The Private Equity Opportunity in Climate Adaptation and Resilience

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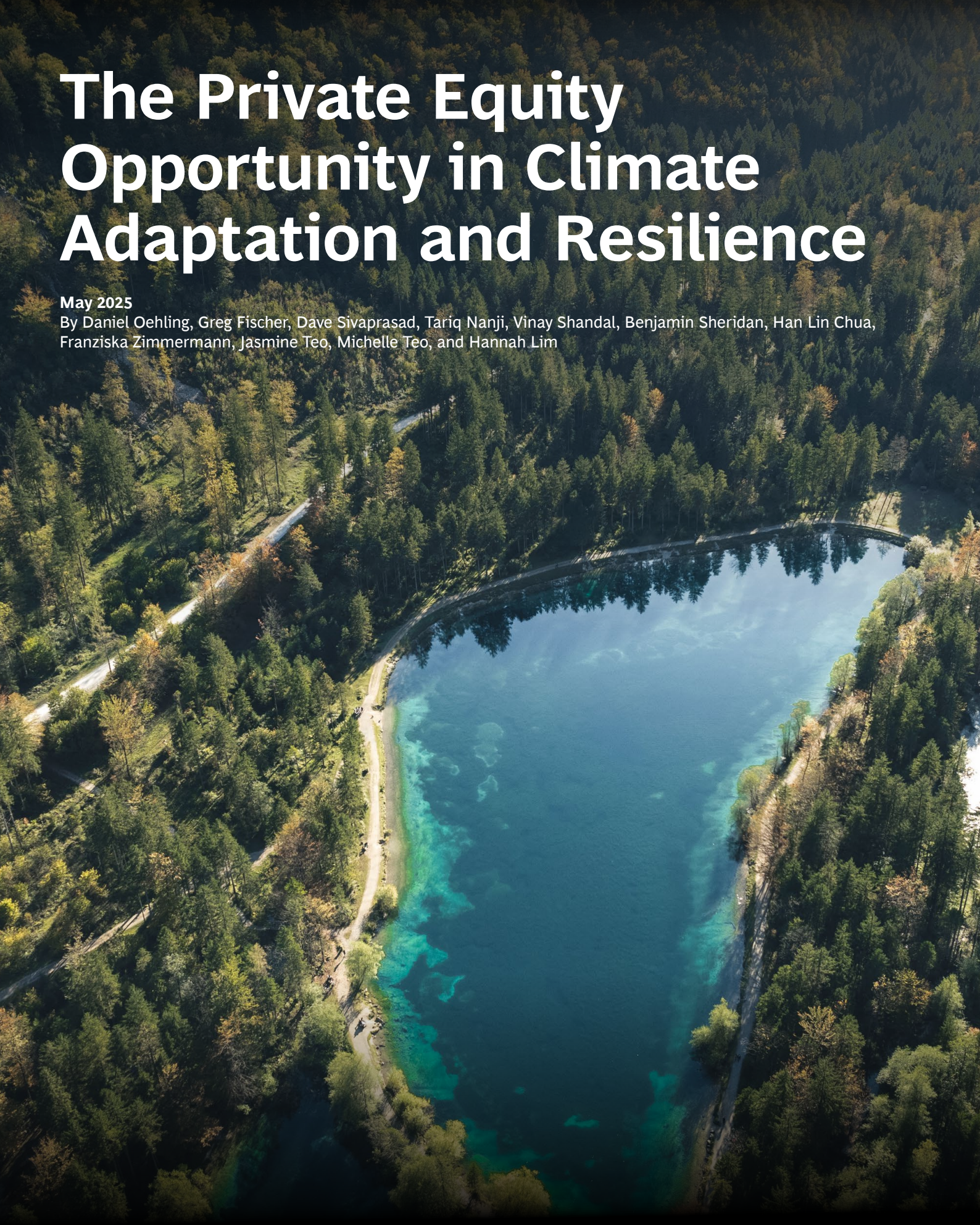

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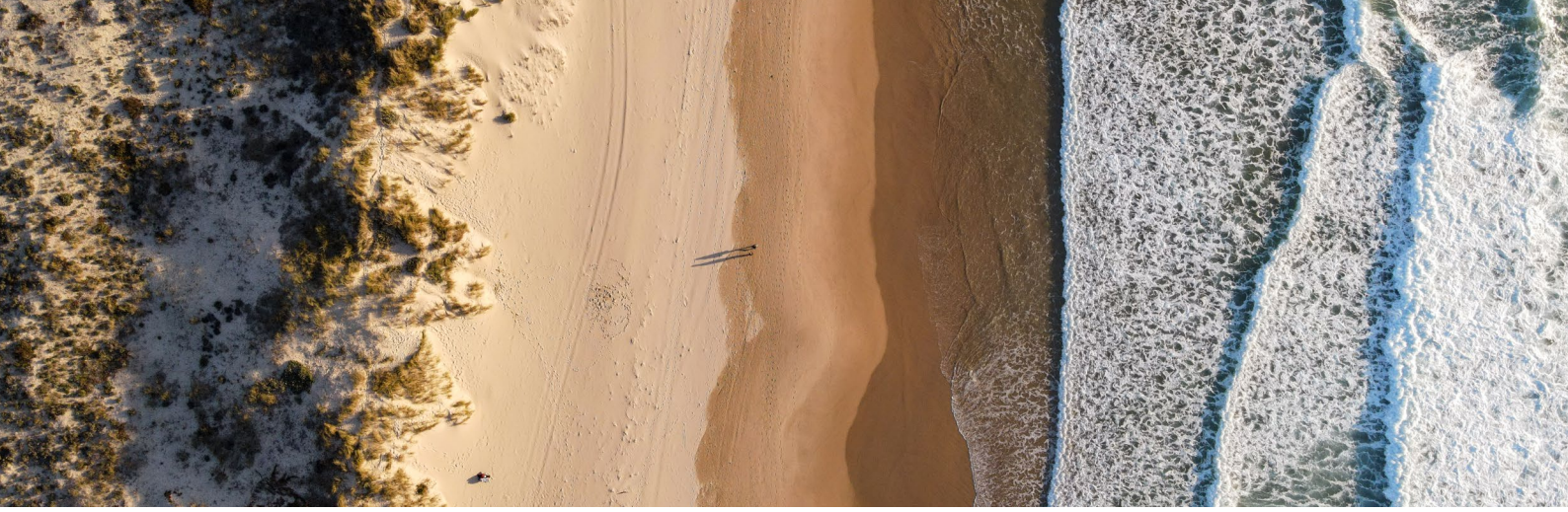
Contents



Executive Summary

According to recent studies, 2024 was the hottest year on record. Temperatures rose by over 1.55°C above pre-industrial levels last year and could rise to 3°C above pre-industrial levels by the end of the century. Global warming has increased the frequency and intensity of extreme weather events such as heat waves, wildfires, hurricanes, and floods, reducing economic productivity and damaging business assets. Climate mitigation remains a priority for investors, but investing in climate adaptation and resilience (Climate A&R) has now moved into sharper focus.

Financing for Climate A&R projects currently stands at around $76 billion a year, with public actors accounting for most of it. According to the 2024 UN Adaptation Gap Report, the countries of the Global South will need Climate A&R investments of between $215 billion and $387 billion a year from 2025 to 2030. Accounting for the developed countries, total Climate A&R expenditure must rise globally to between $0.5 trillion and $1.3 trillion a year by 2030.

The public sector is expected to account for a significant portion of the funding requirement, but the urgent need for Climate A&R solutions will create new value pools across value chains, presenting a growing investment opportunity. Notwithstanding this trend, Climate A&R is a relatively unexplored space for most private investors. Its very nature poses challenges in defining the universe of Climate A&R-related solutions providers and identifying investable sectors and companies.

To shine a light on the way forward, BCG developed the Climate A&R Investment Opportunity Map, which lays out the landscape for private investors. To assess the potential of private equity strategies, such as growth, buyout, and venture capital, the relative commercial attractiveness of these opportunities was analyzed with the help of current and forward-looking signals. Investors with other foci, such as impact investing, infrastructure, credit, and public markets, may also find this analysis useful.

This area offers a diverse array of promising investment opportunities, many of which are primed for near-term action. Multiple subsectors have multi-billion-dollar markets, double-digit growth rates, attractive margins, and a sizable pool of private companies. Our study shows that Climate A&R companies tend towards two dichotomies: early stage pure-play companies or large diversified players. That will allow private investors to use a range of investment strategies. This report dives into six investable Climate A&R-related subsectors, projecting their growth, segmenting the markets, and identifying investment trends in each of them.

Climate A&R presents an investment avenue for financial returns and sustainable impact. Private equity investors have a critical role to play in shaping and advancing this frontier. By drawing on their expertise in value creation, scaling businesses, and guiding companies to maturity, private equity investors can help build a more resilient world while securing a stake in one of the defining markets of the future.

The Private Equity Opportunity in Climate Adaptation and Resilience

With temperatures rising and extreme weather events increasing sharply in terms of frequency and intensity, climate adaptation and resilience (Climate A&R) is increasingly becoming a global focus. Climate mitigation may be the top priority, but to prevent the rising costs and growing disruptions from climate change, scaling Climate A&R solutions has become critical today.

The rising demand for Climate A&R solutions is catalyzing the creation and growth of many companies that are trying to develop and deploy A&R innovations or provide the underlying products and services that make up these solutions. As a result, Climate A&R is increasingly turning into a promising, and profitable, opportunity for private investors.

The Planet Is Overheating

Climate data shows the magnitude of the situation. Just as 2023 went down in the record books as the hottest year ever[1], 2024 quickly surpassed that record, with mean temperatures rising 1.55°C above pre-industrial levels.[2] Spain faced its worst floods in decades as a full year's rain fell in Valencia in a day, claiming over 200 lives.[3] Temperatures soared to record highs of 45°C across Asia in May 2024, forcing schools and businesses to shut.[4] And the wildfires in California in January 2025 are estimated to cost over $250 billion in damages and economic losses.[5]

Climate change is clearly accelerating at a faster pace than ever before, becoming an urgent reality. In fact, the world may have reached the point where the cost of the damages from climate change outweighs the cost of mitigation to limit global warming to 2°C above pre-industrial levels regardless of decarbonization actions taken today.[6]

1. "Climate change indicators reached record levels in 2023," World Meterological Organization, March 19, 2024.
2. "Confirmed: 2024 was the hottest year on record, says UN weather agency," UN News, January 10, 2025.
3. "More than 200 killed in Valencia floods as torrential rain hits another Spain region," BBC, November 1, 2024.
4. "Which parts of Asia are suffering from record temperatures and how long will the heat last?" The Straits Times, May 1, 2024.
5. "Estimated cost of fire damage balloons to more than $250 billion," Los Angeles Times, January 24, 2025.
6. "The economic commitment of climate change," Nature, April 17, 2024.

A recent BCG study projects that if global temperatures are allowed to rise by 3°C by 2100—rather than being limited to below 2°C—corporate profits could fall 5% to 25% by 2050.[7] And another BCG study shows that the first-movers on climate found that the cost of their actions were five times less than the cost of inaction. Consequently, the demand for Climate A&R solutions is set to accelerate rapidly.

The Climate A&R Industry Is Ripe for Investment Today

Global financing for Climate A&R projects stands at around $76 billion[8] a year currently, with public actors accounting for most of the funding. However, to estimate the emerging opportunity, investors should look to studies conducted in recent years that quantify the costs of climate inaction, the corresponding Climate A&R financing needs, and the implied expenditure on Climate A&R solutions.

