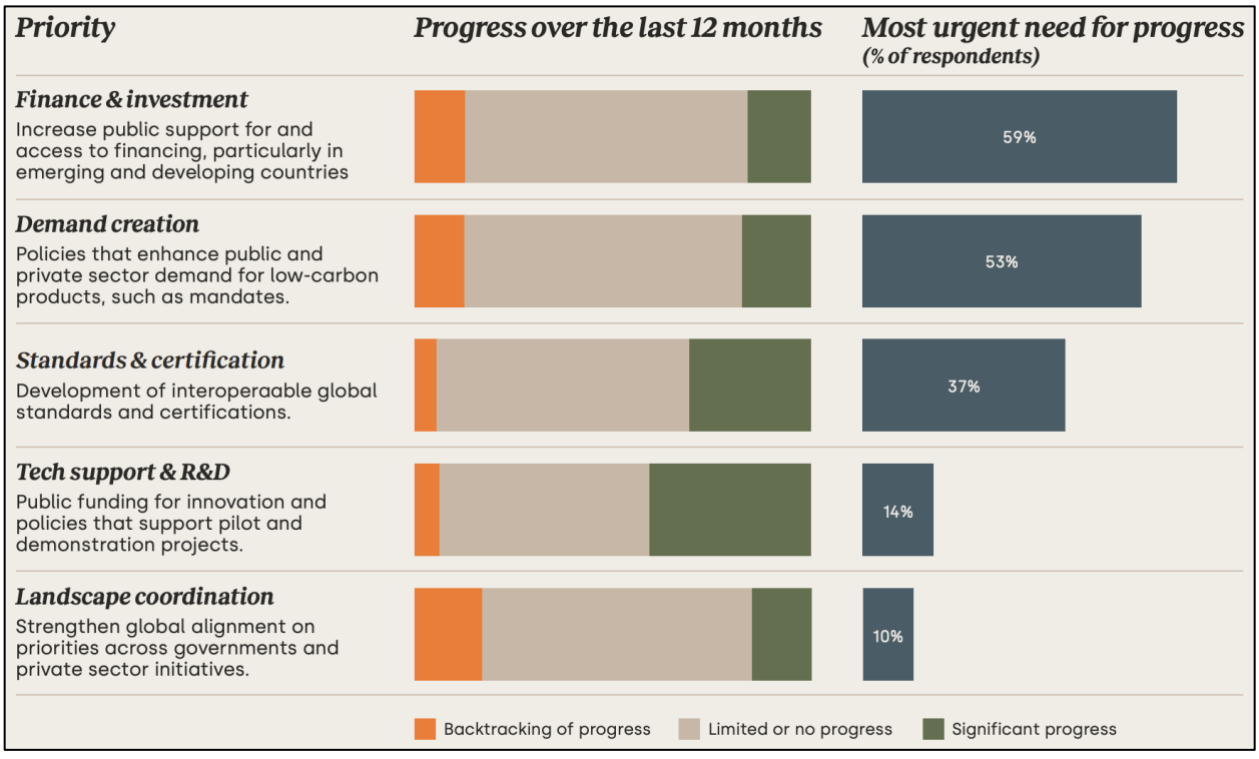


Image taken from pg. 26

## To de-risk and scale low-carbon investments, transition-leading energy and industry companies are (pg. 28):

- **Proactively engaging policymakers and stakeholders.**
- **Forming joint ventures and value chain partnerships.** For example, “many automotive companies are increasingly securing upstream critical mineral access, battery R&D and recycling capacity through partnerships, while steel and hydrogen companies are partnering with utilities to secure access to renewable energy.”
- **Underwriting large capital programs through strategic co-investments**, often supported by public-private financing and export credits. This includes securing equity partners throughout the value chain to de-risk project execution and offtake. Steel companies are securing equity investments from automotive customers.
- **Adopting flexible decision-making frameworks** to enable timely, informed decisions. Steel companies are breaking down siloes to secure grid connections quickly.

## Countries to watch (pg. 30-31):

- Pages 30-31 break down the **countries that have become increasingly attractive destinations for investment** over the past year, due to their efforts to create conditions for market growth.

# Green and Intelligent: The Role of AI in the Climate Transition

*By Grantham Research Institute on Climate Change and the Environment and Systemiq, published by npj Climate Action*

**View the full report here**

## Notable Highlights

- **AI can impact five key areas to accelerate the climate transition:** transforming complex systems, innovating technology discovery and resource efficiency, influencing consumer behavior change, modeling climate systems and policy interventions, and managing adaptation and resilience.
- AI applications in the power, food, and mobility sectors alone **could reduce global emissions by 3.2-5.4 gigatons (Gt) of CO2e annually by 2035.**
- Sectors can accelerate the climate transition by **channeling practical AI applications toward** key impact areas that increase the **market adoption rate and efficiency of low-carbon solutions.**
- These estimated **emissions reductions outweigh the estimated 0.4-1.6 GtCO2e increase in emissions from** the global power consumption of **data centers and AI.**

## Objective

- To identify five areas where AI can effectively support the climate transition and estimate the potential for GHG emission reductions through AI applications in the power, meat and dairy, and light-road vehicles sectors.

## Background

- Report data are available from the corresponding author upon request (pg. 6), with additional references provided on pg. 6-7.
- The emission-reduction potential is based on modeling of AI applications to accelerate the market adoption rate and efficiency of low-carbon solutions in the power sector (supply/demand forecasting and the management of distributed energy sources), food sector (the adoption of alternative proteins), and the mobility sector (efficiency gains, consumer adoption of shared transport, and EV affordability and accessibility) (methodology on pg. 3-4).
- The emission-reduction potential was assessed against a Business As Usual (BAU) scenario (based on the IEA APS scenario) and an Ambitious Emissions Reduction Scenario (based on the IEA NZE scenario).

- The report does not assess the impact of rebound effects or the effects of AI on emission-intensive activities.

# Report Findings

## Five areas where AI can support the climate transition:

### #1: Transforming complex systems (pg. 2):

- AI can **optimize energy grid management** by forecasting supply and demand more accurately and by managing distributed energy resources, such as EVs. CEF member Google's DeepMind has demonstrated that AI applications can increase the economic value of wind energy by 20% by reducing reliance on standby power sources.
- AI can **optimize the interaction of energy systems within urban ecosystems** to enhance planning, design choices, and infrastructure construction.
- AI can **better predict investment risks and returns** in low-carbon projects, making financing more accessible, particularly in emerging markets.

