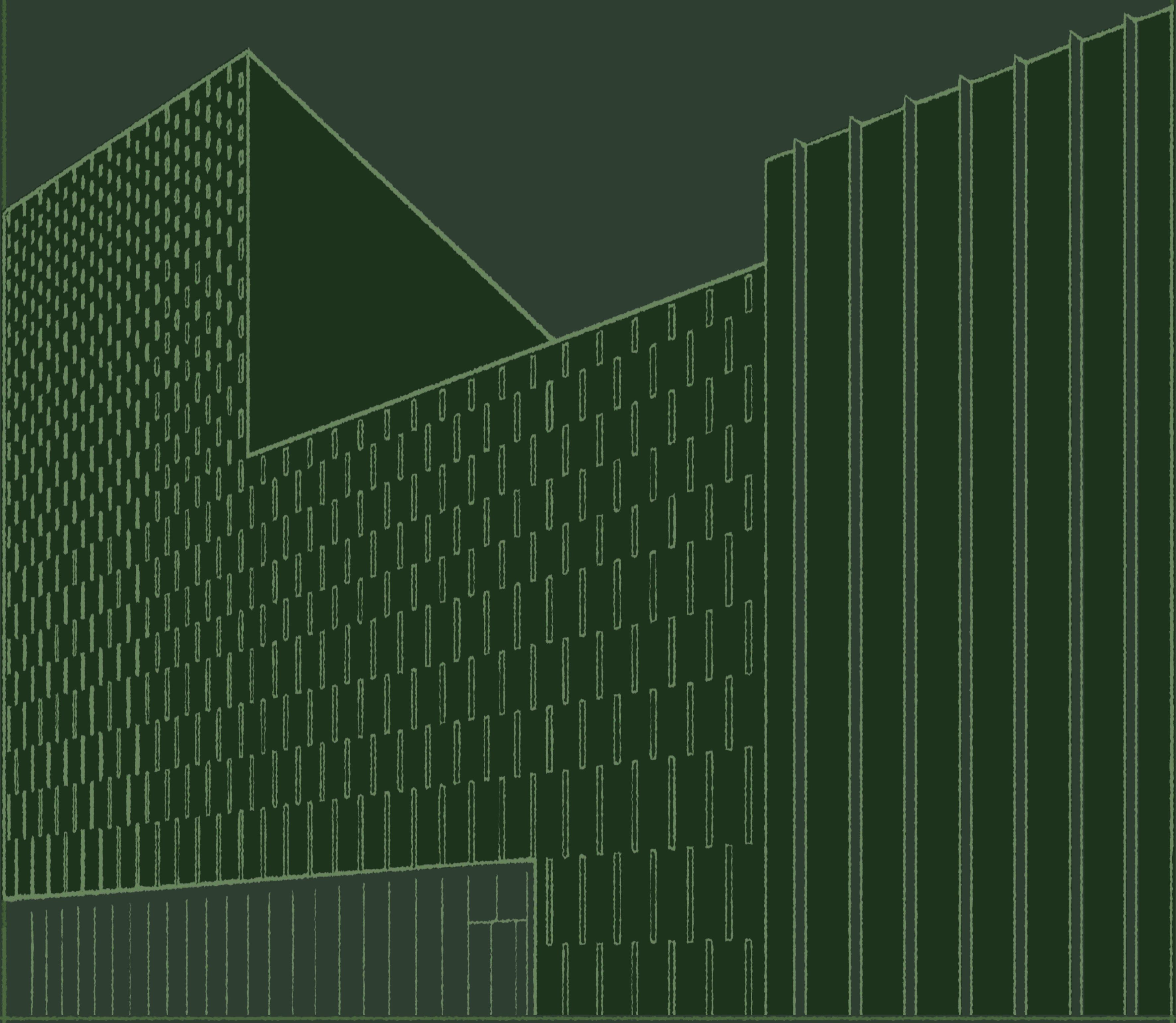
STATE OF BUILT WORLD TECH

RESILIENCE



noa

2025

If you are a founder or built world leader interested to learn more, please reach out below.

Get in touch via info@noavc.com

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Acknowledgements

Our annual report is a comprehensive pulse check on venture investment and secular trends within built world tech, tracking the previous year against activity over the past five years.

Many thanks to the above noa ecosystem partners for contributing to this year's *State of Built World Tech.*

A note from our founder:

Gregory Dewerpe

Founder & Managing Partner, noa

Perhaps more than ever, the built world continues to emerge as “humanity’s OS”, the foundation on which our economies, communities, and daily lives depend. It powers our cities, connects our industries, and shelters our people. It is the key to our progress and innovation in AI, robotics, and overall super intelligence going forward. Yet today, it is under greater strain than at any other moment in living memory.

This year, our State of Built World Tech report focuses on three interconnected pillars of resilience that will define the decades ahead.

Energy resilience is about more than keeping the lights on; it is about reimagining and reinforcing the systems that power our future. As electrification accelerates and digital demand surges, we face the challenge of ensuring that our energy infrastructure can keep pace without compromising reliability or sustainability.

Asset resilience is the recognition that the physical structures we rely on - from transport networks to industrial facilities to housing - were not built for perpetual neglect. They must be maintained, adapted, and future-proofed in the face of ageing, skills shortages, and evolving operational demands.

Weather resilience confronts the growing reality that climate volatility is no longer a distant threat, but a present force shaping the economics, insurability, and safety of our assets. This demands new thinking, new tools, and new investment approaches that anticipate risk rather than react to it.

These three themes are not isolated challenges; they are deeply interconnected. The strength of our energy systems influences how our assets perform. The condition of those assets determines how well we withstand climate stress. And climate resilience will increasingly dictate where, how, and why we build.