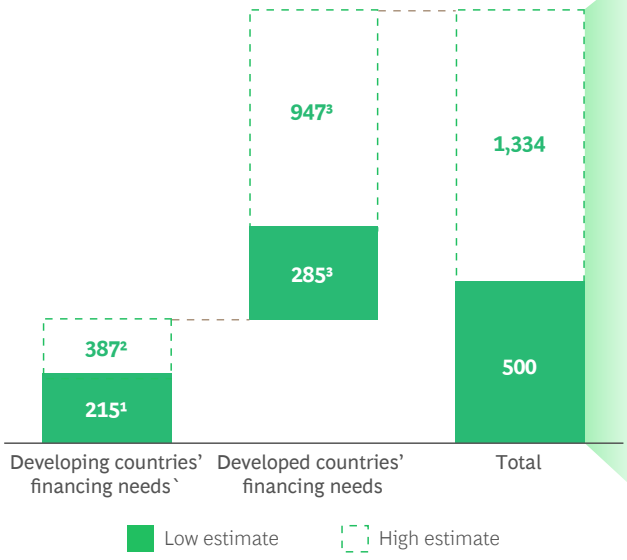
Consider, for example, the 2024 UN Adaptation Gap Report, which estimated Climate A&R financing needs of between $215 billion and $387 billion a year until 2030 for just the countries of the Global South. Accounting for the developed countries, the global projected demand for Climate A&R spending rises to between $0.5 trillion and $1.3 trillion a year by 2030.[8] **(See Exhibit 1.)** This is evidenced by as many as 87% of countries now having at least one national-level adaptation policy, strategy, or plan in place. And the expenditure will continue to grow over time as the impacts of rising temperatures and extreme weather worsen.

EXHIBIT 1

The Climate A&R Market May Grow to Between $0.5 Trillion and $1.3 Trillion from 2025 to 2030—and Become Even Larger Thereafter

The UN Adaptation Gap Report projects that investments in Climate A&R solutions will keep rising every year…

Global Climate A&R financing needs 2025–2030



… And most of that money will flow to companies that provide A&R products, services, and solutions

Main elements of Climate A&R projects Non-exhaustive

Sources: UN Adaptation Gap Report (2024); Climate Policy Initiative (2024); JICA; Cushman & Wakefield; Economic Times; BCG analysis.
[1]Based on modeled costs of adaptation.
[2]Based on adaptation financing needs according to country NDCs and NAPs.
[3]Estimated based on developed countries' share of adaptation finance needs vs. developing countries across modeled costs of adaptation and country NDCs and NAPs (estimates range from 57% to 71% of global needs). Developed countries defined as high-income and upper-middle-income countries within UN Adaptation Gap Report.

7. "The Cost of Inaction: A CEO Guide to Navigating Climate Risk," World Economic Forum, December 11, 2024.
8. "Global Landscape of Climate Finance 2024: Insights for COP29," Climate Policy Initiative, October 2024.

This will spawn new value pools and accelerate the expansion of existing markets, especially those in the supporting ecosystem of products and services, whether downstream Climate A&R projects are financed by public or private capital. For instance, new flood barrier projects will generate revenues for solution providers across the value chain—such as drainage pipe manufacturers, flood engineering consultants, and construction and maintenance companies—regardless of whether the flood drainage systems are financed by the government or the private sector. Climate A&R thus creates a growth avenue for companies addressing those needs, creating a timely opportunity for investors to make a profitable and positive societal impact with their capital.

Private Equity Investors Face Challenges

Even so, private investors have struggled to capitalize on Climate A&R opportunities in a systematic way. One challenge has been in identifying the universe of Climate A&R-related solutions providers—an important first step in quantifying the potential returns from different market segments, understanding their relative attractiveness, and prioritizing the segments to which capital should flow. This is partly because even where revenue streams exist, they tend to be embedded in pre-existing industrial sectors such as materials, engineering procurement and construction, and infrastructure, making it difficult to clearly define Climate A&R solutions providers.

To fill this gap, BCG embarked on a project to develop a systematic, structured, and solutions-oriented approach that will help private equity investors map the universe of Climate A&R opportunities. We analyzed the relative attractiveness of all the opportunities to shortlist the most promising areas, focusing mainly on buyout, growth, and venture capital strategies in private equity.

This report therefore achieves four objectives:

- Lays out the landscape of Climate A&R opportunities that private investors can consider
- Assesses the attractiveness of Climate A&R opportunities in the short run and the medium term for private equity investors
- Identifies Climate A&R subsectors that investors find promising in the near term, providing deeper insights on the available value pools and potential investment strategies
- Creates renewed awareness as well as a sense of urgency about the need to advance Climate A&R solutions that can tackle the worsening impacts of climate change on our environment and society

Drawing the Climate A&R Investment Opportunity Map

Several Climate A&R classification frameworks—such as those of the Global Adaptation and Resilience Investment Working Group, the Climate Bonds Initiative, the UN Climate Technology Center and Network, and the Global Resilience Partnership—have been developed. These are useful, especially for policymakers, economists, and community planners, but few of them have been optimized for the purpose of generating investment insights and prioritizing capital deployment decisions.

Many use the lens of environmental protection, laying out the measures needed to build resilience against climate change. Others involve actions where the commercial angle or the business model are unclear, as in the case of crop rotation, evacuation procedures, or population relocation. A solutions-oriented approach to mapping the Climate A&R landscape is more suitable for investors trying to identify investment opportunities.

This approach must be guided by two simple principles:

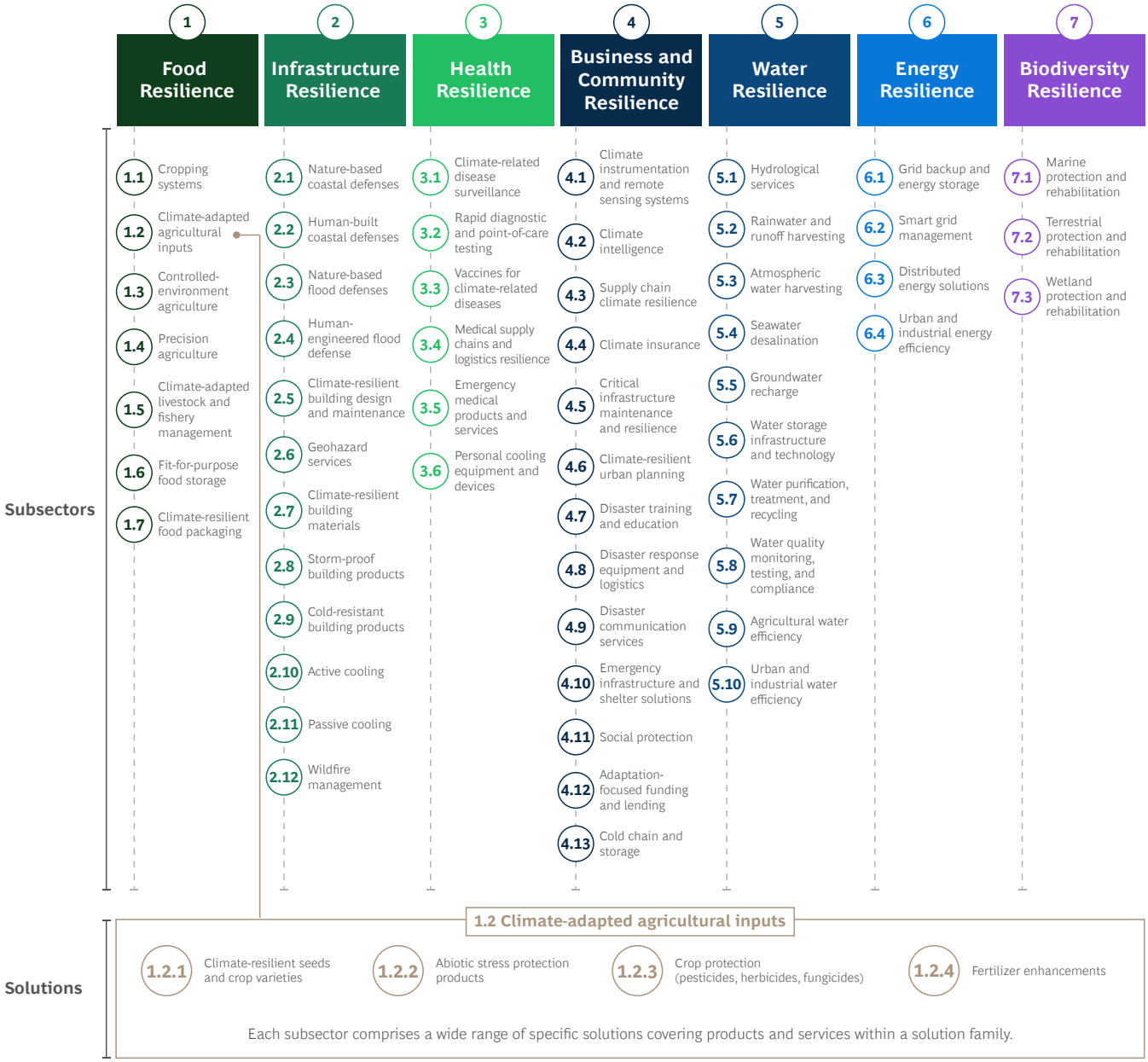
Defining the sectors and subsectors needs calibration. Overly narrow boundaries could lead to the exclusion of mature solutions that already exist—such as water efficiency or cooling solutions—but are critical to building resilience. Conversely, excessively broad categorizations will lead to (almost) every technology—telemedicine, for instance—being labeled as relevant for Climate A&R, even if the links between them are tenuous.

The organization of sectors and subsectors should be based on how product markets and service markets are structured in the real world. Some Climate A&R-related industries, such as climate-adapted farming inputs in agriculture or emergency services in healthcare, are organized vertically. Others—such as predictive maintenance solutions or cold chain solutions that several sectors, from food to pharmaceuticals, can use—are structured in a horizontal fashion. An investor-friendly classification system must mirror how markets are structured, so that they allow for comparisons of market sizes, competitive dynamics, and profitability.

Keeping these objectives in mind, we built on the various global frameworks mentioned earlier to develop a comprehensive map of the Climate A&R investment opportunity landscape. The exercise drew on our collective experience from seat-at-the-table engagements in the private equity industry, and we took care to apply both an investment lens as well as a sustainability-focused lens. The result is a Climate A&R Investment Opportunity Map for investors that extends across geographies, climate hazards, and industries. **(See Exhibit 2.)**

EXHIBIT 2

The Climate A&R Investment Opportunity Map Covers a Wide Range of Subsectors and Solutions Grouped into Seven Impact Themes



Source: BCG analysis.

The Climate A&R Landscape Can Be Viewed in Three Layers

The Climate A&R Investment Opportunity Map provides a three-layered segmentation of investible opportunities in the industry.

Level 1. The first layer—which we call ***impact themes***—is made up of areas where climate change is having the greatest impact. The seven impact themes we identified are food, infrastructure, health, businesses and communities, water, energy, and biodiversity.

Level 2. In each impact theme, we focused on ***subsectors*** based on the type of Climate A&R technology and its applications. Each represents a solution family as well as a view of how those markets are organized, which enables analyses such as market segmentation, sizing, and competitive analysis. For example, the subsectors in energy resilience include, among others, renewable energy generation, grid optimization, and energy storage.

Level 3. In each subsector, we developed a comprehensive list of ***solutions*** based on case studies, innovations, and stakeholder analyses. These solutions cover products and services across mature and emerging technologies, business models, and value segments. For example, the solutions in the flood defense and drainage subsector include modular flood barriers, flood gates, stormwater pipes, detention and retention basins, flood engineering consultants, and so on.

The resulting map reveals the sheer breadth of Climate A&R opportunities. Each sector and subsector offers a wide range of market segments and business models—emerging technologies, software and the Internet of Things, component and equipment manufacturers, predictive services, asset operations, and so on—all of which are viable investment opportunities.

Importantly, Climate A&R solutions are often a co-benefit of many sustainability solutions, making a compelling case to pursue those investments. For example, bioswales or vegetated ditches that are used for flood management, mangrove reforestation for coastal protection, and green roofs for cooling buildings all generate Climate A&R benefits as well as biodiversity protection.

At the same time, investors should be mindful of potential conflicts in the environmental outcomes of some Climate A&R solutions. Concrete and steel, for example, play a critical role in fortifying infrastructure assets to strengthen their resilience against extreme weather events, but their manufacture consumes significant amounts of energy and carbon. Investors in solutions such as low-carbon concrete and green steel, which address both Climate A&R and other environmental objectives, stand to benefit more in the long term.

Identifying the Most Promising Climate A&R Opportunities

Having laid out the landscape of investment opportunities, our next objective was to assess and identify the most promising opportunities for private equity investors. To ensure practicality and actionability, we used a mixture of data that reflects current market dynamics as well as leading indicators. **(See Exhibit 3.)**

Weighing current trends prioritizes actionable opportunities in the short run, which matches the typical investment horizons of private equity investors. Leading indicators are equally important in the context of Climate A&R investments as a key thesis underpinning the investment is the inevitable rise in expenditure on Climate A&R solutions as climate change intensifies.