### #2: Innovating technology discovery and resource efficiency (pg. 2-3):

- AI can **accelerate green tech innovation at scale**. DeepMind's GNoME tool identified more than 45 times more theoretical crystal structures, which can contribute to renewable energy production, than science had identified to date.
- AI-powered optimization systems can **reduce waste in manufacturing, logistics, and recycling.** CEF member Amazon's Package Decision Engine has helped the company avoid over 3 million metric tons of packaging material worldwide since 2015.

### #3: Influencing consumer behavior change (pg. 3):

- Despite growing awareness and willingness to act, consumers often struggle to identify climate-friendly options. AI can **overcome psychological barriers by offering personalized recommendations** that align with their needs while reducing emissions.
    - CEF member Oracle's Opower combines AI with behavioral science to engage customers and encourage energy savings.
    - Google Maps utilizes AI to offer users fuel-efficient travel routes.

### #4: Modeling climate systems and policy interventions (pg. 3):

- AI's capacity to process vast datasets and run complex simulations in real-time can help model the effects of climate change under various policy scenarios, thereby contributing to **better-informed long-term mitigation and adaptation policies.**

### #5: Managing adaptation and resilience (pg. 3):

- As climate-related disasters become more frequent and severe, the ability to forecast hazards and adapt to changing conditions will become increasingly critical.
- AI can **help forecast climate impacts** and is already improving early warning systems.
    - Google's FloodHub utilizes machine learning models to forecast flooding events up to five days in advance and issue alerts in more than 80 countries, enabling damage to be avoided.
    - Digital twins, such as NVIDIA's Earth-2 platform, are being developed to better predict extreme weather events.

## AI's emission-reduction potential in the power, meat and dairy, and light-road vehicles (pg. 3-5):

- AI applications in the power, food, and mobility sectors alone **could reduce global emissions by 3.2-5.4 gigatons (Gt) of CO2e annually by 2035,** including 1.8 Gt in the power sector, 0.9-3 Gt in meat and dairy, and 0.5-0.6 Gt in light-road vehicles.
- AI can optimize grid management and **increase the load factor of solar PV and wind by up to 20%**. AI is expected to have a **minimal impact on the adoption rates** of these technologies, given their already strong affordability and attractiveness.
- **Improvements to EV affordability** (e.g., AI identifying more cost-effective battery compositions) **and accessibility** (e.g., AI predicting optimal locations for EV charging infrastructure in real-time) **could increase EV adoption rates by 25-28%.**
- AI could improve the **adoption rate of alternative proteins** from around 8% to 14% in BAU. In a highly ambitious scenario, adoption rates **reach 27-50%** and production achieves cost parity with that of meat and dairy products.

# RISK & ADAPTATION

## Evidence Review on the Financial Effects of Nature-Related Risks

*By the Taskforce on Nature-related Financial Disclosures (TNFD), the University of Oxford Environmental Change Institute (as part of the Resilient Planet Finance Lab), and Global Canopy*

**View the full report here**

## Notable Highlights

- There is **extensive evidence** of the financial effects of nature-related risks on businesses and the economy; however, **company-specific evidence is limited** due to the reliance of studies on publicly available data.
- **The strongest evidence of material financial effects covers:**
  - Water scarcity leading to greater capex, OpEx, and operational disruption.
  - Firm value effects stemming from **liability risk** (fines and litigation resulting from pollution, marine degradation, and wider environmental degradation).
  - **Reputational risk** relating to deforestation, pollution, water scarcity, and wider environmental degradation.
  - **Policy risk** leading to negative effects on firm value, capex, OpEx, operational disruption, and stranded assets.
- **Challenges companies face in assessing the financial materiality of nature-related risks** include the lack of a single, widely accepted indicator for nature-related risks and a globally accepted scenario analysis methodology, as well as understanding which risks are most relevant. Additionally, there are limited and inconsistent disclosures from portfolio companies.
- The following Report Findings include **recommendations for companies and financial institutions** to better assess and manage the financial effects of nature-related risks.

## Objective

- To explore how nature-related risks that stem from business dependencies and impacts on nature can translate into financially material outcomes, including cash flow, the cost of capital, and access to capital.

# Background

- The report data is based on interviews with five global companies and financial institutions, expert insights, and an analysis of over 360 sources of academic research, case studies, company reports, and news articles in the IFB Nature-Related Financial Risks Database, covering 28 nature-related risks (listed on pg. 22-23) (methodology on pg. 3-4, 15-17).
- "Transmission channels" are pathways through which nature-related hazards translate into physical and transition risks that can affect the economy at various levels.

# Report Findings

## Evidence of the financial effects of nature-related risks on businesses (pg. 15-45):

**NOTE: The following subchapters provide a detailed overview of evidence of the financial effects of nature-related business risks found within the IFB Database.**

▷ **Subchapters:** transmission channels framework (pg. 18), water-related risks (27), invasive alien species (31), land/freshwater/ocean use change (35), soil depletion (41), zoonotic diseases (42), ecosystem stability risk (43)

- **Evidence of the financial effects at the company level varies by the driver of nature loss.**
    - There is moderate evidence of native species outbreaks damaging assets in the energy sector.
    - Limited evidence exists for the financial effects of invasive species at the company level.
- Complete causal chains (from dependencies and impacts to financial effects) are rarely fully mapped.

## Approaches to identify financially material nature-related risks (pg. 46-54):

- **Companies tend to rely on stakeholder interviews and qualitative assessments** to identify financially material risks. They often use third-party tools and insights to make datasets more context-specific, including the ENCORE tool, the Global Forest Watch, the WWF Biodiversity Risk Filter, and WRI's Aqueduct tool.
- **Financial institutions are generally more advanced than companies in quantitative methods** for assessing the financial materiality of natural-related issues. They tend to use top-down, portfolio-level tools, such as heatmaps, to identify risk exposure.