The path we chart requires more than incremental improvements; it calls for bold innovation, coordinated capital, and a willingness to challenge legacy assumptions. At noa, our commitment is to support the founders and visionaries who are tackling these resilience challenges head-on, building solutions that will define not just the future of the built world, but the future of how humanity lives, works, and thrives.

Onwards and upwards – always.

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At a glance

1 ENERGY RESILIENCE

AI and data centre driven energy demand is accelerating at an unprecedented pace

50 Years

Average grid infrastructure age

Europe and North America have the oldest power grids in the world, on average 45-50 and 35-40 years respectively (McKinsey, 2024). Comparatively, China's grid is just 15-20 years old. As much as 20% of planned data centre projects could be at risk of delays due to electricity grids under strain (IEA, 2025).

4x Faster

Energy consumption growth

Until 2030, data centre energy consumption is projected to grow more than 4x faster than the total electricity consumption of all other sectors combined, reaching 945 TWh by 2030. This is more than Japan's total electricity consumption today (IEA, 2025).

21.4 Trillion $

Grid investment required

An investment of $820bn per year is required in the run-up to 2050 to accommodate growing electricity demand (Mckinsey, 2022), across both new capacity development and infrastructure upgrades. The consequences of underinvestment are already felt today, with the Iberian Peninsula's blackouts driven by grid failures (Naishadham & Wilson, 2025).

Today 2030 2050

2 ASSET RESILIENCE

Ageing and analogue physical infrastructure is met with acute labour shortages

1.4 Trillion $

Global annual downtime costs

Undetected issues in infrastructure assets have significant productivity impacts, causing estimated unplanned downtime costs of $1.4tn each year across the world's 500 biggest companies. These costs are growing; downtime costs for a heavy industry plant in 2024 were 1.6x that of 2019 (Siemens, 2024).

1.5 Million

Blue collar skill gap

Across the EU and North America, electrification and the onshoring of manufacturing and energy production is creating new jobs for which there is inadequate supply. In the EU, the number of unfilled plant operator roles is expected to be 1.5mn through 2030, while in the U.S. 1.9mn manufacturing jobs could remain unfilled by 2033 due to the skills gap (Deloitte, 2024).

230 Trillion $

Global spend required

Europe and North America have an acute problem with ageing physical infrastructure. Required annual global spend to build new assets across energy, mobility, buildings, industry and land is estimated at $9.2tn until 2050 (McKinsey, 2022), while the annual investment shortfall is increasing. Meanwhile, ageing infrastructure is the leading cause of industrial accidents.

Today 2030 2050

3 WEATHER RESILIENCE

Extreme weather events threaten our physical world more each year

5x Increase

In extreme weather events

Extreme weather events and disasters have increased by ~5x over the past 50 years (WMO, 2025). Global wildfire incidents have risen >2x in the past 20 years, (NASA, 2025), while global flood events are projected to rise by as much as 49% by the end of the century (Fathom, 2025). Simultaneously, water scarcity now affects over 50% of the world's population (UN, 2025).

2x Increase

In CRE insurance costs

Weather and climate related insurance claims have grown by nearly 60% in recent years (Hollins, 2024). The average monthly cost of insurance for US commercial real estate could grow by 80% from 2023 to 2030 and almost double for states with the greatest extreme weather risk (Deloitte, 2024).