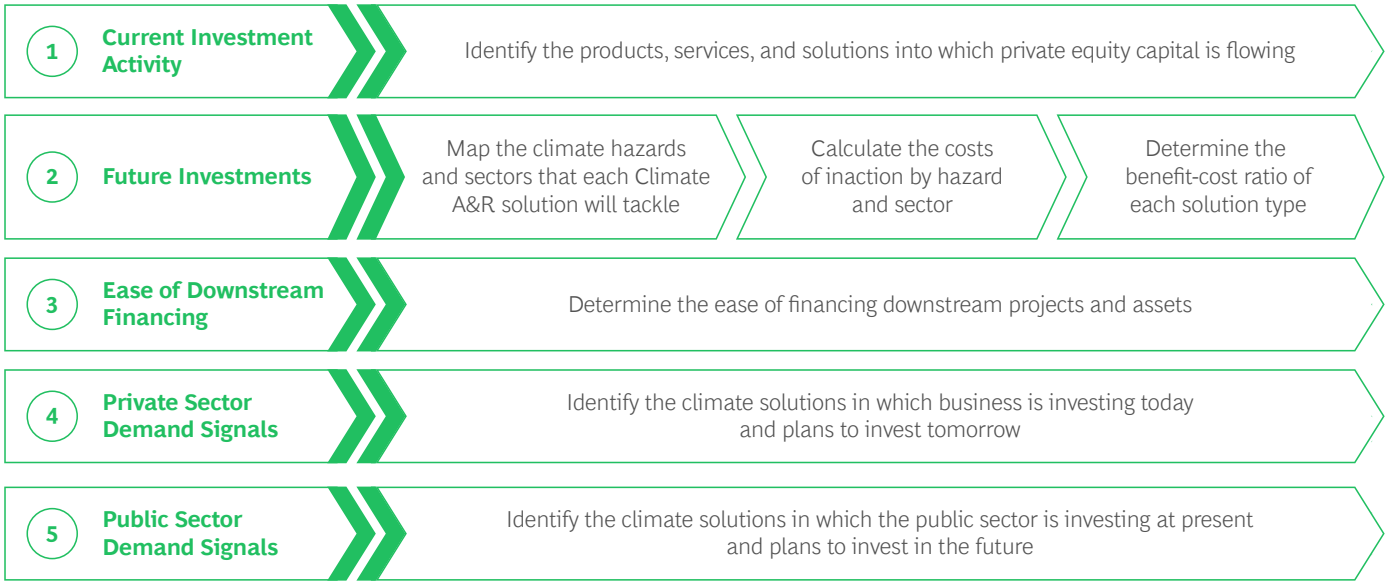
The investment opportunity assessment exercise evaluated each subsector on five dimensions, using quantitative and qualitative data sources such as cost-of-inaction studies, investment databases, company disclosures, and national adaptation plans. The dimensions are outlined in **Exhibit 3**.

Current Investment Activity

This captures the products, services, and solutions to which private equity capital is flowing at present. The presence of a sizeable pool of investors and deal flows is indicative of investor interest, demand, and the maturity of the subsector. A variety of investment databases such as Pitchbook, Tracxn, Crunchbase, and Capital IQ were used for this analysis.

EXHIBIT 3

Five Factors Will Help Private Equity Investors Identify the Most Promising Climate A&R Opportunities Today



Future Investments

Solutions with the highest benefit-cost ratios—which address climate hazards with the highest costs of inaction—will likely see the greatest demand, presenting larger opportunities for investors. A mix of public studies and BCG's proprietary climate risk assessment models were used to identify these solutions.

Ease of Downstream Financing

Solutions with less downstream financing challenges are expected to face higher demand. For example, assume that a new high-tensile material has been developed to build seawalls that can protect against sea level rises. If seawall projects face financing challenges due to the lack of a monetization model and cash flows, that could constrain the market for material makers as well as their supply chain partners.

Private Sector Demand Signals

As corporates mature in their understanding and management of physical climate risks, more public information, such as Carbon Disclosure Project (CDP) disclosures, about the private sector's planned actions to address climate risks are becoming available. This information encapsulates the relative demand across Climate A&R solutions from the private sector.

Public Sector Demand Signals

Climate A&R solutions that receive higher government demand have larger addressable markets. At least 60 countries had submitted national adaptation plans to the United Nations Framework Convention on Climate Change by the end of 2024, detailing their priorities and actions across different time horizons. The data gives investors a good understanding of how government budgets will be allocated to Climate A&R solutions in the future.

The Most Actionable Opportunity Areas

Each Climate A&R subsector was scored on those five dimensions on a five-point scale.

The analysis reveals several interesting trends.

A wide range of opportunities exists.

Our study shows that Climate A&R already offers a multitude of actionable opportunities for investors. A sizeable pool of providers of Climate A&R-related products and services exists, consisting of both players at scale with established cashflows as well as early stage ventures that are growing rapidly.

Many subsectors have multi-billion-dollar addressable markets with double-digit growth rates, attractive margins, and companies operating at scale—characteristics that align well with the investment criteria of private equity investors. In fact, the recent launch of several dedicated Climate A&R funds shows the rising interest in this space. **(See Exhibit 4.)**

Two opportunity archetypes exist.

Climate A&R companies tend to fall into two dichotomous groups: They are either early stage pure-play companies or large diversified players. Investors who want to invest in pure plays—that is, companies whose revenues come largely from Climate A&R solutions—may find only early stage targets, which carry greater technology and market risks. Investors who pursue growth and buyout strategies may have to be content with targets whose Climate A&R businesses currently account for only a small, but growing portion of their revenues.

These dynamics mirror the climate mitigation industry in its early days. Private investors approached that market by buying into large companies with legacy businesses that can provide cashflows as a way of investing in decarbonization-focused companies. Similarly, many established players are (re-)aligning their strategies with Climate A&R as a growth vector. From Orcal Inc., which is building a crop protection and fertilizer portfolio to improve the world's food resilience, to Azuria Water Solutions, which is strengthening water resilience with its pipeline-rehabilitation capabilities, there is no dearth of established companies that are focusing on the Climate A&R market for growth.

Climate A&R markets are local.

Climate impacts vary by geography, and so do the Climate A&R solutions that address them. For example, North America mostly uses detention and retention basins to prevent inland flooding, while Asia relies on pipes and drains to divert floodwaters. These differences open up more opportunities because investors can invest in Climate A&R companies to expand their markets geographically, increase cross-selling, and/or execute roll-ups, acquiring and merging companies in the same sector.

The localized nature of Climate A&R markets allows investors to enter at lower valuations before market expansion can be fully priced in. For instance, the global wildfire management solutions market was almost entirely confined to North America until two years ago. That is until wildfires broke out in Greece and Portugal, and the European market started growing. Several wildfire management solution providers have since experienced rapid expansion outside the US.[9]

The time to invest is now.

Private equity firms have the opportunity to invest in areas where climate risks are still underappreciated. Extreme weather events and climate hazards are increasing in probability and rising in terms of impact, so investors that keep abreast with the latest climate science and data across regions will be able to stay one step ahead and position themselves to capture the most attractive opportunities.

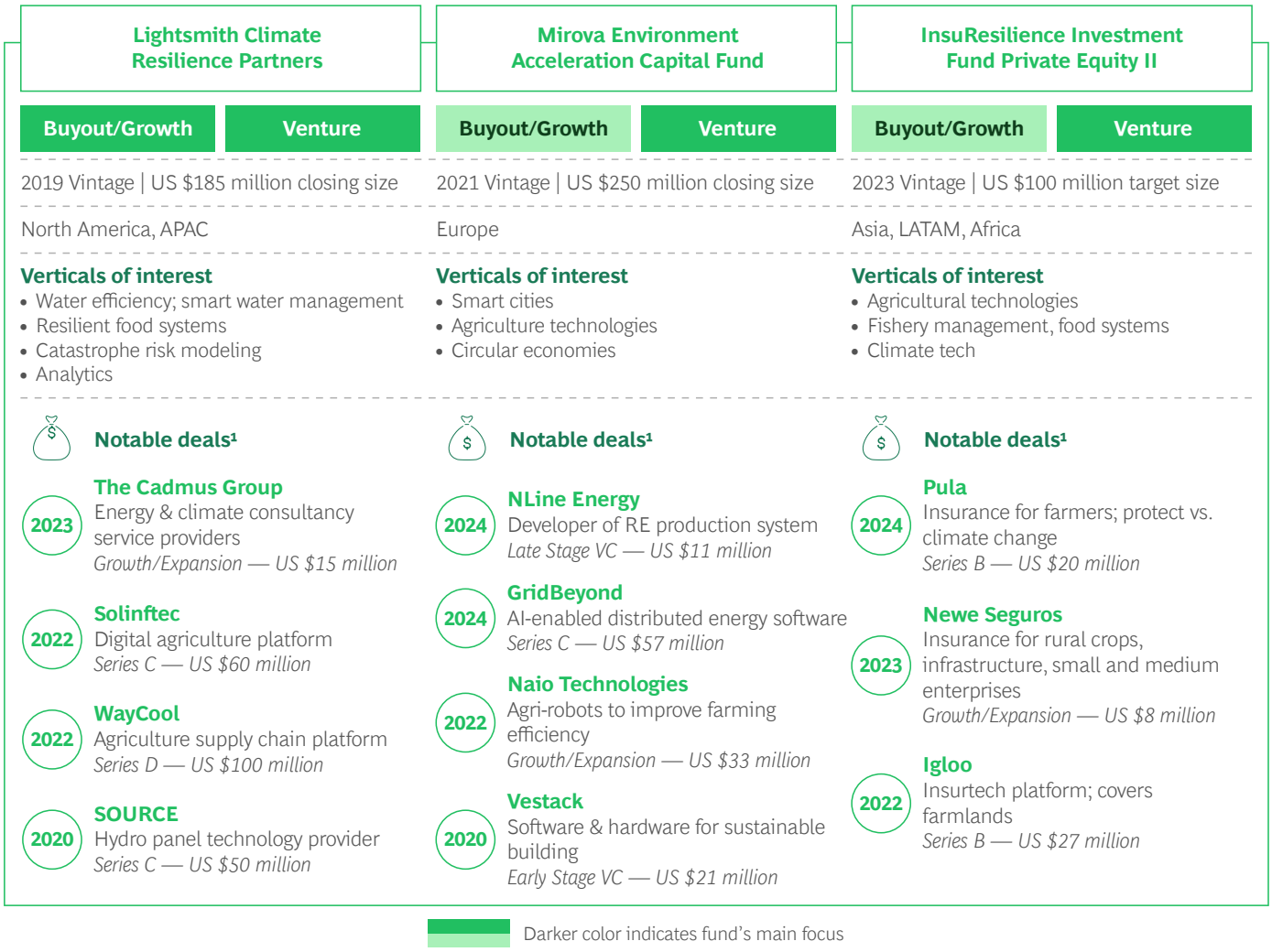
Exhibit 5 presents our findings on subsectors which are most ripe for private investment. In the next section, we shine a spotlight on six subsectors, illustrating the range of investible opportunities in each of them today.

9. For instance, Munich-based OroraTech secured €25M Series B funding for regional expansion and was awarded a €20 million contract by the European Space Agency to provide Greece with wildfire monitoring data. ("Greece First Country to Build a National Wildfire System Using OroraTech Technology," OroraTech, July 2, 2024).