## Recommendations for companies and financial institutions to better assess, measure, and manage the financial effects of nature-related risks on the business (pg. 58-59):

- **Provide greater transparency** on which nature-related risks, impacts, and dependencies are included within data products, including metric definitions, metadata, and the distinction between observed data, proxy data, and modeled data.
- **Assess, manage, and disclose nature-related issues.**
- **Build organizational capability** to assess the financial effects of nature-related risks (e.g., through closer collaboration between the risk, finance, and sustainability teams).
- Improve **company-level data collection**.
- **Integrate climate and nature into risk assessments.**
- **Use existing risk assessment approaches** (including the TNFD scenario analysis guidance) to assess and measure the financial effects of nature-related risks. Even if based on internal or non-standardized methodologies that regulators don't yet mandate, this can inform strategy and lay the foundation for more quantitative methods over time.
- Establish and disclose **clear thresholds for what constitutes a material nature-related risk** to the business. Clarify the assumptions, tools, and methodologies used.
- **Assess potential trade-offs between environmental and nature conservation goals** to ensure risk assessments are transparent and balanced (e.g., when actions to support the energy transition may have negative impacts on nature).
- **Financial institutions should engage portfolio companies** on their nature-related risk assessment practices, including how they identify and assess the financial effects of nature-related risks, the thresholds used, and the mitigation measures implemented.

# 2025 Global Data Centre Physical Climate Risk and Adaptation Report

*By XDI*

**View the full report here**

## Notable Highlights

- Today, **78% of data centers are classified as Low Risk for infrastructure damage due to physical climate risks, 16% are Moderate Risk, and 6% are High Risk.** By 2050, 73% will be Low Risk, 20% Moderate Risk, and 7% High Risk.
- Pages 11-13 rank the **top 100 data center hubs worldwide** (with the highest concentration of centers) by the percentage projected to be High Risk by 2050.
- **Structural modifications to data center infrastructure** (using readily available changes in materials and/or design specifications) **could reduce infrastructure damage from climate hazards by 74% and avoid $8-11 billion in annual damages** (for a fleet of data centers estimated to be worth $4 trillion by 2030).
- Without these adaptation measures, by 2050, **extreme weather insurance could cost three to four times more** than today's rates.
- **Structural adaptation is not a silver bullet** for data center resilience, because data centers depend on external systems, adaptation is expensive, and not all structures are suitable for adaptation. **Reducing carbon emissions remains the most cost-effective way to keep data centers operational.**
- The following Report Findings include **regional overviews of data center hubs,** including physical climate risks and data center development across the region.

## Objective

- To analyze the vulnerability of global data centers to physical climate risks, map these risks, and quantify how structural adaptations can protect data center operations and reduce damage and insurance costs.

## Background

- This report utilizes Data Center Map data to assess the climate risk to 8,868 data centers worldwide (operational, under-construction, and planned), with a focus on physical damage to building structures. It analyzes the risk from eight climate hazards (riverine flooding, surface water flooding, forest fire, extreme wind, freeze-thaw, soil

movement, tropical cyclone wind, and coastal inundation) under a high-emissions scenario (RCP 8.5/SSP 5-8.5) from 2025 through 2100 (methodology on pg. 6-9, 50).

- Data centers are categorized as High Risk, Moderate Risk, or Low Risk Properties based on the "Maximum-to-Date Value at Risk" (MVAR):
    - High Risk: There is a high probability of total or partial damage within the building lifecycle. Adaptation is essential.
    - Moderate Risk: Adaptation is recommended.
    - Low Risk: The net probability of significant damage is low and within typical industry and insurance risk tolerances.
- A base archetype data center was used to quantify how structural adaptations could protect operations and reduce damage and insurance costs (pg. 15).

# Report Findings

## The impact of climate-related risks on data center insurance (pg. 10):

- In 2024, **global insurance losses** from natural catastrophes **surpassed $135 billion**. **Insurers are increasing premiums and imposing stricter coverage terms** for data centers, particularly those situated in high-risk areas.
- **High Risk Properties are highly likely to face cost-prohibitive or unavailable insurance premiums.** Moderate Risk Properties are facing higher insurance costs. Low Risk Properties may still experience higher costs due to international trends in global reinsurance markets.

## Adaptations to data center design could reduce physical climate risks, and therefore, operational disruption and insurance premiums (pg. 15-18):

*To quantify the potential for improved data center resilience, the authors applied adaptation measures to a standard base archetype data center, modifying structural elements using readily available changes in materials and/or design specifications.*

- With these measures, the number of High Risk data centers is expected to decrease by 72% globally by 2050, and the number of Moderate Risk centers is expected to decrease by 71%.

## Regional overviews of data center hubs (pg. 19-43):

**NOTE: See the following subchapters for detailed overviews of data center hubs, including physical climate risks and data center development across the region.**

▷ **Subchapters:** North America (pg. 20), Europe (22), East Asia (26), Latin America and Caribbean (28), Southeast Asia (30), West Asia (32), Oceania (34), South Asia (36), Russia and Central Asia (38), Sub-Saharan Africa (40), North Africa (42)

### North America

- 6.34% of North American data centers are **projected to be at High Risk by 2050 (including 1 in 10 US centers)**, with another 256% increase in damage risk by 2100.
- **With adaptation measures**, the risk of **damage could decrease by 82% by 2050**.
- In the U.S., surging demand for AI and cloud services is driving **record investment in secondary markets and rural areas,** which offer inexpensive land and scalable infrastructure.

### Europe

- **1 in 20 European data centers is projected to be at High Risk by 2050**, with an additional 227% increase in damage risk by 2100.
- With **adaptation measures**, the risk of damage could **decrease by 70% by 2050.**
- **Hamburg is the third-riskiest data center hub worldwide,** with 58.33% of data centers projected to be High Risk by 2050.
- The Nordic region is experiencing a surge in development, driven by countries developing national strategies to position themselves as ideal locations for data centers.
- Cities in Southern Europe, such as Lisbon and Barcelona, are increasingly viewed as viable hubs due to the decentralization of Europe's data center network.

### East Asia

- **Nearly 1 in 5** East Asian data centers is **projected to be at High Risk by 2050**, with an additional 465% increase in damage risk by 2100.
- With **adaptation measures**, the risk of damage could **decrease by 63% by 2050.**
- Nearly a quarter **(22.54%) of data centers in China are projected to be High Risk** by 2050, with Jiangsu and Shanghai ranking as the **#1 and #4 riskiest hubs globally**.
- This is one of the **fastest-growing markets, projected to surpass $60 billion by 2030**.
- Taipei and Kaohsiung are emerging as data center hubs due to their robust manufacturing sectors and growing tech ecosystems.