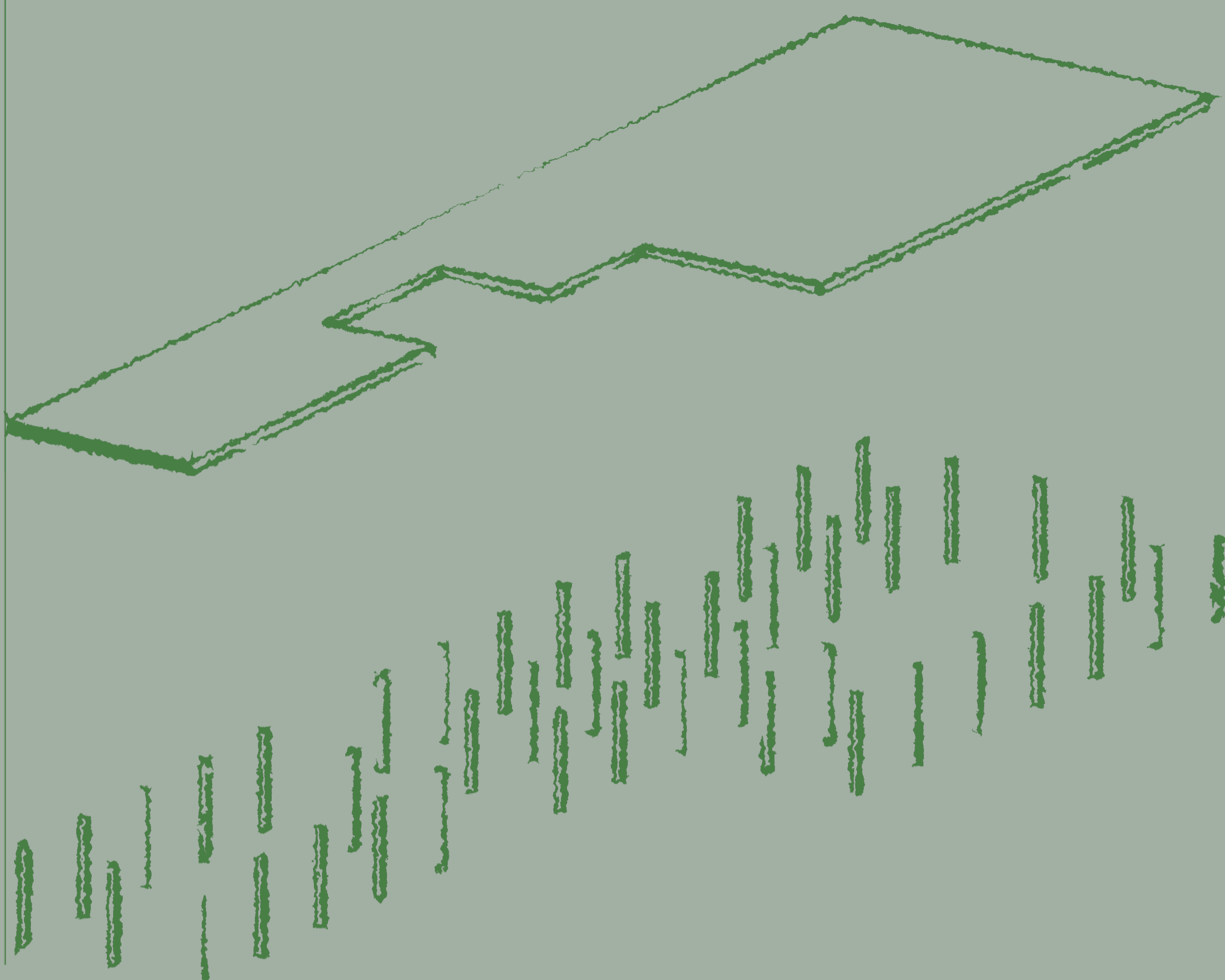
38 Trillion $

Global annual damages

Global annual damages from extreme weather could reach $38tn by 2050 (PIK, 2024). As of 2024, global economic losses reached $320bn, a growth of nearly 80% above the trailing 30-year average (MunichRe, 2025). The data is clear: a substantial increase in resilience solutions is required to buffer future economic losses.

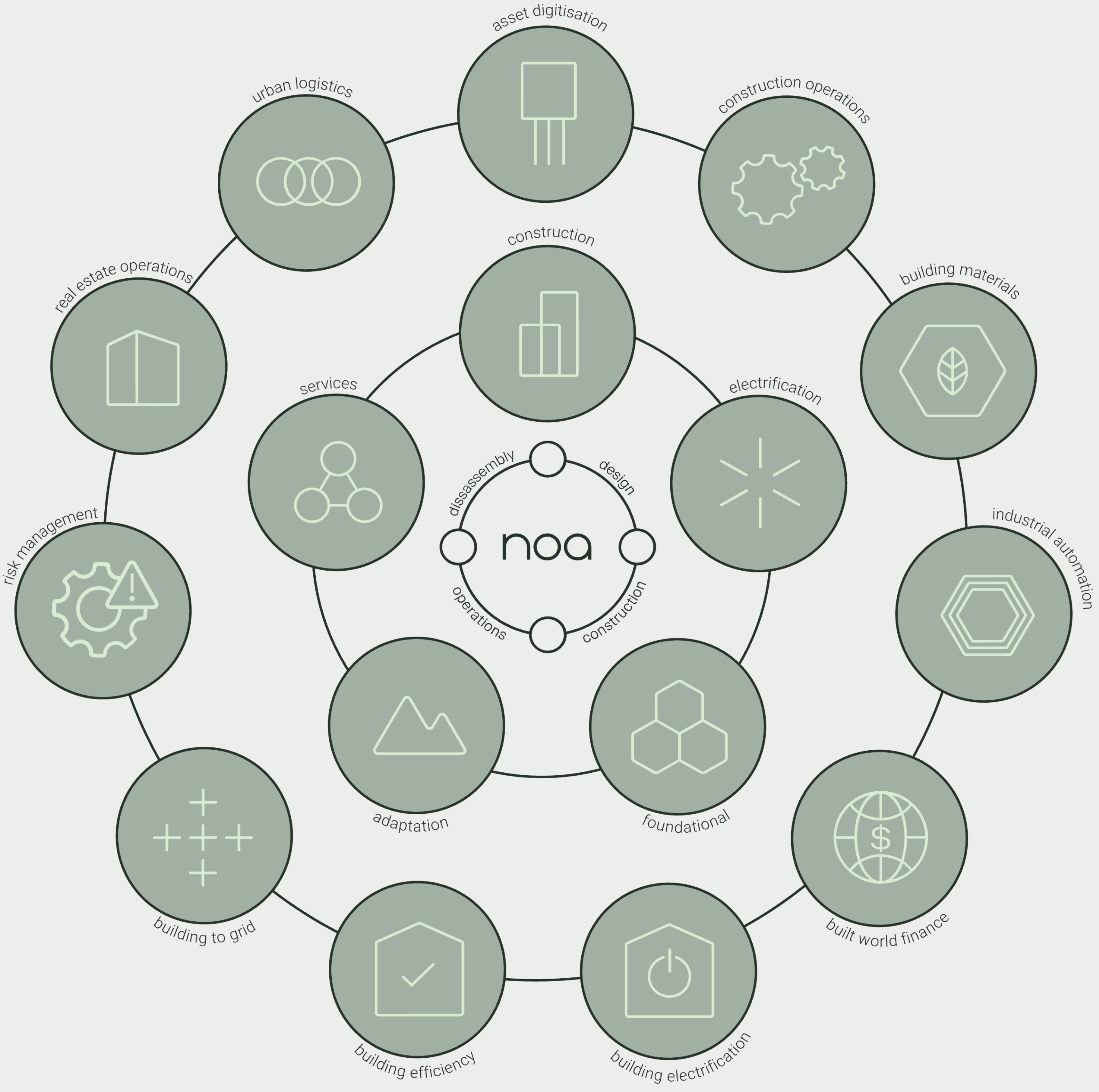
Today 2030 2050

THE BUILT WORLD TECH OPPORTUNITY



Humanity's OS

noa's built world taxonomy



The built world encompasses everything from the buildings we occupy, and the spaces that surround us, to the roads we travel, the bridges that connect communities, and the energy and grids that power them.