EXHIBIT 4

The Recent Launch of Several Dedicated Climate A&R Funds Indicates the Growing Interest in this Investment Opportunity

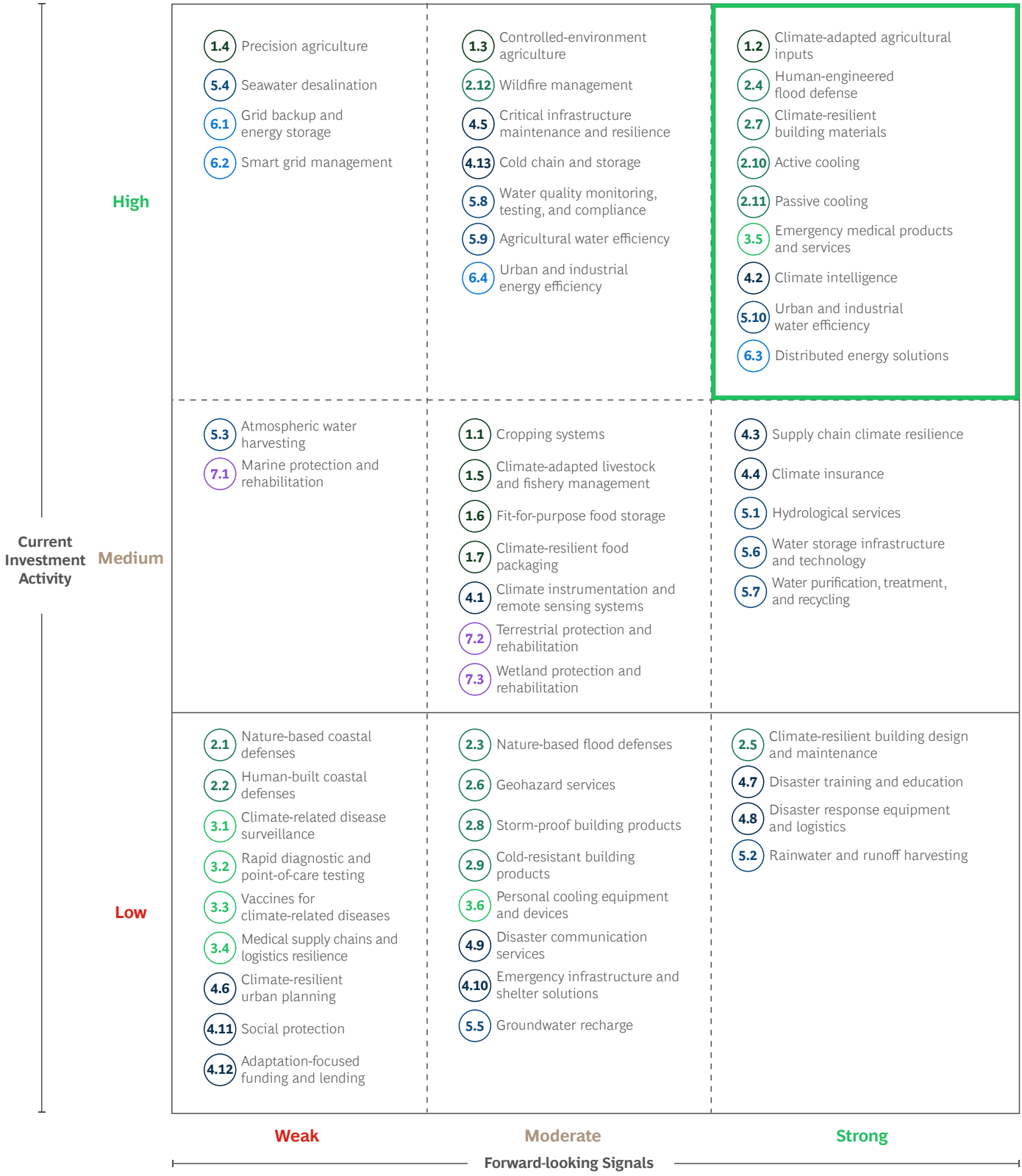
Selected examples



Sources: PitchBook; Preqin; company websites; press releases; BCG analysis.
[1]Numbers denote total deal sizes, not amount invested.

EXHIBIT 5

The Relative Attractiveness of Climate A&R Investment Opportunities Differs in the Short Run



Diving into the Dynamics of Promising Climate A&R Investments

Based on an in-depth analysis of the BCG Climate Adaptation and Resilience Investment Opportunity Map, this section offers deep-dives into six Climate A&R-related subsectors. Our studies capture the current market dynamics, competitive landscapes, and emerging trends in each sector, giving different types of investors the insights they need to navigate the complexities of and capitalize on the Climate A&R market's growing potential.

Climate Intelligence

The Market

Companies and communities naturally need climate data and intelligence to plan better for extreme weather events. The climate forecasting and risk assessment industry consists of three main segments. **(See Exhibit 6.)**

- ***Hazard warning providers*** provide short-term weather forecasts that cover time periods ranging from a few hours to two weeks in order to help minimize the immediate losses from weather-related events.
- ***Catastrophe risk analytics providers*** offer medium-term climate intelligence, the time horizon of which extends from a season to several years. They also calculate the probability of losses from catastrophic events, which the insurance industry in particular uses.
- ***Climate analytics companies*** focus on long-term scenarios, ranging from decades to a century, based on general circulation models that capture the interactions between the land, the oceans, and the atmosphere. Their projections help organizations that invest in long-term climate planning, with climate risk disclosures a growing use case in recent times.

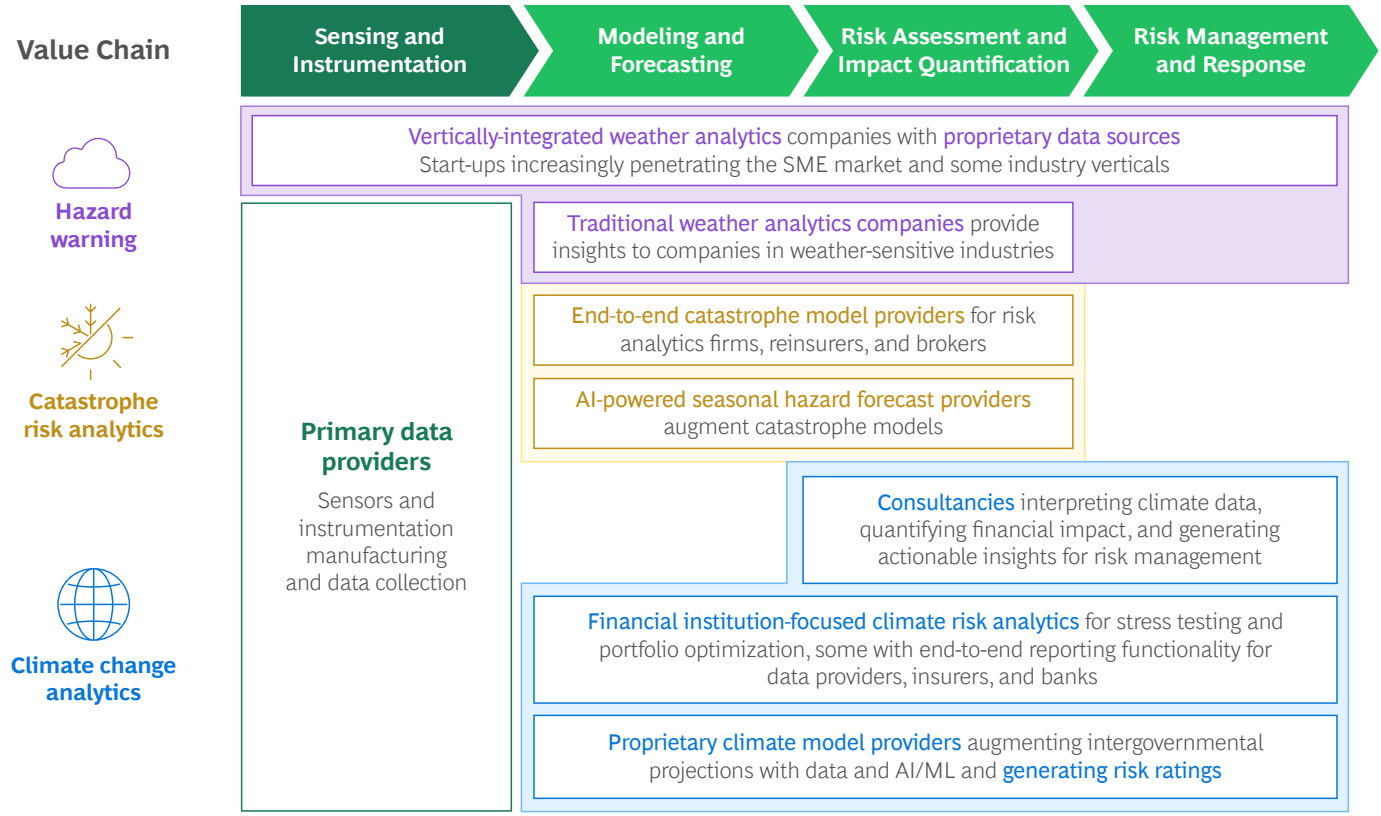
The Outlook

The climate intelligence solutions market is expected to grow by around 15% per annum over the next five years, with the climate risk analytics segment likely to grow the fastest, followed by the hazard warning segment. Over time, more and better data will become available, which will strengthen the accuracy of quantifying the financial impact of climate hazards. That will help increase the market penetration of climate intelligence solutions.

EXHIBIT 6

The Climate Intelligence Market Can Be Divided into Three Segments, Each Consisting of Companies that Focus on a Different Time Horizon

Non-exhaustive



Sources: Press search; expert interviews; BCG analysis.

Climate analytics companies will benefit from the regulations that mandate climate risk disclosures, such as the implementation of International Sustainability Standards Board-compatible mandatory reporting in several countries including Hong Kong, Japan, Singapore, and the UK, as well as the EU's Corporate Sustainability Reporting Directive. These requirements will drive companies to further develop their climate risk assessment and management capabilities. In fact, the number of reporting companies is expected to grow by at least three to four times by 2028, and will continue to increase as more countries make climate risk assessments mandatory. This will create new value pools that climate analytics players can tap.

New vertically-integrated business models have also emerged in the hazard warning segment, where some companies—such as Tomorrow.io and Climavision, two US-based real-time weather forecasting companies—have invested in sensors and instrumentation to collect their own climate data. They use proprietary data models to develop accurate hyperlocal forecasts and to make predictive recommendations for specific industries, such as providing sowing suggestions by crop, geography, and climate, which will expand the value pool. **Exhibit 7** presents a more detailed analysis of each segment.

EXHIBIT 7

The Climate Analytics Segment Is Growing Rapidly, While the Hazard Warning and Catastrophe Risk Analytics Segments Are Closer to Maturity

Segment	Commercials and customer segments	Drivers	Investment activity and pure-play A&R opportunities
Hazard warning	• Mature segment, with several companies whose solutions are used by large companies in weather-sensitive industries. Potential growth from SME customers. 2024 Mkt. size USD: ~$2.5 to 3B '24–'30 CAGR: 8–10% EBITDA margin: 25–30%	• Shift to industry-specific solutions, hyper-local forecasts, and predictive insights. • Potential to target white spaces, such as markets with lower data saturation, non-traditional sectors, and SMEs that need decision-support tools.	• Track record of private equity investments in platforms and M&A to expand analytics capabilities and geo coverage. • Recent increase in investments in start-ups with innovative industry-specific solutions. Relevant PE strategy: Venture Capital; Growth/Buyout; Catalytic Pure-play opportunities
Catastrophe risk analytics	• Stable market with mostly insurance and reinsurance customers. Pockets of growth in emerging markets, adoption of AI/ML, and catastrophe bonds. 2024 Mkt. size USD: ~$1.5 to 2B '24–'30 CAGR: 5–8% EBITDA margin: 25–30%	• Stickiness with existing providers, so incumbents are slow to innovate. • Some differentiation will be possible through asset-level risk assessment and recommendations.	• Recent M&A of large pure-play firms by data analytics companies. • Fewer start-ups in this space. • Brokers and reinsurers serve smaller insurers with own models. Relevant PE strategy: Venture Capital; Growth/Buyout; Catalytic Pure-play opportunities
Climate change analytics	• Nascent market with less than 5% adoption by corporates, but higher among banks. Larger margins since this is a new product. Early buyers figuring out how to meet climate risk disclosure regulations. 2024 Mkt. size USD: ~$1 to 1.5B '24–'30 CAGR: 25%–30% EBITDA margin: 35%–40%	• Demand is growing for quality data, especially in emerging markets, for more accurate risk assessments. • Ability to turn climate data into business implications in actionable terms, so the insights can be used for decision making.	• Strong start-up investment activity in last five years; focused on upstream companies. • Large providers are data analytics companies and banks; limited large pure-plays Relevant PE strategy: Venture Capital; Growth/Buyout; Catalytic Pure-play opportunities

Darker color indicates main strategy

Pure-play opportunities indicates number of companies with pure focus on climate intelligence. Circles indicate how relevant the strategy is to each segment.