# CIRCULARITY

## The Tipping Point: Building Trust in the Circular Economy

*By BSI, in partnership with the Cambridge Institute for Sustainability Leadership*

**View the full report here**

## Notable Highlights

- **86% of consumers believe a circularity economy** — a systemic shift toward an economy intentionally designed to be restorative and regenerative — **should be a business priority.**
- **Cost savings are the most potent motivator for adopting circular behaviors** (with 68% of consumers putting this in the top three), followed by creating positive environmental impacts and convenience (both 67%).
- **Increased cost (or the perception of it) is the most significant barrier to consumer adoption of circular behaviors** (ranked in the top three by 46%), with additional barriers including a lack of trust in product quality/reliability (41%), inconvenience (36%), and a lack of trust in product environmental claims (33%).
- **Business barriers** include the complexity of transitioning to circular models, the need for intricate supply chain collaboration, internal resistance to change, skill or technological limitations, and difficulty accessing finance.
- **Businesses can build consumer trust in circular goods and services through** assured performance and quality of products/services, transparency and traceability, verification and certification of environmental claims, increased harmonization through standardization, and secure, ethical data management.
- The following Report Findings include **product-, service-, and system-level enabling conditions,** as well as **detailed recommendations for companies** to build trust in circularity and reach circularity tipping points.

## Objective

- To explore the pillars required to build consumer trust in the circular economy and reach a societal tipping point, where consumers desire and adopt circular goods and services.

# Background

- The data in this report is based on interviews with 30 companies across various sectors, investors, startups, and industrial experts, a literature review, as well as a multi-market, multi-sector opinion poll of 8,225 adult consumers (methodology on pg. 54).

# Report Findings

## Consumer adoption of circular behaviors (pg. 16-18):

- 43% of consumers are moderately/very familiar with the concept of circularity.
- Out of 10 circular behaviors, **around 25-35% of people identified themselves as "early majority" for adoption:**