We believe the built world is more than just physical infrastructure: it is a manifestation of human ingenuity and a reflection of societal values.

We call it humanity's OS.

Technology for a better built world

As one of the world's most analogue industries, the heterogeneity of the global building stock and the complexity of supply chains mean there is no silver bullet – an entire ecosystem of solutions will be required to effect impactful change.

At noa, we view the built world technology ecosystem through a multi-layered taxonomy framework that comprises over one hundred subcategories. These are grouped into five overarching themes: foundational, manufacturing, electrification, services, and adaptation.

Here we outline technology opportunities in the built world through the lens of the built world lifecycle across design, construction, operations, and disassembly workflows. The full taxonomy and impact theory can be found in the *Methodology* section at the end of this report.

- ## Foundational

Asset digitisation and built world finance can be viewed as the foundations of built world tech. New financing models reduce the upfront cost of novel technologies, while the digitisation of buildings, renewables, and infrastructure through earth observation and physics modelling sets the stage from which to layer on other technologies.

- ## Manufacturing

During construction, digital workflows create efficiencies across permitting and procurement, while green building materials reduce the built world's embodied carbon impact. We also see a whole host of robotics and modularisation technologies solving for labour shortages in physical processes – be it during the manufacturing or disassembly of assets.

- ## Electrification

Post construction, one of the largest challenges is electrification. The energy transition requires the electrification of buildings en-masse, through installing rooftop solar, energy storage, and heat pumps. In becoming both consumers and generators of energy, building electrification places a huge strain on ageing grid infrastructure.

Optimising and orchestrating buildings and other distributed energy assets on the grid improves reliability and reduces the frequency of blackouts. And, for the times of the day when electricity costs are high, building efficiency measures - across insulation and HVAC controls – help to keep costs low.

- ## Services

Beyond reducing the built world's carbon footprint, tech also plays a central role in improving the lived experience of buildings and cities. Streamlined asset operations across repairs and maintenance, interior fitouts, and community platforms boost tenant satisfaction, improving labour efficiency and ultimately increasing net operating income. At the urban scale, last mile delivery, waste collection, and self-storage facilities enable much more efficient, higher density living.

- ## Adaptation

Together, it becomes clear that with the fundamental transformation of the built world comes a new era of risk. Extreme weather events, climate regulation, and cybersecurity concerns are all creating new threats for built world assets. For this reason, a whole host of data, insurance and disaster response solutions tailored to the built world are needed to enable real asset portfolios to remain resilient.

Figure 1: noa's Built World Tech taxonomy

Design → Construction → Operation → Disassembly

Foundational

Asset Digitisation
- Earth Observation | Design Software | Asset Monitoring

Built World Finance
- Project Finance | CRE Transactions | Residential Transactions

Manufacturing

Construction Operations
- Permitting | Labour Procurement | Equipment Procurement | Scheduling + Administration

Building Materials
- Materials Discovery | Green Building Materials | Industrial Process Optimisation | Materials Planning + Purchase

Manufacturing Automation
- Construction Automation | Indoor Farming | Waste Processing

Electrification

Building Efficiency
- Insulation | HVAC Controls | Efficient Heating | Energy Management

Building Electrification
- Electrification Hardware | Microgrids | Retrofit Installer Tech

Building to Grid
- Energy Procurement | Grid Flexibility | Utility Scale Power

Services

Asset Operations
- Operations Robotics | Property Management | Tenant Operations

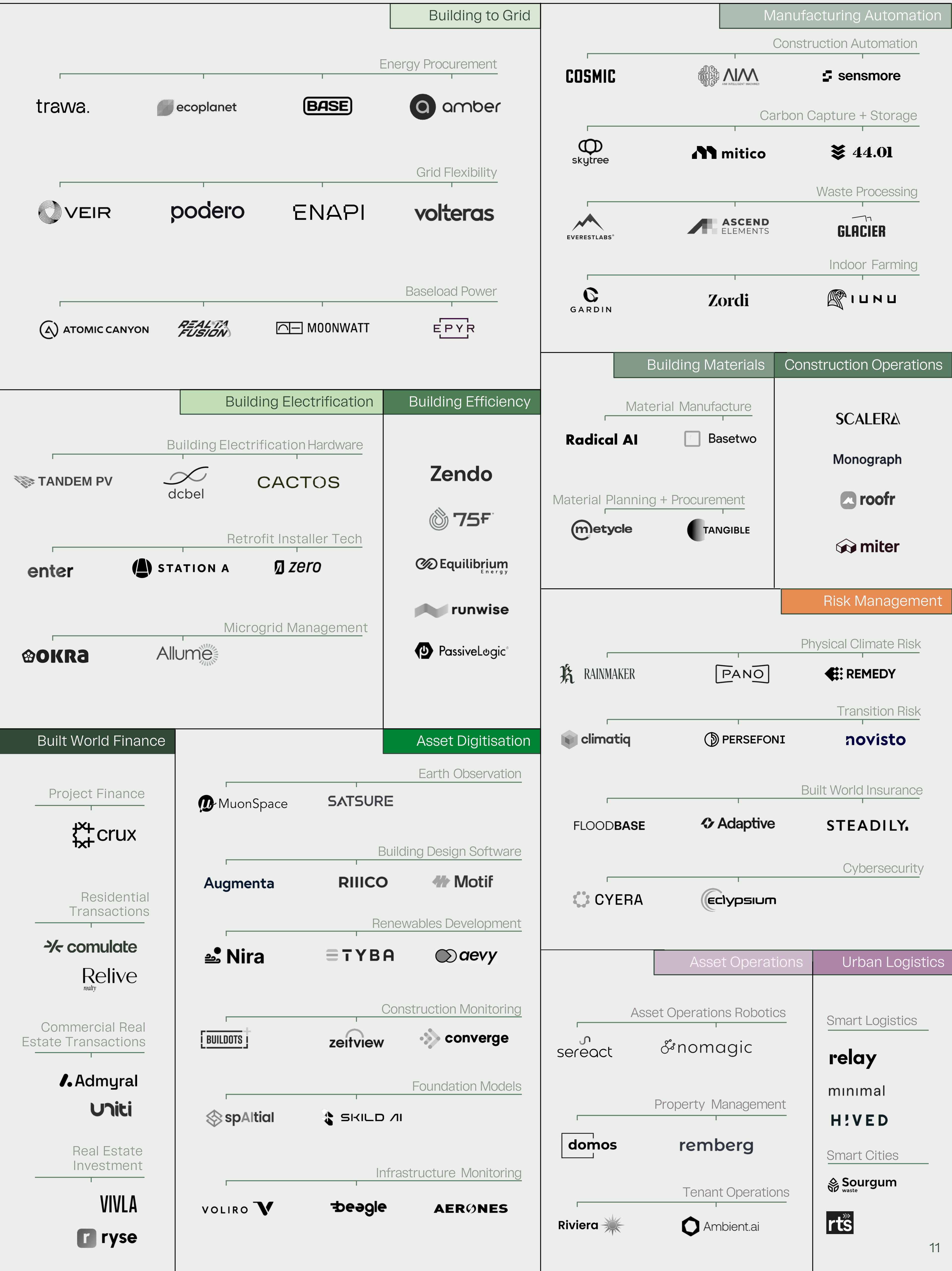
Urban Logistics
- Smart Logistics | Smart Cities