Sources: Expert interviews; press search; BCG analysis.

Investible Opportunities

Private equity has been active in this market in recent times. (**See "Deals of Note: Climate Intelligence."**) The hazard warning segment, characterized by proven business models and stable cash flows, seems to be most promising for traditional private equity investors. Many have already invested to drive capability development and market expansion. For instance, in April 2017, TBG, a private investment firm based in Zürich, acquired Telvent DTN for approximately $900 million. The company provides digital information services and decision-support solutions to over 80,000 US subscribers in agriculture, oil and gas, trading, and weather-sensitive industries. After the acquisition, TBG has focused on building the DTN brand and expanding its global presence.

The climate analytics segment—characterized by several fast-growing startups such as Jupiter Intelligence in California, Boston-based risQ, and UK-headquartered Risilience and Fathom—is a promising arena for venture capital and growth investments. The winners in this space have created one, or both, of two differentiators: They have built better data models and/or have developed the ability to translate climate data into actionable insights.

Several credit rating and data giants have bolstered their capabilities by acquiring climate intelligence startups. For example, in 2019, Moody's purchased Four Twenty Seven, a Berkeley, California-based company specializing in data related to physical climate risks. In 2022, S&P acquired The Climate Service, a firm based in Durham, North Carolina that quantifies climate risks for corporates, investors, and governments. These deals show the possible exit strategies for private equity investors in this segment.

Deals of Note: Climate Intelligence

Union Park Capital, which focuses on lower-to-middle market industrial technology companies, invested in **AEM**, a provider of weather, water, and air quality analytics, in 2018. The objective was to accelerate AEM's rollups of integrated multi-specialist players such as Davis Instruments and Earth Networks.

TPG Rise invested $100 million in **Climavision**, a weather services platform that uses a network of high-resolution radars, GPS-RO data, and advanced software to enhance the accuracy of weather forecasting. The 2021 investment accelerated the growth of Climavision's weather solutions platform and expanded its coverage.

Centata Growth Partners, a global growth equity firm, led a $33-million Series B round of financing in 2022 for **ZestyAI**, which provides AI-driven property-level risk assessment and mitigation solutions for insurers and real estate companies. The aim was to expand ZestyAI's product offerings such as its predictive wildfire risk model, Z-FIRE, which many US P&C insurers use.

CDPQ, **Clearvision Ventures**, and **Mpower Partners** collectively invested $54 million in **Jupiter Intelligence**, which delivers asset-level insights on floods, hurricanes, extreme heat, and extreme cold risks. The investment is driving Jupiter's global expansion and new product development.

Climate-Resilient Building Materials

The Market

Climate-resilient building materials are increasingly becoming critical to protect the world's infrastructure. This market can be broken into four broad segments. **(See Exhibit 8.)**

- The ***structural materials segment*** is made up mostly of well-established concrete and steel majors as well as a few specialized climate-resilient material makers. It is a conventional business, with limited competition and high entry barriers.
- The ***façade materials segment*** can be divided into glass and fire-resistant materials companies. Innovation in this segment has centered around making glass materials more energy efficient. Fire-resistant materials have seen more aesthetic development than functional innovation.

EXHIBIT 8

Climate-Resilient Building Material Companies Can Be Segmented by the Types of Materials They Use

Non-exhaustive

Material Segment	Types of Climate-Resilient Construction Materials		Tech Maturity	Climate Hazard Resilience: Cyclones, Hurricanes, Wind	Wild-fires	Fluvial/ Coastal Floods	Extreme Heat
Structural Materials	Enhanced Concrete	Self-healing concrete: Concrete that produces limestone when cracks form to increase resilience against weathering that occurs with increased extreme weather conditions	Low	✓		✓	
		Ultra-high-performance concrete (UHPC): With additives to increase density and resistance to weathering to increase resilience against harsh weather conditions	Medium	✓		✓	
		Permeable concrete: Concrete that allows water to pass through to reduce flood risks in residential areas	High			✓	
	Enhanced Steel	Ductile steel: Steel with high tensile strength and flexibility to allow structures to handle strong winds	Medium	✓			
		Weathering steel: Steel that forms a protective rust layer on its surface to prevent further corrosion	High			✓	
		Shape memory alloys: Steel that can return to its original shape after deformation; deployed in earthquake-prone areas	Low	✓	✓		
	Emerging Materials	Cross-laminated timber: Weight-bearing material made by compressing and gluing wood layers together	Low				✓
Façade Materials	Fire-resistant Façades	Fire-resistant cladding panels: External wall panels engineered with fire-resistant materials to prevent spread of fire	High		✓		
		Fire-resistant coating: Paints or coatings that are applied directly on building materials to form a heat-insulating layer when exposed to higher temperatures	High		✓		
	Glass & Windows	Impact-resistant glass: Laminated or tempered glass to reinforce windows against forceful impacts and winds	High	✓			
		Solar control glass: Window with a coating to reflect solar radiation to limit heat entering a building to maintain indoor temperatures	Medium				✓
Insulation Materials	Conventional Application[1]	Spray foam insulation: Expanding foam that provides airtight seal to provide high insulation	High			✓	✓
		Cellulose insulation: Insulation made from recycled cardboard and/or paper, a more sustainable alternative with additional fire-resistant properties	High		✓		✓
		Mineral wool insulation: Insulation made from recycled glass, rock wool, or slag wool, with additional fire resistance	High		✓		✓
	Specialized Application[2]	Aerogels: Highly porous and lightweight insulation material with high thermal insulation and minimal thickness	Medium		✓		✓
		Vacuum-insulated panels: Panels with vacuum-sealed cores that provide high thermal resistance in ultra-thin applications	Medium		✓		✓
Water-proofing Materials	Sealant	Epoxy sealant: Sealant made from epoxy to cover up spaces	High			✓	
	Waterproof Membranes	Roofing membranes: Applied over roofs to provide waterproofing	High			✓	
		Foundation membranes: Applied on foundations to prevent ingress of water	High			✓	

Tech Maturity: High – Widely applied, industry-standard solutions; Medium – Emerging use, accredited by industry guidelines; Low – Limited use/used in small-scale developments

[1]Insulation material that is compliant to regulatory guidelines and is broadly applicable in construction.
[2]High-performance insulation with specific use in high thermal management requirement (e.g., data center, pharmaceutical manufacturing environments).

- The ***insulation materials segment*** is shifting from the use of fiberglass to alternatives such as spray foam and aerogels, the objective being to improve the energy efficiency of buildings.

- The ***waterproofing materials segment*** has seen little innovation because current solutions, such as epoxy sealants, have been sufficient to withstand extreme weather events.

The Outlook

The climate-resilient building materials market is projected to expand by between 6% and 8% (CAGR) over the next five years, with façade materials likely to lead the way by notching up a growth rate of between 8% and 10% a year. Stricter regulations mandating materials that ensure building safety as well as the rising demand for cooling will spur the creation of more energy-efficient buildings. That is why the energy-efficient façade and insulation market segments are likely to register the fastest growth rates in this industry. **Exhibit 9** presents a more detailed analysis of each segment.

Investible Opportunities

The opportunities in this industry have been primarily M&A-oriented in order to spur geographic and/or product expansion, with private equity investors active mainly in the insulation materials market. However, because of the rising demand for high-performance and climate-resilient building materials, investors are now positioned to exploit opportunities in all four segments of the market. For examples of recent private equity deals in this subsector, **see "Deals of Note: Climate-Resilient Building Materials."**

The structural materials segment, in particular, offers investors several opportunities to capitalize on the demand for niche materials and structural technologies such as low-carbon steel and self-healing concrete. Several established companies—such as Sweden's SSAB, Brazil's Aço Verde do Brasil, and Spain's Hydnum Steel—as well as start-ups such as Stegra are constructing green steel production facilities. Stegra, for example, is planning to use renewable electricity and green hydrogen to reduce carbon emissions by 95% compared to traditional steelmaking, with production slated to begin in 2026.

The absence of companies operating at scale in this space suggests that only venture capital strategies may be able to identify tomorrow's winners. By comparison, the façade and insulating materials segments are better suited for growth and buyout strategies. Because of the increase in demand for energy-efficient materials, larger companies with sophisticated R&D capabilities may be attractive options for private investors.

Interestingly, many construction material manufacturers are well integrated, so they offer private investors the potential of upsides in several market segments at the same time. Growth and buyout strategies both offer value creation opportunities, allowing private equity investors to shape these companies' futures by modifying their product portfolios so they can meet Climate A&R-related demand.

Deals of Note: Climate-Resilient Building Materials

CPPIB participated in **Solidia Technologies'** $78 million financing round in 2021. A manufacturer of low-carbon concrete with higher compressive strength and greater insulation, Solidia has used the capital to develop and deploy its technologies.

Arkea Capital, the private equity arm of France's Crédit Mutuel Arkéa Group, invested in **Glass Partners Solutions (GPS)** in 2022. A manufacturer of fireproof and solar-controlled glass that is both functional and decorative, GPS has used the investment to grow.

AEQUITA, a German family office, set up **Vandaglas** in 2019 through the acquisition of Glassolutions B.V. from Saint Gobain. Vandaglas, which specializes in making advanced glass products such as impact-resistant and solar-controlled glass, has expanded its operations across Europe through six subsidiaries.

Industrial Opportunity Partners, a North American buyout firm focused on middle-market manufacturing and distribution companies, acquired **Greenfiber** and merged it with Applegate Holdings in 2022. Greenfiber manufactures cellulose products that provide fire and sound insulation in homes.

EXHIBIT 9

The Four Segments of the Climate-Resilient Building Materials Market Differ in Terms of Both Size and Profitability

	Structural Materials	Façade Materials	Insulation Materials	Waterproofing Materials
	2024 Mkt. size USD: **$20 to 25B** '24–'30 CAGR: **4–6%** EBITDA margin: **10–15%**	2024 Mkt. size USD: **$100 to 120B** '24–'30 CAGR: **5–10%** EBITDA margin: **10–15%**	2024 Mkt. size USD: **$40 to 45B** '24–'30 CAGR: **8–10%** EBITDA margin: **20–25%**	2024 Mkt. size USD: **$60 to 65B** '24–'30 CAGR: **7–9%** EBITDA margin: **15–20%**
Tech stability	Innovation activity is high, but commercial viability is limited by high prices	Demand for higher performance solutions due to focus on building energy efficiency	Demand for higher performance solutions due to focus on building energy efficiency	Low R&D as existing tech is resilient against future climate hazards
Market Size and Growth	Market size only comprises climate-resilient forms of structural materials (e.g., UHPC) Lowest growth due to lack of regulatory-driven demand and limited willingness to pay	Growth driven by regulatory pressures around energy efficiency and ease of retrofitting façade solutions into existing buildings (e.g., solar-controlled windows)	Relatively strong and stable growth due to regulatory pressures around building insulation performance	Stable growth rate due to regulatory guidelines on waterproofing requirements Market growth driven by shorter replacement cycle of waterproofing materials (10 to 15 years)
Financials and Right to Win	Low willingness-to-pay price premiums (0–10%) for new climate-resilient forms due to low-margin business of end-users and marginal performance benefits New climate-resilient solutions with low-carbon co-benefits have a stronger business case	Higher willingness to pay a premium for climate-resilient facades since they result in higher energy efficiency	High margins due to willingness-to-pay for higher performance alternatives Right-to-win defined by performance and additional benefits such as soundproofing and fire resistance	Due to difficulty in differentiation with low-tech waterproofing solutions, the right to win lies in product companies that have established strong brand reputation Majority of players have other construction materials in portfolio, such as insulation and waterproofing solutions

Tech stability = Degree of disruptive tech expected by 2030 (Full circle means no disruption)

Sources: Expert interviews, press search, BCG analysis.