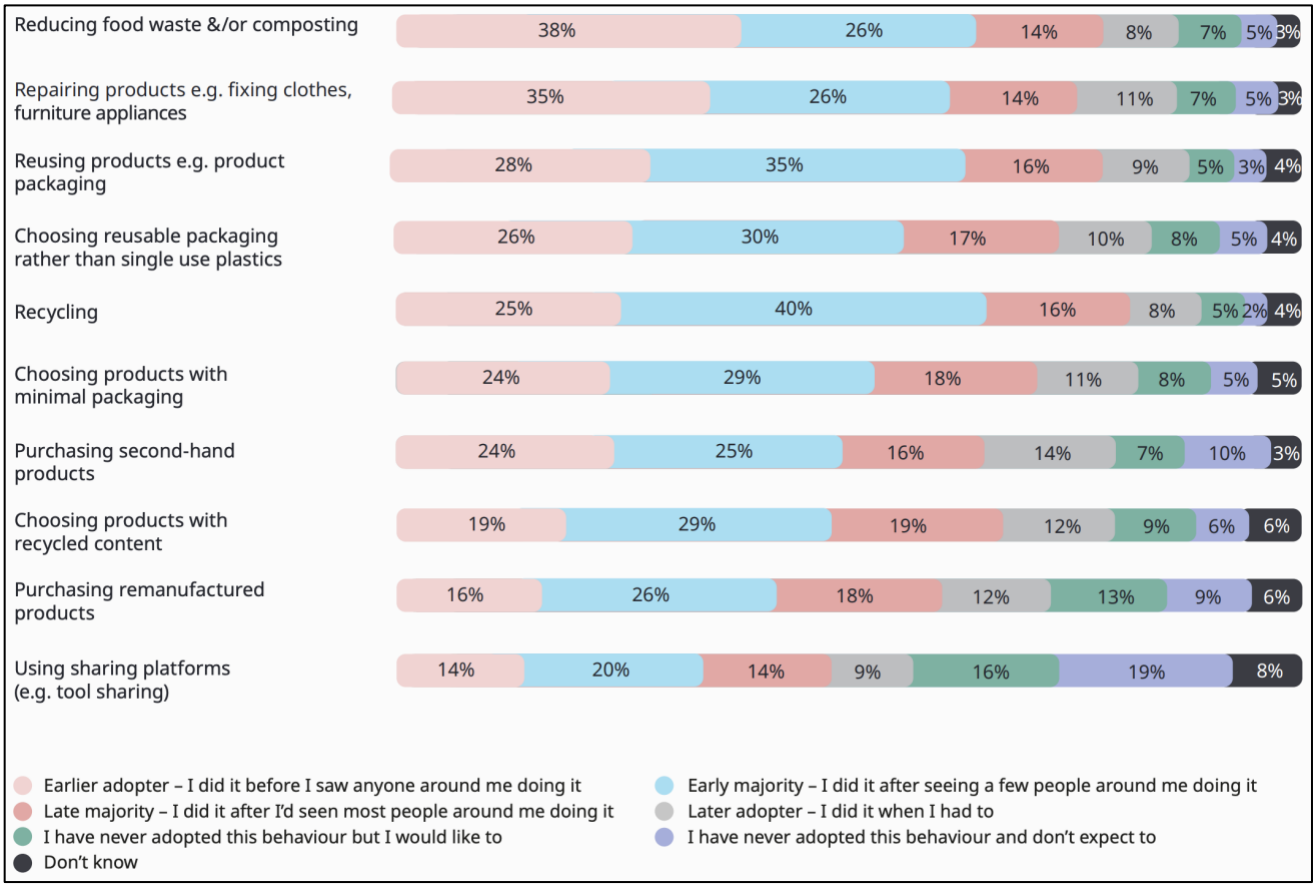


Image taken from pg. 17

## Barriers to consumer adoption of circular behaviors (pg. 19-23, 48):

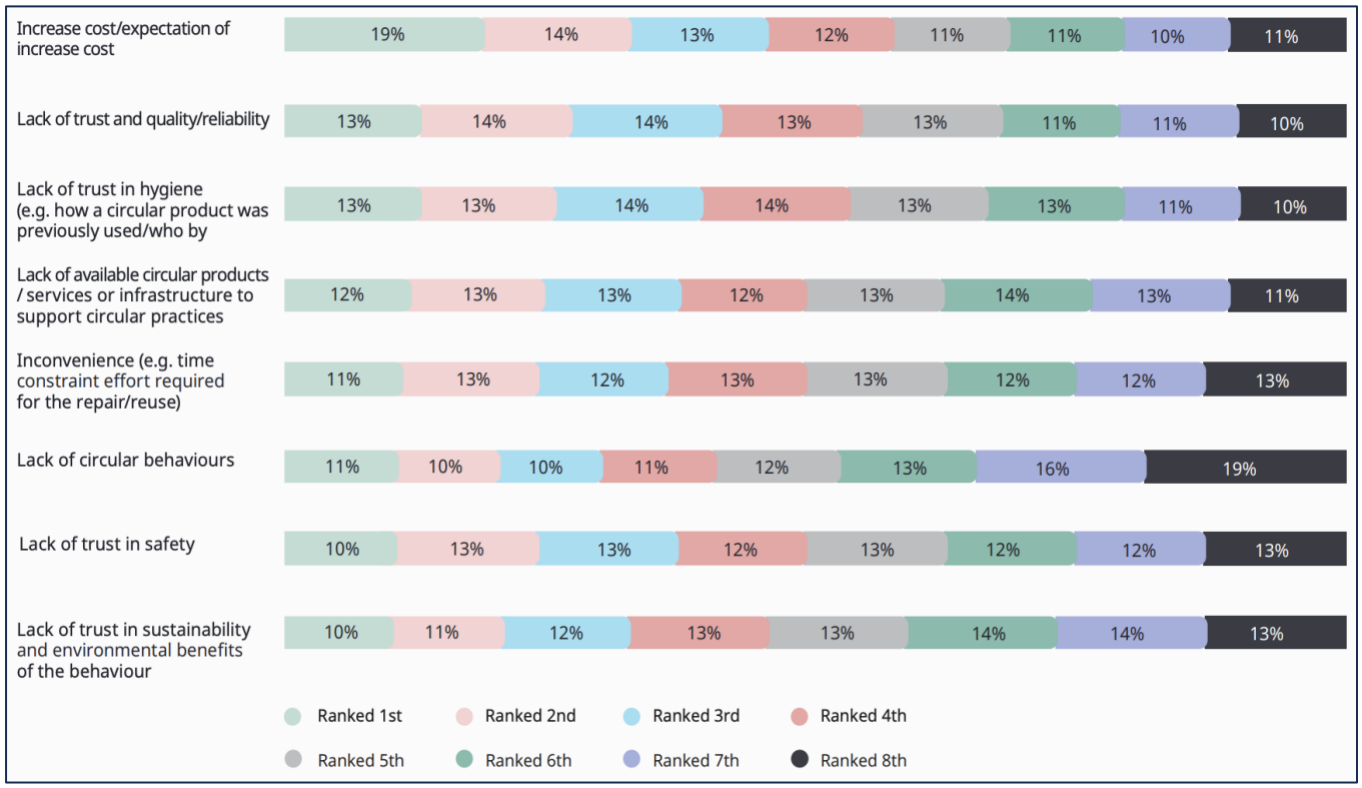


Image taken from pg. 20

## Five pillars to build consumer trust in the circular economy (pg. 25-29):

1. **Assured performance and quality:** Consumers often perceive that "used," "refurbished," or "recycled" equates to "inferior." Circular products and services must meet or exceed customer expectations in terms of performance, durability, and reliability.
    - Design for durability and longevity from the outset.
    - Implement rigorous quality control processes.
    - Provide comprehensive warranties comparable to those for new items, along with accessible and effective repair services.
2. **Transparency and traceability:** Provide clear, comprehensive, easily accessible information about the entire product lifecycle (e.g., through blockchain or DPPs).
3. **Verification and certification** (e.g., the BSI Kitemark™ for Remanufacturing and Environmental Product Declarations (EPDs))**:** 59% of consumers say that a recognized label would build their trust in sustainability claims. 49% value evidence supported by independently verified certification.
4. **Driving harmonization through standardization** creates clarity, consistency, and comparability across markets, enabling businesses, investors, and regulators to operate

with shared expectations. The ISO 59000 provides internationally recognized standards for a circular economy.

5. **Secure, ethical data management:** Circular models are increasingly data-driven. Concerns about data breaches, misuse of personal information, or excessive surveillance could become barriers to adoption. Develop a robust data infrastructure and demonstrate a commitment to data protection/privacy and compliance with regulations.

## Circularity tipping points (pg. 31-36):

- Pages 38-48 break down circularity **tipping points for the built environment, consumer goods and retail, food and packaging, and healthcare sectors**, including barriers and signs of momentum.

**Product- and service-level enabling conditions for circularity tipping points:**

- **Demonstrate that circular products offer** a lower total cost of ownership or improved resource efficiency and meet or exceed expectations in terms of quality and reliability.
- **Resonate with customers' values and cultural aspirations.**
    - Align branding with evolving lifestyle choices and consumer preferences (e.g., by refurbishing luxury items to promote exclusivity and product uniqueness).
    - Embed circularity into the product's identity and desirability at the design stage (e.g., by pairing sustainable furniture with flexible leasing options).
- **Make it easy for customers to engage with a circular product.** Infrastructure must support collection, repair, redistribution, or renewal in a way that integrates the user's experience, including physical logistics, digital platforms, and customer communication.

**System-level enabling conditions for circularity tipping points include:**

- **Policy and regulations** that actively promote circularity.
- **Technological innovation**, including materials science (durable, reusable, and recyclable materials), product design (modularity and repairability), advanced sorting and recycling, remanufacturing, and digital platforms (to enable sharing models).
- **Capital for circular economy initiatives**, including innovative financing mechanisms.
- A **shift in consumer mindsets and behavior**, including the adoption of service-based models and take-back schemes, a demand for transparency about product lifecycles, and the potential to exert pressure through activism and voting.

## Recommendations for companies to accelerate circularity tipping points (pg. 50-52):

- **Disrupt and rethink economic models** so the upfront costs of circularity aren't prohibitive for businesses and consumers.
- Focus on **product/service quality above all.**
- **Validate sustainability claims with recognized labels and independently verified certification** to bolster confidence in the quality of circular products and their sustainability claims.
- **Financial incentives** can encourage changes in consumer behavior, with 48% of consumers indicating that receiving money back for recycling would encourage them to participate.
- **Collaborate across industries** on platforms, technologies, the creation of a common language, and the establishment of agreed-upon rules of engagement.