Adaptation

Risk Management
- Climate Risk | Insurance | Cybersecurity

*This infographic is a summarised version of the full taxonomy, which you can find in the *Methodology* section of the report

Figure 2: State of Built World Tech 2025 market map



VENTURE FUNDING TRENDS

Chapter 2

12–16

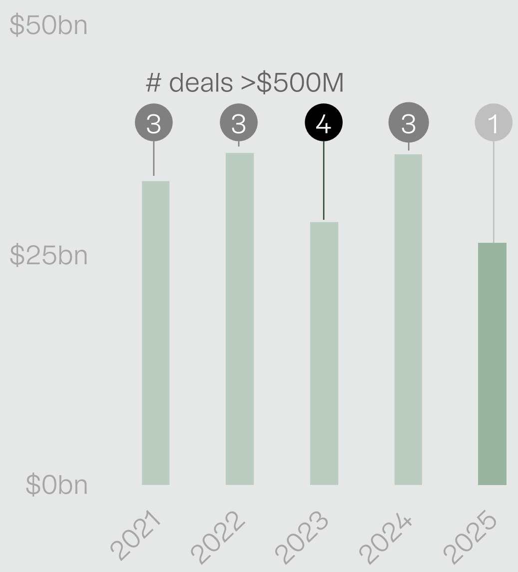
Funding dips amid a volatile macro environment

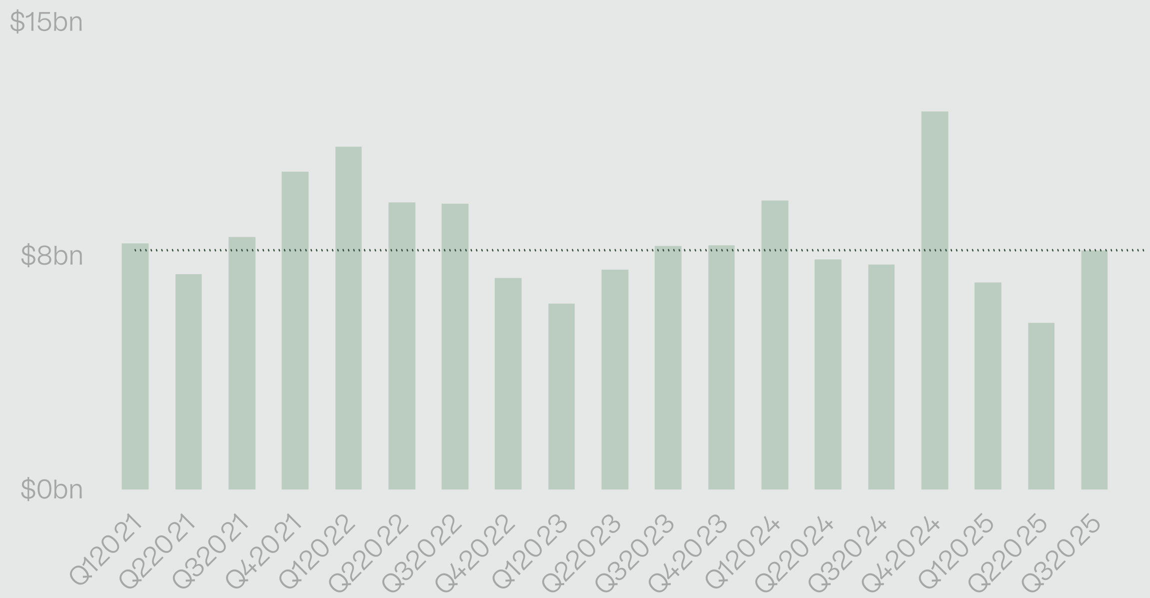
Expected fall in total venture funding for built world tech in 2025, with signs of H2 uptick

Fewer mega (>$500M) robotics and AI-related rounds have contributed to overall reduced investment volume in 2025, with quarterly funding at or below the 2021-2024 average. This is exacerbated by a challenging year for climate tech legislation, with the rollback of a number of key incentive policies across the US and Europe. That said, reporting delays and the likely announcement of a handful of mega rounds in Q4 could see the annual funding gap narrow over the coming months, mirroring what was seen in 2024.