Human-Engineered Flood Defense

The Market

As much as 30% of the world's population will be exposed to fluvial and/or pluvial flooding by 2030, driving the need to build flood defenses to protect infrastructure and settlements from climate change. Two types of companies co-exist in this market: manufacturers and distributors, which focus on specific segments such as flood defense or water diversion, and service companies, which provide planning, design and engineering, and procurement, construction, and maintenance services. **(See Exhibit 10.)**

There has been much innovation in flood defense, such as the development of deployable barriers and fixed flood gates. Demand for technologically sophisticated products has also picked up in the last few years, driven by the rising incidence of extreme weather events.

The Outlook

The world's flood defense and drainage market is likely to grow at between 7% and 10% (CAGR) over the next five years. Flood-defense products will lead the way, followed by procurement, construction, and maintenance services businesses. The pace of expansion will depend on two trends:

- Growing populations and more migration from rural areas to cities will lead to the even faster growth of urban centers. As the population vulnerable to inland flooding increases, it will lead to more demand for flood defense and drainage systems.
- The demand for better flood protection will push lawmakers and insurers to act. Many updates to local and international building codes have already been announced, while insurers are incentivizing flood defense solutions and penalizing high-risk areas that have yet to invest in them. As the cost of inaction rises, emerging markets, which have a disproportionate portion of their populations at risk, will accelerate the adoption of flood defenses.

Exhibit 11 presents a more detailed analysis of each segment.

Investible Opportunities

There have been ample venture, growth, and buyout investments as well as M&A activity in the flood defense business, creating opportunities for investments as well as exits. **(See "Deals of Note: Human-Engineered Flood Defense.")**

The flood defense solutions segment is seeing a great deal of innovation, with several ventures—such as Germany's IBS Technics and Norway's AquaFence—at different stages of growth. As the leaders scale, opportunities to deploy growth capital to make their solutions available in more flood-prone countries will grow.

The flood diversion solutions sector is more mature, presenting actionable opportunities for growth and buyout strategies. Companies in this segment will likely grow in developing markets, where the demand for advanced drainage systems is expected to rise in the near future.

However, making Climate A&R-specific investments in the flood diversion services market may be challenging. That is because diversion solutions typically account for only a fraction of the sales of the world's major design, engineering, and operations-and-maintenance providers, such as the UK's Arup and Canada's WSP. Identifying the right opportunities that meet investors' Climate A&R objectives will therefore be critical.

Deals of Note: Human-Engineered Flood Defense

DFW Capital Partners, a North American private equity firm, invested in **Aqualis** (previously R+R), a provider of stormwater management services such as inspection, maintenance, repair, and emergency response. The 2022 investment is speeding up Aqualis's growth across industry verticals and regions as well as M&A.

PSP Capital, a global private investment firm based in Chicago, acquired **StormTrap**, which specializes in detention and retention basins as well as systems to manage runoff and protect waterways. StormTrap was owned by a North American private equity firm, Warren Equity Partners, until 2022.

Morgan Stanley Capital Partners acquired **APEX**—an environmental consulting and engineering firm focused on water resources, stormwater compliance, and infrastructure solutions—in 2023 from Sentinel Capital Partners. The investment has supported bolt-on M&A such as that of Storm Water Inspection & Maintenance Services Inc. in 2024.

Endurance Capital, a German private equity firm, invested last year in **IBS Technics**, which focuses on the manufacture of floodwater protection systems for the disaster-prevention and water-supply sectors.

EXHIBIT 10

Human-Built Flood Defenses Minimize the Impact of Water Damage on Infrastructure and Urban Areas

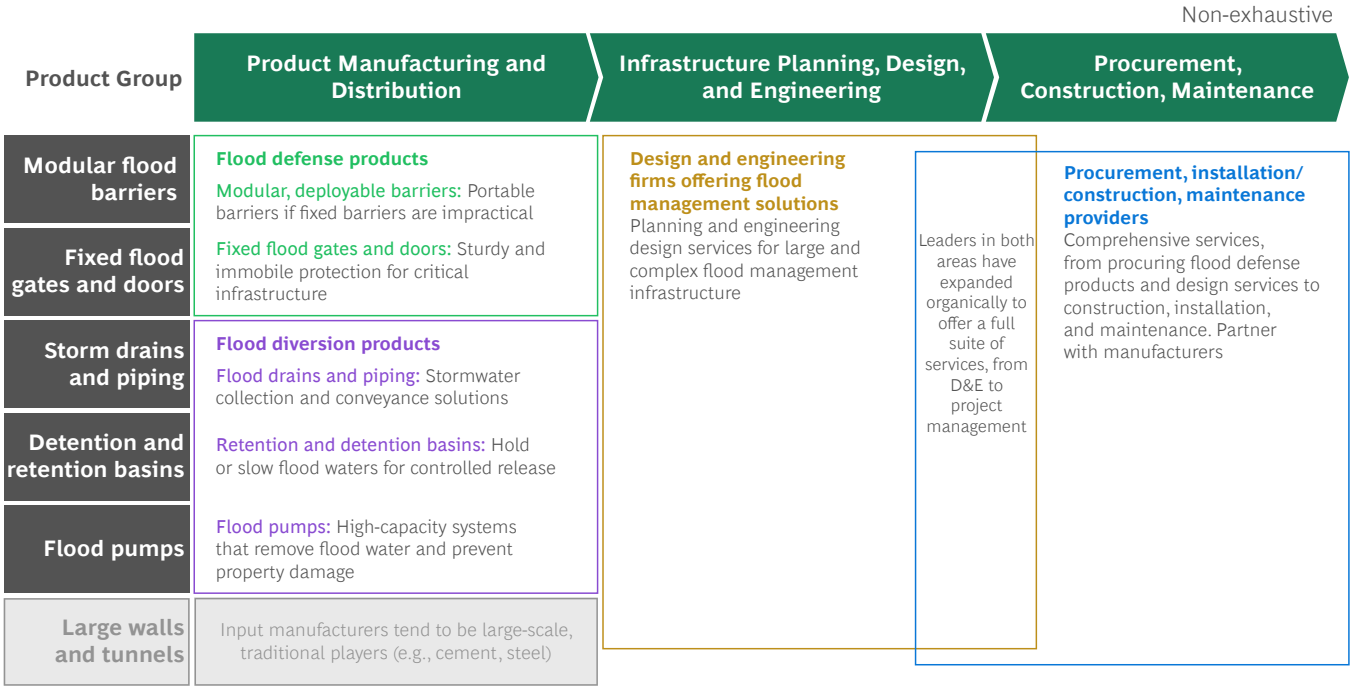
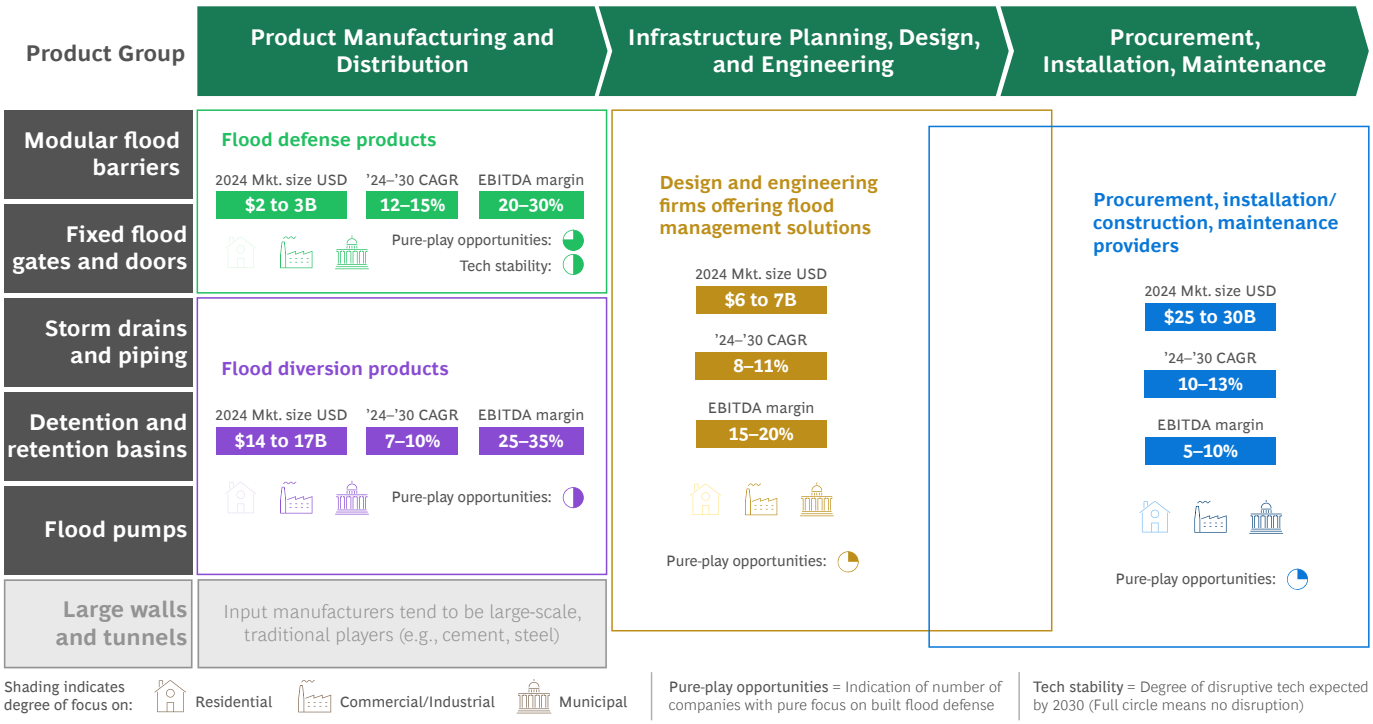


EXHIBIT 11

Each Subsegment of the Flood Defense Market Differs in Terms of Product Coverage, Customer Focus, Technological Stability, and Resulting Profitability



Sources: Expert interviews, press search, BCG analysis.

Climate-Adapted Agricultural Inputs

The Market

Climate change is negatively impacting crop yields, soil health, and water quality, while increasing the vulnerability of many crops to disease and pests. Consequently, climate-resilient inputs are becoming increasingly crucial to ensure food security and affordability. The climate-adapted agricultural inputs market comprises several segments, such as commercial seeds, stress protection, and crop protection products, each characterized by a different level of technological maturity. **(See Exhibit 12.)**

The Outlook

The climate-adapted agricultural inputs market is likely to grow at between 4% and 7% (CAGR) per annum over the next five years. The largest market segments are likely to grow modestly, driven by the slow pace of regulatory approval. That said, the greatest disruption in the future is likely to take place in the commercial seeds segment, which will be driven by regulatory changes and customer acceptance of synthetic biology.

By contrast, the abiotic stress-protection and fertilizer enhancement market segments are small at present, but are likely to grow, driven by precision agriculture. The increasing availability of local data, technological innovation, and the drive for more efficiency will expand their use, especially in the markets of the Global South.

Exhibit 13 presents a more detailed analysis of each segment.

Investible Opportunities

The major agricultural input players will continue to use M&A to build scale, expand channels, and improve their supply chains. Given the differing technological maturity across segments, each one's attractiveness to investors will peak at different points of time. For instance:

- The commercial crop seeds segment will see relatively limited private equity opportunities in the short run. Although dominated by large public companies, such as Germany's Bayer and the US's Corteva, the value chain is also dotted by smaller seed start-ups—such as Inari and Pairwise—as well as providers of molecular seed-breeding services. Regulations will likely mature in the 2030s, when synthetic bio-engineered seeds could become central to unlocking agricultural resilience.

- The abiotic stress-protection and crop-protection segments both offer opportunities for growth and/or buyout strategies. The emergence of a pool of players, such as Koppert, Pivot Bio, and Sound Agriculture, has opened up fresh opportunities for investors. Pivot Bio, for instance, engineers soil microbes that capture nitrogen from the atmosphere and deliver it to crops such as corn, wheat, and other cereals. This reduces the environmental impact of synthetic fertilizers, lowers greenhouse gas emissions, and improves soil health while increasing crop yields.

- Climate-adapted agricultural input distribution and retailing also offers opportunities for growth and/or buyouts. A large number of mature players with steady cashflows exist around the world, such as Hefty Seed and Fargro, and most of them offer a wide range of products. Private investors can use their investments to guide distributors and retailers to offer climate-resilient products, or fund upstream acquisitions to execute white label strategies.