# CARBON REMOVAL & ENVIRONMENTAL JUSTICE

## Carbon Dioxide Removal and Environmental Justice in the United States

*By Carbon Direct, in collaboration with the McKnight Foundation*

**View the full report here**

### Notable Highlights

- Carbon dioxide removal **(CDR) projects** in the U.S. **are not disproportionately located in low-income communities** of color or areas with significantly higher pre-existing environmental burdens.
- **Some CDR projects exist near frontline communities** with higher environmental burden, which may be related to the location of "current carbon dioxide infrastructure" or general economic development patterns.
- CDR projects are still nascent within the voluntary carbon market (VCM), accounting for about 37% of all projects, but **CDR is expected to scale over the next decade**.
- Plans for **equitable community engagement** and project mechanisms that bring **benefits to frontline communities will be crucial to advancing environmental justice** as CDR scales.

## Objective

- To explore the impacts of carbon dioxide removal (CDR) projects on frontline communities and mechanisms to advance environmental justice as CDR scales.

## Background

- This first-of-its-kind report analyzes 937 projects from seven major registries across the US voluntary carbon market (VCM), with a focus on the 342 US CDR projects (including nature-based, hybrid, and engineered solutions) (methodology on pg. 9, 11, 36-37).
- Carbon Direct integrated registry project data with the EPA's EJScreen data and utilized EJScreen's five demographic variables (people of color, low-income, demographic index, unemployment, life expectancy) and 14 environmental burden indicators (e.g., drinking water contamination and hazardous waste proximity).
- Only projects for which registries have issued or retired carbon credits are included.

- "Frontline communities" refer to people who live with comparatively higher degrees of climate vulnerability and environmental justice challenges (pg. 6).

# Report Findings

## Trends in CDR projects (pg. 17-21):

- CDR projects in the U.S. are not disproportionately located in low-income communities of color or areas with significantly higher pre-existing environmental burdens. However, trends vary more at the CDR solution level:
- **Trends in nature-based CDR projects (pg. 19):**
    - Nature-based projects account for 95% of CDR projects registered in the VCM.
    - Most medians for environmental burden indicators fall around the national median for projects (the 50th percentile), with low-income households (61%), unemployment (54%), and life expectancy (57%) falling slightly above this median.
- **Trends in hybrid CDR projects (pg. 20):** Environmental burden indicators for all hybrid projects are near the 50th percentile, with the highest percentile at 63% for wastewater discharge.
- **Trends in engineered CDR projects (pg. 21):** Drinking water contamination was the highest indicator, ranking in the 83rd percentile.
- **More research is needed** to understand how CDR differs from other forms of economic and industrial development and how the emerging carbon market might diverge from the legacy carbon market as CDR scales over the next decade.

## Project-level CDR case studies (pg. 22-31):

- Pages 22-31 include case studies of project-level nature-based, hybrid, and engineered CDR projects.

# ENERGY

## 2025 Levelized Cost of Energy+

*By Lazard, with support from Roland Berger and Teneo*

**View the full report here**

## Notable Highlights

- **On an unsubsidized basis, utility-scale solar and onshore wind remain the most cost-competitive and fastest-to-deploy form of generation**.
- Pages 8-12 **compare the levelized cost of energy (LCOE)** of energy technologies across the "sensitivities" of **US federal tax subsidies, fuel prices, carbon pricing, and the cost of capital.**
- The Levelized Cost of Storage **(LCOS) of commercial and industrial (C&I) and utility-scale battery energy storage systems declined** due to market dynamics (including lower EV demand and the resulting oversupply of cells) and technological advancements (including increased cell capacity and energy density).
- While battery energy storage system pricing is benefiting from competition, the spread of LCOS is widening, indicating **increased market uncertainty related to tariffs**.
- Despite the sustained cost competitiveness of renewables, **diverse generation fleets will be required to meet long-term power needs**.

## Objective

- To analyze the levelized cost of energy generation, the levelized cost of battery energy storage systems, and the cost of firming intermittency in the United States.

## Background

- The annual report combines Lazard's Levelized Cost of Energy (LCOE) and Levelized Cost of Storage (LCOS) analyses.
- The LCOE compares the cost of generating electricity from renewables (onshore and offshore wind, utility-scale solar, and hybrid projects) vs. conventional technologies (gas peaking, gas combined cycle, coal, and nuclear) over the lifetime of the project and across various "sensitivities" (US federal tax subsidies, fuel prices, carbon pricing, and the cost of capital) (methodology on pg. 7, 33-40).

- The LCOS compares the cost of battery energy storage systems over their lifetime for utility-scale, commercial and industrial (C&I), and residential use cases (pg. 18, 42-47).
- The Cost of Firming Intermittency analysis evaluates energy system-level costs associated with supplementing intermittent renewable energy on the grid with firm capacity to ensure reliable electricity delivery during peak demand periods (pg. 29).

# Report Findings

## Levelized Cost of Energy (LCOE) (pg. 4, 7-15):

- **The LCOE of renewables:** solar PV (utility-scale) ($38-78/MWh), onshore wind ($37-86/MWh), offshore wind ($70-157/MWh), geothermal ($66-109/MWh)
- **The LCOE of conventional technologies:** gas peaking ($149-251/MWh), gas combined cycle ($48-109/MWh), coal ($71-173/MWh), and nuclear ($141-228/MWh)
- A **carbon price range** of $40-60/ton of carbon would increase the LCOE of coal to $108-249/MWh, gas peaking to $173-291/MWh, and gas combined cycle to $63-132/MWh.

## Levelized Cost of Storage (LCOS) (pg. 4, 18-24):

- Energy storage **adoption is expanding** beyond ISO/RTO-driven wholesale markets **into states** where municipal procurement and data center growth are prevalent (e.g., Arizona, Colorado, Florida).
- Energy storage systems **offer numerous potential revenue sources** based on their benefits to customers and the grid (details on pg. 22-24).

## Levelized Cost of Firming Intermittency (pg. 4, 27-30):

- The cost of firming helps grid operators assess a region's existing generation mix and load characteristics to strike a balance between reliability and affordability. **As the penetration of low-cost intermittent power generation increases, the value of firm capacity rises.**
- The development of more sophisticated firming capacity accreditation frameworks (e.g., incorporating seasonal adjustments) could have material impacts on firming costs.