All deal stages

Built world tech venture, $ · Built world tech venture (2025F), $ · -- Average quarterly investment volume, $

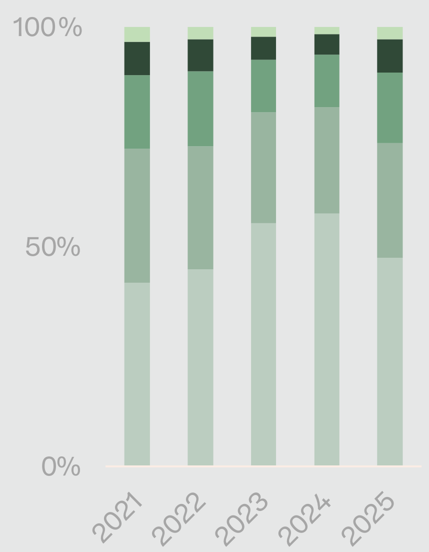




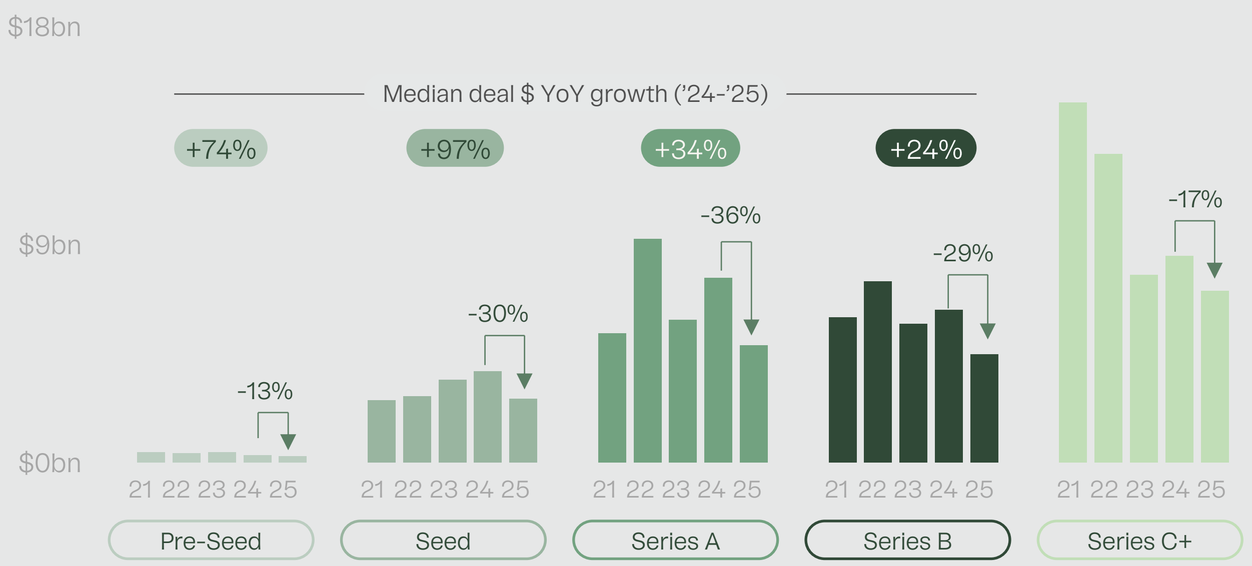
Deal volume reweighting away from Pre-Seed towards Series A/B, while deal sizes increase across the board

An increase in Pre-Seed deal count over 2023/4 has normalised in 2025, with deal stage distribution broadly returning to 2021/2 ratios. This is met with a jump in round sizes at the Pre-Seed (+74%) and Seed (+97%) stages, with relatively lower growth in Series A/B rounds (+34% and 24% respectively). As such, despite the drop in Pre-Seed deal volume, dollars invested remain much less affected than later funding stages.

Built world tech venture, # deals



Built world tech venture by stage, $



US funding dominance persists

US startups continue to attract more capital across the board, but Europe remains an electrification hub

While the US leads in both early and later stage dollars invested, 2025 deal volume is evenly distributed across key climate investment themes, including grid technologies, building efficiency and building electrification. Notably, funding for AI/robotics applications in the built world – concentrated within the asset digitisation, manufacturing automation, asset/construction operations, and risk management (driven by disaster response and weather models) verticals - remain highly concentrated in the US market.