For examples of interest in this space, **see "Deals of Note: Climate-Adapted Agricultural Inputs."**

Deals of Note: Climate-Adapted Agricultural Inputs

GEF Capital Partners, Global Environment Fund's spinoff, invested in **SeedWorks**, an integrated developer and manufacturer of hybrid agricultural seeds, in 2020. The company focuses mainly on rice, and has a footprint in The Philippines and Africa.

Aliment Capital, a growth capital investor that is focused on agriculture technology, invested in **Pairwise's** Series B and C rounds in 2021 and 2024, respectively. Pairwise is a specialist developer of CRISPR-based plant editing to enhance crop traits and deliver better consumer foods and agricultural products.

Partners Group invested around €500 million to pick up a majority stake in **Rovensa** in 2020, with a sustainable agriculture arm known as Rovensa Next. It sells bio-stimulants and specialty nutrients such as fertilizer enhancers and biocontrol products. The objective was to accelerate the growth of Rovensa's biological solutions portfolio, international expansion, and bolt-on acquisitions.

NB Renaissance Partners, a European private equity firm spun off by Intesa Sanpaolo and Neuberger Berman, invested in **Biolchim** in 2016 alongside Chequers Capital. A leader in bio-stimulants for abiotic soil stress management, Biolchim doubled in size in the next five years and was sold to Huber Group in 2022.

EXHIBIT 12

The Climate-Adapted Agricultural Inputs Market Focuses on Five Niche Areas

Non-exhaustive

Product Group	Product Development and Manufacturing	Distribution and Retail
Commercial crop seeds	**Climate-resilient crop varieties** developed by crossbreeding, genetic modification, and/or genetic engineering. Mix of **integrated R&D and R&D-focused firms** that supply manufacturers.	Distributors and retailers **carrying a wide range of agricultural input products**, usually involving a team of agronomists to work with farms.
Abiotic climate stress protection	**Syn-bio products applied as coatings to seeds or to soils** to mitigate climate stress such as drought, salinity, waterlogging, and nutrient deficiency.	
Fertilizer enhancement	**Products** that drive the more effective absorption of fertilizer. They can be **applied as supplements, soil amendments, or seed coatings**.	
Crop protection	**Biological and synthetic fungicides, herbicides, and pesticides** often applied as surface-level sprays.	
Fertilizers	Minimal innovation expected compared to other climate resilient inputs;. Push to decrease traditional application amounts	
Irrigation technology	Covered under Agricultural Water Efficiency subsector	
Precision agriculture, data, and mechanization	Covered under Precision Agriculture subsector	

EXHIBIT 13

Each Segment Varies in Terms of Market Size, Technological Stability, Product Coverage, and Resulting Profitability

Non-exhaustive

Product Group	Product Development and Manufacturing	Distribution and Retail
Commercial crop seeds	**Climate-resilient seeds** 2024 Mkt. size USD: $50 to 60B '24–'30 CAGR: 4–7% EBITDA margin: 15–25% Tech stability:  Pure-play opportunities: 	**Agricultural input distributors and retailers** 2024 Mkt. size USD: N.A. '24–'30 CAGR: 4%–7% EBITDA margin: 5%–15% Market consolidation:  Tech stability:  Pure-play opportunities: 
Abiotic climate stress protection	**Abiotic stress protection products** 2024 Mkt. size USD: $2 to 3B '24–'30 CAGR: 10–13% EBITDA margin: 15–25% Tech stability:  Pure-play opportunities: 	
Fertilizer enhancement	**Fertilizer enhancement products** 2024 Mkt. size USD: $1 to 2B '24–'30 CAGR: 7–10% EBITDA margin: 20–30% Tech stability:  Pure-play opportunities: 	
Crop protection	**Fungicides, herbicides, pesticides** 2024 Mkt. size USD: $60 to 70B '24–'30 CAGR: 3–6% EBITDA margin: 10–20% Tech stability:  Pure-play opportunities: 	

Market consolidation = Degree of market made up by top 5–10 players

Tech stability = Degree of disruptive products expected by 2030. (Full circle means no disruption)

Pure-play opportunities = Indication of number of companies with pure focus on climate resilient inputs

Sources: Expert interviews, press search, BCG analysis.

Urban and Industrial Water Efficiency

The Market

Climate change is disrupting water cycles and depleting freshwater sources so much that half the world's population could be living in water-stressed areas by 2050. Most water losses occur during distribution, so leak reduction and leak repair (aka water efficiency) solutions have become critical to improve water resilience.

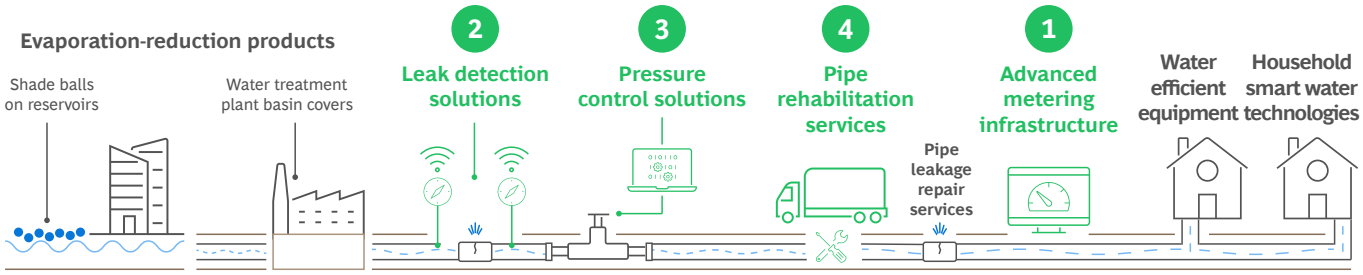
This analysis focuses on four segments in the urban and industrial water efficiency market. **(See Exhibit 14.)**

- ***Smart metering solution manufacturers.*** These devices enable the real-time monitoring of water use as well as leak detection. Growth is driven mainly by demand from utility providers, who wish to improve distribution efficiency and customer experiences.
- ***Leak detection solution providers.*** These services place sensors along water distribution networks to pinpoint and manage leaks.
- ***Pressure control valve makers.*** Smart valves can reduce both water losses and pipe stress by providing only the minimum water pressure necessary to meet demand.
- ***Pipe rehabilitation service providers.*** Water pipes that are close to the end of their lives and those that have become more vulnerable over time need to be rehabilitated or replaced. This segment is likely to experience steady growth, especially since the process can be accelerated by using trenchless pipe-replacement techniques.

EXHIBIT 14

Water Efficiency Solutions Exist Across the Value Chain; This Report Focuses on Solutions Targeting Distribution, Where Water Loss Is Greatest

Non-exhaustive



Sourcing	Treatment	Distribution		Water Use
		Leak Reduction	Leak Repair	
Evaporation-reduction products Products placed on water surface of reservoirs/storage basins to reduce evaporation loss from surface water sources		**1 Advanced metering infrastructure** Smart meters and software adopted to enable real-time, remote monitoring of water usage	**4 Pipe rehabilitation services** Larger scale pipe restoration works on deteriorated pipes to extend lifespan, without full pipe replacement	**Water efficient equipment** Low-flow or precision equipment that reduces water use
		2 Leak detection solutions Sensors/instruments and software to detect leaks precisely within distribution networks	**Pipe leakage repair services** Repair services for small-scale pipe patches and leakages, using low-tech clamps or sealants	**Household smart water technologies** Devices with water consumption monitoring and behavioral nudging capabilities
		3 Pressure control solutions Smart valves and software to optimize pressure within pipes and reduce water loss		

The Outlook

Water management regulations are likely to become more stringent in the future. For instance, the UK's Water Services Regulatory Authority is trying to reduce water leakages in that country by 16% by 2025. In the US, the state of California has asked water utilities to reduce per capita water consumption by 20%.

While the urban and industrial water efficiency solutions market is expected to grow by between 6% and 8% in the next five years, the leak-detection segment will likely grow the fastest. Spurred by the integration of AI and the Internet of Things, the segment will likely expand at between 10% and 12% a year. Automated metering solutions makers will also grow as more utility companies opt for real-time metering to improve efficiency and customer experiences.

During the same period, the pressure control solutions segment is likely to grow by between 8% and 10% per annum even as the technologies break into the North American market. Penetration will differ depending on the physical characteristics of distribution networks. For instance, water networks in North America spread across much larger distances than in the EU and could benefit more from leak-detection solutions, while the EU has an older water pipe infrastructure that will require more pressure control solutions and pipe rehabilitation services.

Exhibit 15 presents a more detailed analysis of each segment.

Investible Opportunities

Private equity investors focused on traditional growth and buyout strategies may find profitable opportunities in the advanced metering infrastructure and pipe rehabilitation services spaces. There are less than a handful of large companies worldwide, but a sizeable number of medium-sized companies, such as Ovarro, Master Meter, and Metron-Farnier, are growing. They have developed the organizational muscle to bolt on smaller firms to provide a wider array of smart-metering solutions.

Trenchless pipe players, such as Puris, NordiTube, and Vortex Companies, may also interest growth- and buyout-focused investors. These companies provide rehabilitation services for various kinds of piping infrastructure beyond water distribution, which diversifies their revenue streams. Further upstream, investors may be interested in companies that manufacture special materials for pipe rehabilitation.

Investors with an early stage focus may find attractive opportunities in the leak-detection and pressure-control solution segments. In the leak-detection segment, startups are increasingly harnessing AI to disrupt rivals. The existence of several VC-backed startups, coupled with the possibility of M&A, will provide investors with viable entry and exit pathways.

Investors would do well to keep an eye open for emerging opportunities in the water pressure-control segment. Traditional valve manufacturers and emerging smart valve specialists are competing to deploy smart pressure controls economically. While commercial viability is not yet certain, rising penetration and output levels will provide opportunities for the first-movers to gain outsized market shares.

For a sample of the range of viable strategies within this subsector, **see "Deals of Note: Urban and Industrial Water Efficiency."**

Deals of Note: Urban and Industrial Water Efficiency

New Mountain Capital, an American growth investing firm, invested over $450 million in **Azuria Water Solutions** (formerly Aegion Corporation) in 2021 alongside AIMCo. Azuria is a provider of construction, maintenance, protection, and rehabilitation services for water, wastewater, and industrial pipelines. The investment has been used to expand its portfolio through acquisitions, such as those of Performance Pipeline Technologies and North American Pipeline Management.

J.F. Lehman & Company, a mid-market American private equity firm, acquired and formed **PURIS** in 2018 by merging Inland Pipe Rehabilitation, Inliner Solutions, and Murphy Pipeline Contractors. It has become a leading trenchless pipeline rehabilitation provider that offers cured-in-place piping (CIPP), slip lining, and manhole rehabilitation services. The investment has helped accelerate PURIS's growth and efficiency.

SKion Water, a European investor in mid-market water solution providers, acquired **FIDO Tech**, a UK-based provider of AI-powered leak detection solutions for water utilities, in 2022. The investment has been used for scaling operations, technology development, and market expansion.

XPV Water Partners, a Canadian impact investment firm specializing in water companies, invested in an American smart water technology company in 2019. The latter sells residential and commercial water meters that provide low-flow performance and enable automated metering without the need for costly infrastructure.