# CLIMATE INVESTING

## 2025 Global Climate Investing Survey

*By Robeco*

**View the full report here**

## Notable Highlights

- Following a year of political backlash against ESG, **46% of investors say climate change is a significant or central factor in their investment policy** (down from 62% in 2024).
- Investors in **Europe now lead the way** (62%, down from 76% in 2024) over Asia-Pacific investors (59%, down from 79%) **in prioritizing climate issues. In North America, the percentage fell** from 35% to 23%.
- 54% say their **biggest challenge** with portfolio decarbonization is **uncertainty over short-to-medium investment returns.**
- **Investment allocations toward climate adaptation/resilience solutions are low,** with the top reasons being uncertainty about achieving competitive returns, a lack of suitable investment products, and difficulty identifying credible companies.
- **49% say adaptation and resilience will become a more attractive growth theme** in the next three to five years.
- Enhanced analysis and evidence of financial returns, more transparent and robust corporate disclosures on climate adaptation business lines, and a broader range of public market funds **can increase investments in adaptation**.

## Objective

- To analyze global investors' climate investing strategies, including barriers to portfolio decarbonization, sentiment toward President Trump's energy agenda, and allocation toward climate adaptation and resilience.

## Background

- The data in this annual report is based on CoreData Research of 300 institutional investors with a cumulative $24.6 trillion assets under management (AUM) and wholesale investors with a cumulative $6.6 trillion AUM across Europe ($13.8 trillion), North America ($9 trillion), and the Asia-Pacific ($8.5 trillion) (methodology on pg. 2).

- Investors are categorized into four groups: those not prioritizing portfolio decarbonization (25%), those starting their decarbonization journey (38%) (e.g., assessing their carbon footprint), those at an intermediate stage (28%) (e.g., have mapped portfolio emissions and developed a decarbonization strategy), and those at an advanced stage (8%) (e.g., have set long-term targets, made significant decarbonization progress, and scaled up investments in climate solutions).

# Report Findings

## Regional differences in attitudes toward climate investing (pg. 7-10):

- **49% expect a "too little, too late" climate transition in the next decade.**
    - With the perceived greater uncertainty surrounding net zero, those committed to decarbonization may prefer to work with external asset managers that are better aligned.
    - **Half of investors prefer their asset managers' net-zero ambitions to align with their net-zero targets,** including 64% in Europe and 35% in North America.
    - 39% of investors said they'd be **less willing to work** with an asset manager **if it weakened its net-zero commitment.**
- **Investors see President Trump's energy agenda as causing a temporary setback in climate investing, with some revising their investment approach:**

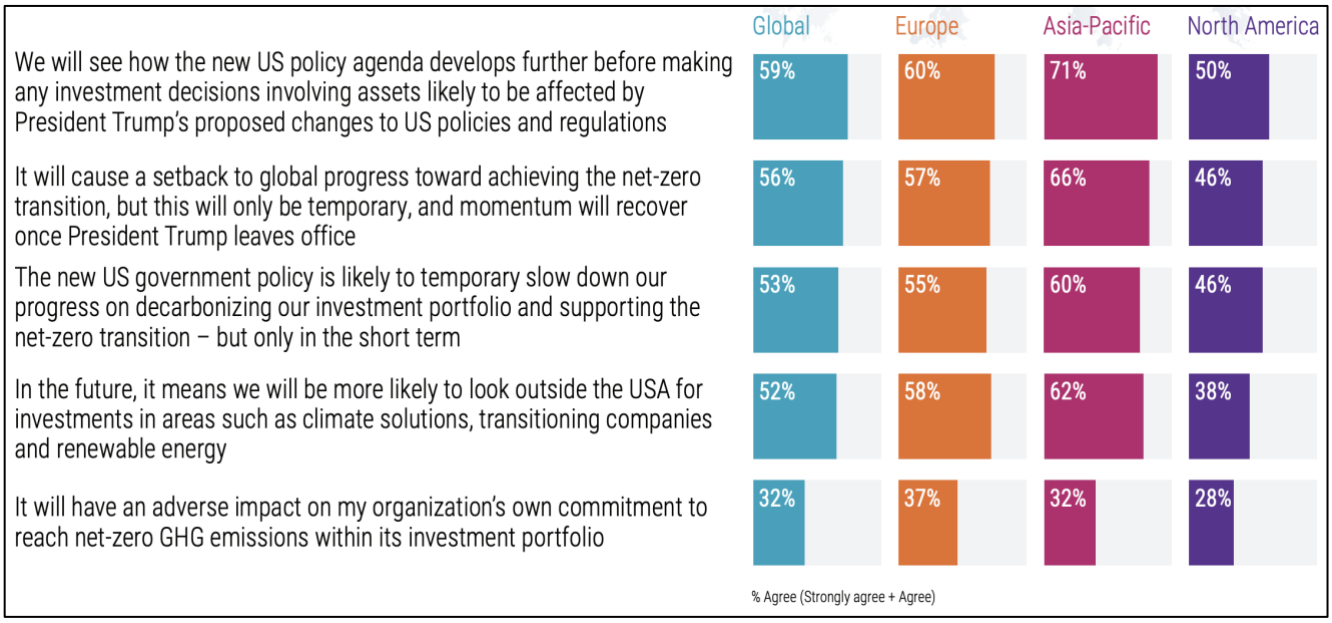


Image taken from pg. 8

## Investors invest in myriad climate mitigation solutions and plan to increase investments in the next two years (pg. 21-24, 27):