Early stage funding (Pre-Seed to Series B) over time

Deal concentration by theme (2025 YTD), all deal stages

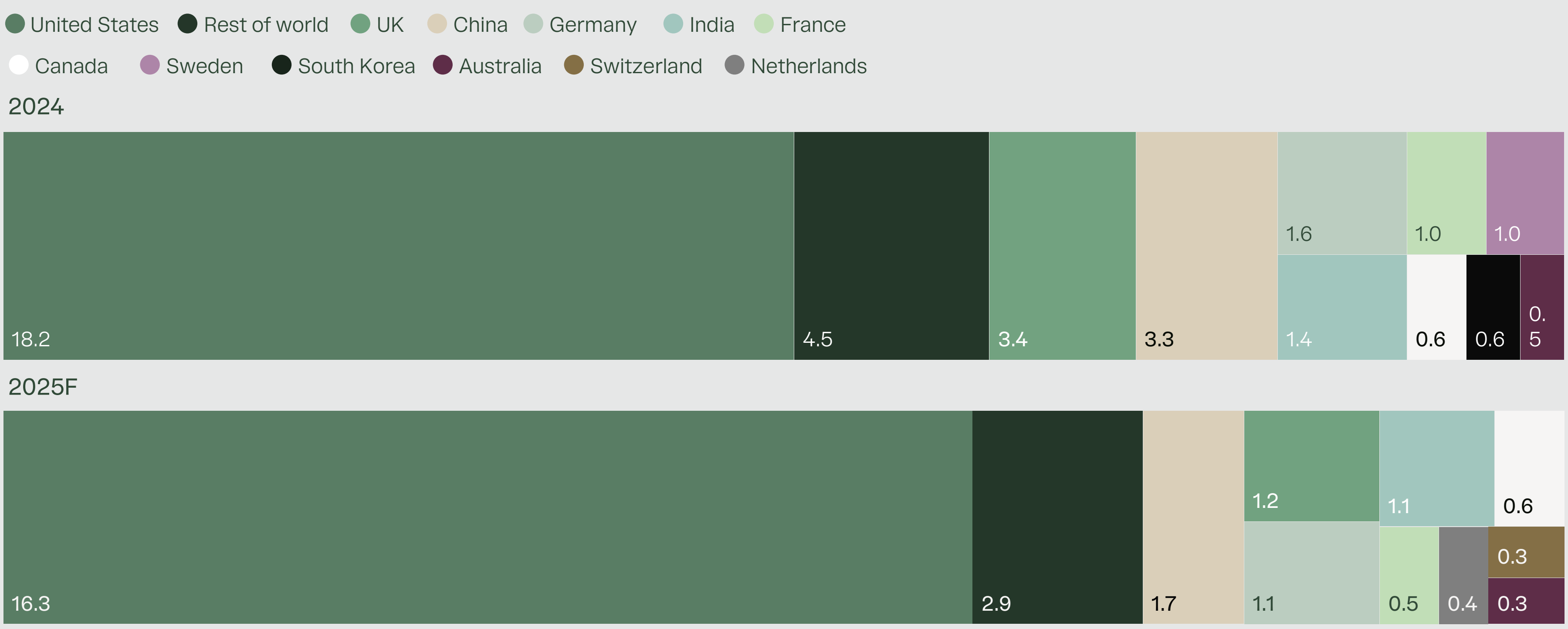
High: 40%+ Medium: 30-39% Low: <30%

	North America	Europe	Rest of World
Building to Grid	33%	47%	20%
Building Efficiency	35%	41%	24%
Building Electrification	40%	37%	22%
Risk Management	51%	36%	13%
Manufacturing Automation	44%	35%	20%
Asset Digitisation	43%	29%	28%
Construction Operations	56%	23%	22%
Built World Finance	58%	21%	21%
Asset Operations	45%	21%	34%
Urban Logistics	38%	25%	38%
Building Materials	35%	33%	31%

US on track to claim >60% of the market in 2025, with the UK set to shrink by >60%

Built world funding resilience in the US and mainland Europe contrasts with rapidly declining investment in the UK. This is consistent with an overall slowdown in the UK venture landscape outside of built world themes, with total venture investment in H1 2025 16% down on H1 2024.

Funding by geography ($bn), all deal stages



Impact dollars normalise while enabling tech surges

Three degrees of impact within built world tech

Given the pronounced antiquated and analogue nature of the built world, its processes, and its legacy culture, it is critical to support three types of companies to drive maximum impactful change in the industry. noa's impact framework outlines three degrees of impact in the built world.

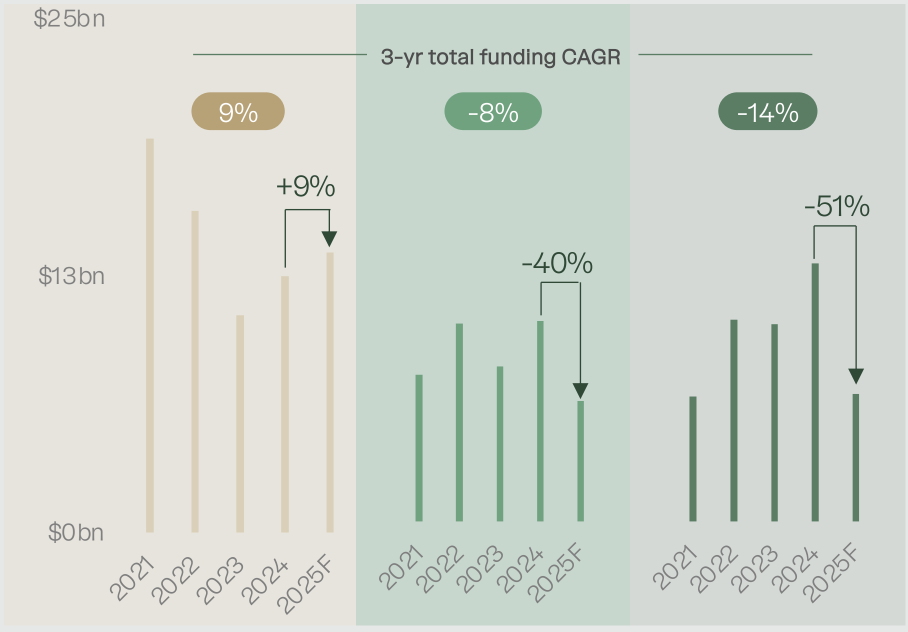
	Enabling Tech	Impact Catalyst	Impact Native
noa impact framework	A product or business model that facilitates the conditions necessary for impact but does not focus on environment or social considerations itself.	A product or business model that supports environmental or social impact through optimised operations, valuable data, or specialised services, while maintaining a primary focus on profit generation.	Approaches, technology and strategies designed to create positive impacts from the outset, integrating social or environmental considerations into the core design of the product.
E.g.: Tech to increase rooftop solar adoption	LiDAR scanners and IoT sensors enable quick and accurate digital twins of existing buildings.	Training and workflow software for energy retrofit installers boosts green labour supply and increases the quality of installs.	Energy audit platforms identify underperforming assets and connect asset owners to a marketplace of energy retrofit installers.