EXHIBIT 15

Advanced Metering Is the Largest Segment Today, While Leak Detection and Trenchless Pipe Rehabilitation Are Showing Increasing Promise

Subsector	Commercials and customer segments	Right to win	Investment activity and pure-play A&R opportunities
Advanced metering infrastructure (AMI)	• Early adoption stage (~20% globally), with higher penetration in NA than EU and APAC 2024 Mkt. size USD: ~$4 to 5 B '24–'30 CAGR: 8–10% EBITDA margin: 25–30%	• Market is shifting from low-tech automatic meter reading[1] to real-time data transmission	• Moderate pure-play opportunities as AMI solutions are today mostly focused on optimizing customer billing experience Suitable PE strategy: Venture Capital / Growth/Buyout / Catalytic Pure-play opportunities
Leak detection solutions	• Nascent market with 2–3% penetration • Technology is more prevalent in NA than EU and APAC 2024 Mkt. size USD: ~$2 to 3B '24–'30 CAGR: 10–12% EBITDA margin: 25–30%	• Precision of leak detection is a key differentiator • Players offer both software and leak detection turnkey solutions (implement/operate /monitor leak detection solutions for utility operators)	• Predominantly VC activity as disruption of AI and IoT within the segment is recent • Active acquisitions by strategics present viable exit opportunities Suitable PE strategy: Venture Capital / Growth/Buyout / Catalytic Pure-play opportunities
Pressure control solutions	• Adoption varies across regions. Lower in the US, but higher in the EU given its aging infrastructure 2024 Mkt. size USD: ~$2 to 3B '24–'30 CAGR: 8–10% EBITDA margin: 20–25%	• More effective for leak prevention within older, denser networks • High prices present some barriers for adoption	• Emerging software-focused players have viable exit opportunities through strategic acquisitions Suitable PE strategy: Venture Capital / Growth/Buyout / Catalytic Pure-play opportunities
Pipe rehabilitation services	• Mature market with a mix of low-skilled open-cut excavation[2] rehabilitation techniques and expensive trenchless technology[3] • Growth and higher margin segments concentrated in the trenchless market 2024 Mkt. size USD: ~$4 to 5B '24–'30 CAGR: 4–5% EBITDA margin: 15–20%	• Efficiency of tech deployment to ensure limited disruption during restoration process	• Strong PE activity within trenchless technology solution providers • Majority of players also serve other industries beyond water (e.g., oil and gas), but also for infra resilience purposes Suitable PE strategy: Venture Capital / Growth/Buyout / Catalytic Pure-play opportunities

Darker color indicates main strategy

Pure-play opportunities = Indication of number of companies with pure focus on water efficiency

Sources: Expert interviews; press search; BCG analysis.
[1]Automated Meter Reading (AMR) systems enable data collection via drive-by or walk-by methods.
[2]Open-cut excavation is a traditional method of pipeline repair or replacement that involves digging trenches along the entire pipeline length to access and repair it.
[3]Trenchless technology is a modern method of pipeline repair that does not requires digging a trench; technology includes cured-in-place-pipe (CIPP) and pipe bursting.

Emergency Medical Products and Services

The Market

Essential and emergency medical services (EMS), a fast-growing subsector of the global economy, are likely to expand by between 8% and 10% per annum in the next five years. The EMS products segment is expected to grow even faster—the main drivers being the growing need for medical relief in the immediate aftermath of extreme weather events, as well as the ripple health effects from both acute and chronic climate risks, such as respiratory, water-borne, or vector-borne diseases.

Several segments will appeal to private equity investors, as shown in **Exhibit 16**:

- The ***EMS products market***, which is served by several well-diversified medical device companies, is mature. This segment could grow by between 10% and 12% per annum over the next five years, driven by a variety of innovations—such as longer-lasting batteries, user-friendly AEDs, and automated CPR devices—as well as greater demand.
- ***Mobile-hospital suppliers*** cater to the military, governments, NGOs, and hospitals that provide healthcare during disasters and conflicts, including emergencies originating from extreme weather events. In a fragmented market, suppliers have to keep shipping times and costs low, and build close relationships with local governments in order to succeed. Because of some levels of excess stocking during the COVID-19 pandemic, this segment's future growth is expected to be muted in the short term, at only around 5% to 8% a year.

EXHIBIT 16

Three Segments of Interest to Private Equity Have Emerged in the Emergency Medical Products & Services Market

Non-exhaustive

EMS Products

Patient transfer equipment

Equipment used for moving patients safely and efficiently

Examples: Ambulance stretchers, patient transfer boards, stair chairs

Point-of-care (POC) and portable equipment

Portable tools used to provide on-the-spot treatment and diagnostics

Examples: Portable ventilators, defibrillators, portable ultrasound machines

Emergency room (ER) equipment

Equipment for use within emergency rooms

Examples: ER crash carts, patient monitors, infusion pumps

Mobile Hospitals

Tents

Portable, quickly deployable medical structures for field hospitals or emergency situations; typically for inpatient wards

Examples: Inflatable medical tents, modular rapid-deploy tents, field triage centers

Containers

Emphasize sturdy, modular containerized solutions that function as fully equipped mobile hospitals with more specialized equipment

Examples: ICU container units, modular surgical containers, diagnostic and imaging containers

Ambulance Services

Land ambulance services

Land-based transport used for on-ground disaster response

Examples: Basic Life Support (BLS) ambulances, Advanced Life Support (ALS) ambulances, Mobile ICU ambulances for critical care

Air ambulance services

Aerial transport for rapid disaster response and patient evacuation

Examples: Helicopters for on-site response, ICU-equipped planes for critical disaster relief missions

- ***Ambulance services*** cover emergency responses as well as evacuations during extreme weather events, and are conducted by land and/or air, mainly by helicopters and air ambulances. Private sector companies service 20% to 40% of the global market today, with governments and NGOs managing the rest. Growth could average between 8% and 10% in the next five years, with the air ambulances business, in particular, projected to grow rapidly. The market will expand because of rising government demand, more outsourcing to private companies, and the greater incidence of climate change-driven illness such as cardiac arrests and infectious diseases.

Exhibit 17 presents a more detailed analysis of each segment.

The Outlook

The sharp increase in extreme weather events will arm both governments and non-governmental institutions with the mandate and the resources to strengthen their disaster-management capabilities. They will therefore invest in boosting the number of ambulances, mobile hospital units, and EMS devices they possess and in training first responders. Technological developments will drive responses that are automated, faster, and user-friendly in addition to offering advanced life support capabilities.

Investible Opportunities

Of the three segments described, ambulance services and EMS products are likely to be most attractive to private equity investors. (**See "Deals of Note: Emergency Medical Products and Services."**) Private ambulance services are growing globally, with some consolidation. The world's two largest providers, GMR and Falck A/S, each enjoy a 20% to 30% market share, followed by the regional players and a number of sub-scale (less than five ambulances each) companies.

New players such as Ziqitza Healthcare and MeduLance, both in India, have developed novel growth strategies. Founded in 2005, Ziqitza mainly operates ambulance services in partnership with state governments. Medulance, set up in 2017, is a private ambulance service provider that focuses on technology-driven emergency response through GPS-enabled ambulances. Both address gaps in India's emergency medical infrastructure.

Investor interest driven by cashflows is also evident from Harbor Point's investment in Midwest Medical Transport in the US in 2022 and Ancala Partners' 2023 acquisition of Babcock International Group's aerial emergency service business across Europe (named Avincis). Roll-ups have also been common, such as those of Priority Ambulance, Falck, and PatientCare Logistics Solutions.

The EMS products market, which is more mature, will be driven by innovation. Some of the actionable investment opportunities will be in niche ventures that could be targets for bolt-on acquisitions to complement larger companies' offerings and distribution channels. For instance, ZOLL Medical, a subsidiary of Japan's Asahi Kasei, acquired as many as 16 smaller companies between 2003 and 2021 to boost its critical care and cardiopulmonary health-focused portfolio.

Deals of Note: Emergency Medical Products and Services

Blackrock, through the funds it manages, orchestrated a $225 million investment in **RapidSOS**, a platform that connects data from over 500 million devices to first responders, in 2024. The investment will boost the integration of AI with the company's products, which will enhance its ability to provide real-time data to first responders.

Heartland Equity Partners, an American private equity firm focused on manufacturing and value-added distribution businesses, acquired **Spectrum Aeromed** in 2019. The latter is a leading provider of advanced air medical solutions such as custom life support equipment for air ambulances.

In 2023, **Ancala Partners** acquired Babcock International Group's aerial emergency service businesses in Spain, Portugal, Italy, Norway, Sweden, and Finland. Renamed **Avincis**, the company has a portfolio that includes medical transport, firefighting, and search and rescue operations with over 230 aircraft located at 160 sites in Europe.

Enhanced Healthcare Partners, a US-based healthcare-focused PE firm, invested in **Priority Ambulance** in 2017, accelerating its national expansion strategy through various acquisitions, such as First Call Ambulance and OnDemand Visit, a telehealth solutions provider. Priority Ambulance supports over 600,000 patient transports annually with a fleet of over 1,100 ambulances.

EXHIBIT 17

Regional Ambulance Providers May Be Most Attractive, Followed by EMS Product Makers

Subsector	Commercials and customer segments	Right to win	Investment activity and pure-play A&R opportunities
EMS products and devices Deep-dive	• Mature market with top 5 players accounting for 60–70% of the market • NA and EU growth driven by upgrades; APAC and LATAM driven by adoption as regulations improve 2024 Mkt. size USD: ~$20 to 25B '24–'30 CAGR: 10–12% EBITDA margin: 15–25%	• Product innovation towards more user-friendly and automated/ AI-guided products; important in markets facing healthcare worker shortages (NA, EMEA) • Customer support and product training to differentiate from other providers, build brand loyalty, and ensure uptime	• Strong M&A activity by larger players rolling up smaller pure plays for their technology • Limited play for top players—mostly public companies Suitable PE strategy: Venture Capital, Growth/Buyout, Catalytic Pure-play opportunities
Mobile hospitals	• Customers are the military, for both conflict and disaster relief; governments, for disaster resilience; and hospitals, for rural services • Fragmented market, with a focus on local providers to minimize shipping time and cost • Limited growth due to stocking during the COVID-19 pandemic 2024 Mkt. size USD: ~$3 to 4B '24–'30 CAGR: 5–8% EBITDA margin: 15–20%	• Strong local relationships; military and local government are key customers • Speed of delivery, 2–6 months or more depending on complexity of equipment and size; longer if shipping from farther • Quality is key for international organization-funded projects; European providers with certifications preferred	• Limited investment opportunities for pure-play companies (lack of scale; localized) • Mobile hospital offerings may be embedded within larger companies providing military solutions, which could be subject to exclusion policies in investment firms Suitable PE strategy: Venture Capital, Growth/Buyout, Catalytic Pure-play opportunities
Ambulance services Deep-dive	• Mature in developed countries, growing in emerging countries; boost from strengthening disaster risk response for extreme events • Operating models vary; can be goverment-run, PPP, outsourced to NGO/private sector, or a mix • Private companies have the largest markets in North America, Nordics, Germany, UAE, and India 2024 Mkt. size USD: ~$20 to 25B '24–'30 CAGR: 8–10% EBITDA margin: 10–20%	• Sizeable asset base: able to bid for large government RFPs for ambulance services; owned or aggregated from smaller players • Service quality: fast response times and availability of trained personnel (US is currently in shortage) • Corporate channels: new growth area as corporates offer more health benefits in markets that lack public services and scalability to provide other occupational health needs (e.g., corporate clinics) is key to customer acquisition	• Potential for roll-up of leading local providers (or acquisition of large international players) • Potential for early-stage investments to scale up providers with innovative business models Suitable PE strategy: Venture Capital, Growth/Buyout, Catalytic Pure-play opportunities

Darker color indicates main strategy

Pure-play opportunities = Indication of number of companies with pure focus on EMS products and services

Sources: Expert interviews; press search; BCG analysis.

Mobilizing Capital for a Resilient Future

With the impacts of rising temperatures and extreme weather events intensifying in the future, the market for Climate A&R solutions will only continue to grow. Corporations, governments, and municipalities will increasingly prioritize Climate A&R solutions to strengthen the resilience of businesses and communities, while regulatory frameworks and financing mechanisms will evolve to catalyze their deployment.

Private equity investors have a significant opportunity to ride the growth in Climate A&R and achieve substantial returns. While some opportunities will reside in large incumbents or diversified public market conglomerates, many others will be found in middle-market enterprises, specialized service providers, and innovative technology companies. This study highlights prospects across six Climate A&R subsectors; a deliberate approach will likely uncover even more.

Private equity investors have a critical role in shaping and advancing this frontier, drawing on their expertise in value creation, scaling businesses, and guiding companies towards maturity. They can help accelerate the commercialization of new technologies, scale businesses, improve operational efficiency, develop novel business models, and optimize cash flows—all strategies that have been honed over time as part of the private equity investor's toolkit.

By investing in this space, private equity firms can position themselves to capture a rapidly expanding market and contribute to global climate resilience across industries, communities, and ecological systems. The convergence of financial opportunity and meaningful impact makes Climate A&R an investment avenue where returns and benefits are aligned. By acting now, investors can help build a more resilient world while securing a stake in one of the defining markets of the future.

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