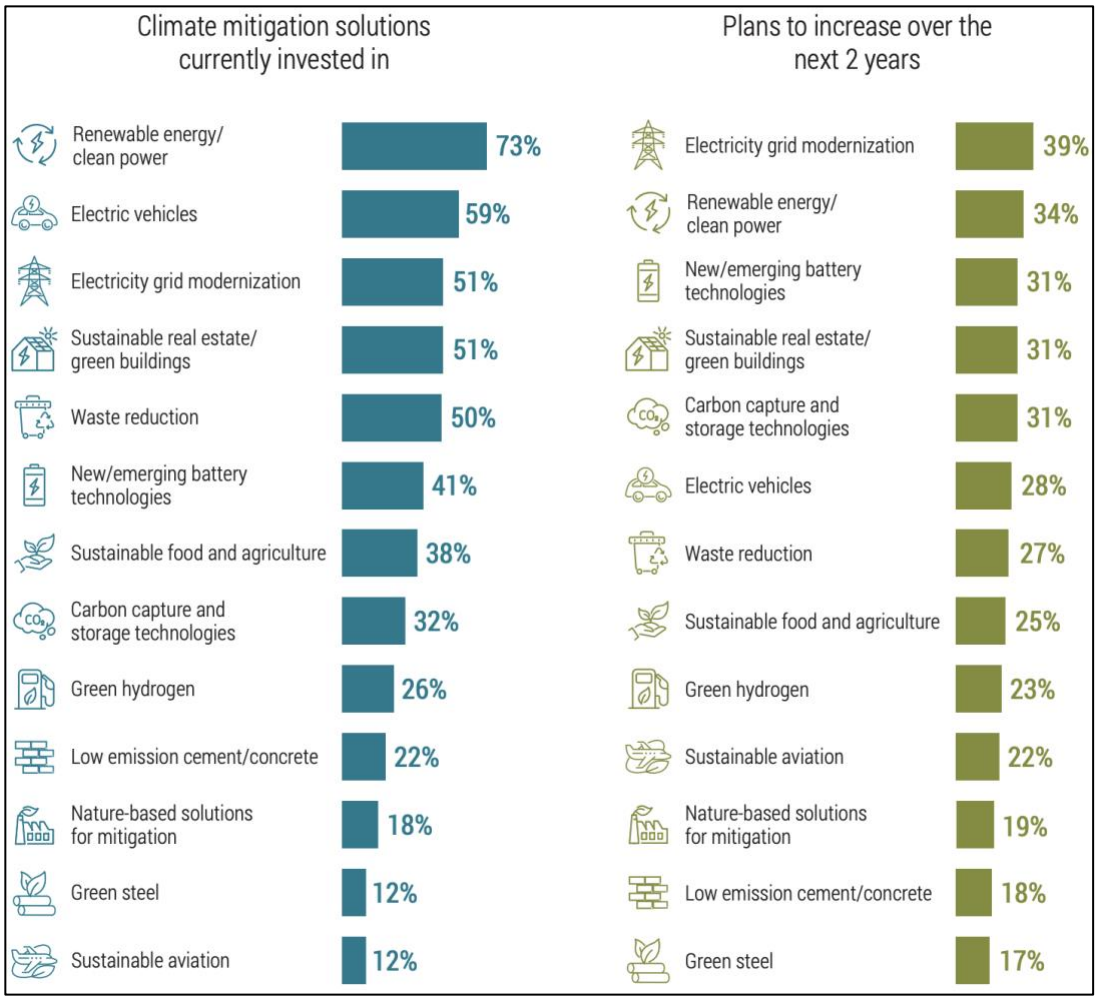


Image taken from pg. 22

- **Globally, the three most popular approaches investors are using to invest in "transitioning" companies** are green bonds/sustainability bonds (45%), active equity strategies that target transition-oriented companies (36%), and actively engaging with investee companies to align with Paris Agreement emissions pathways (31%) (pg. 27).

## Barriers to portfolio decarbonization (pg. 11-13, 28):

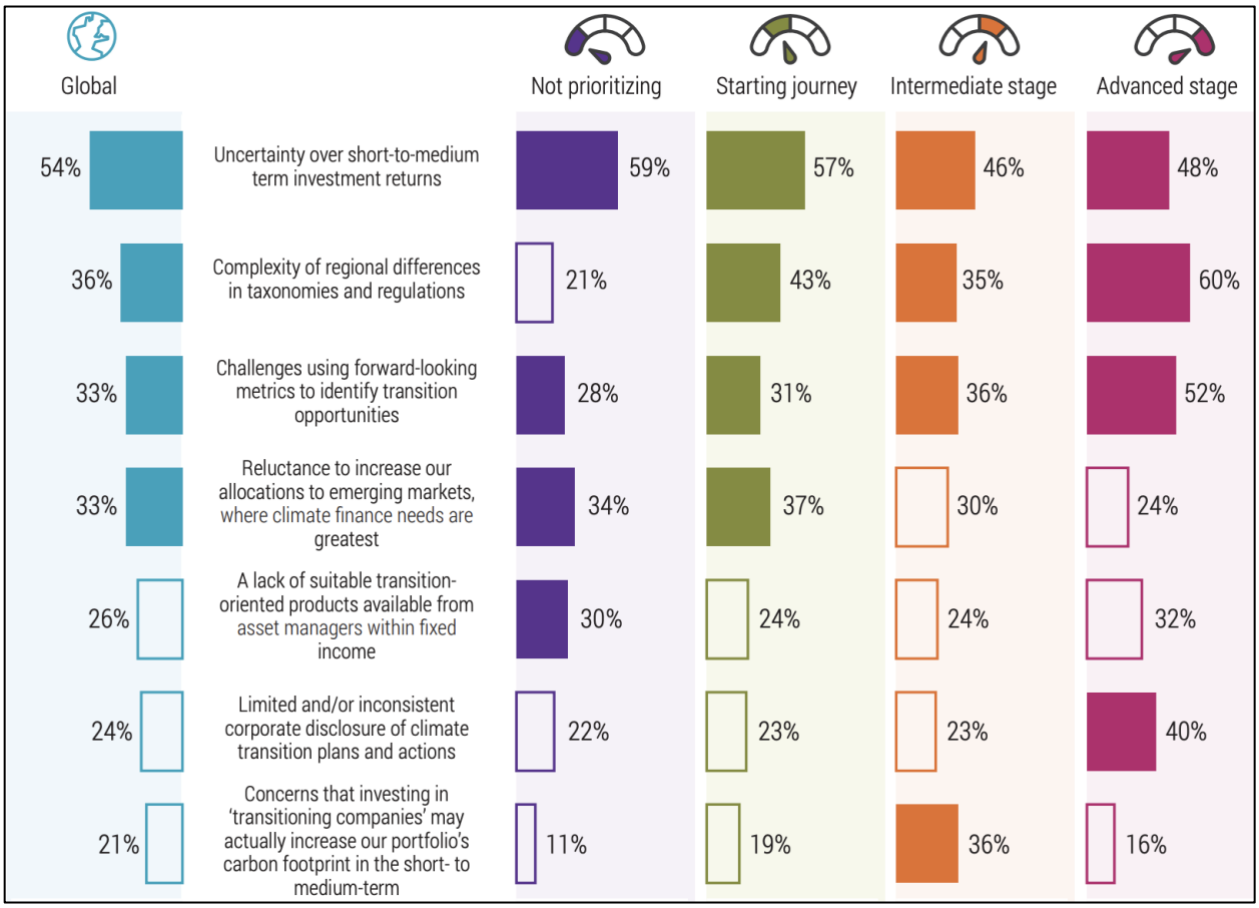


Image taken from pg. 28