Changing macro environment sees a crash in direct impact funding, while enabling tech dollars climb ~10%

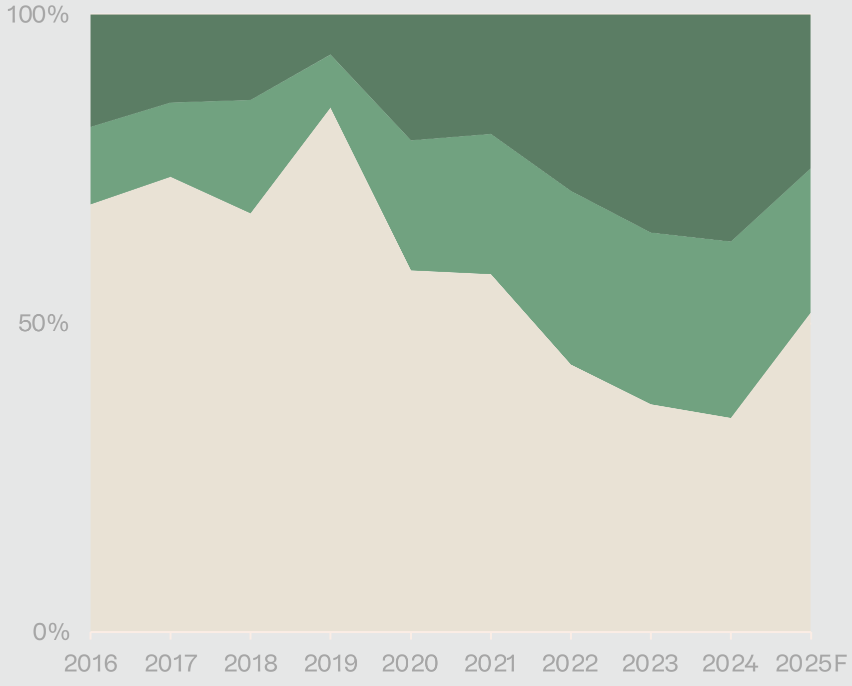
This year has seen governments across North America and Europe continue to place greater policy emphasis on energy security, industrial capability, and productivity growth. At the same time, key climate policy initiatives have been scaled back, damaging both customer demand and subsequent investor sentiment. Increasingly, this is translating to a stronger venture funding focus on enabling tech solutions that serve a more diversified group of industries across manufacturing, governments, energy and defence.

Enabling Tech · Impact Catalyst · Impact Native

Built world tech funding by impact type, all deal stages[1]



10-yr funding distribution across impact types



1. See the Methodology section of this report for a breakdown of impact type by investment theme

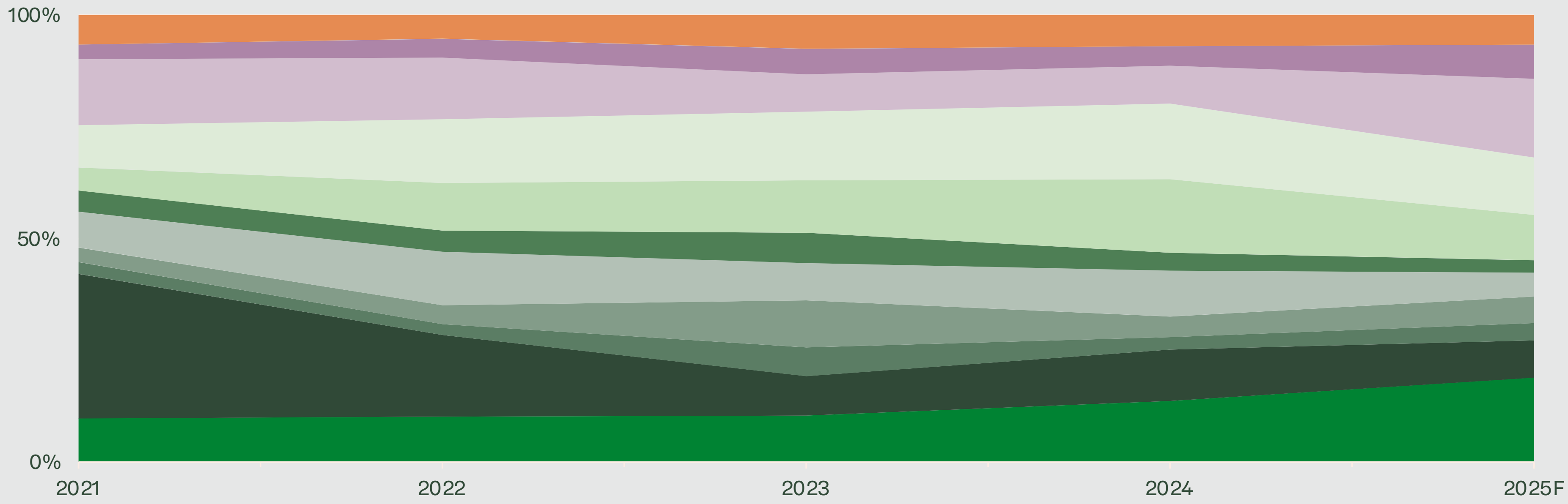
In 2025, resilience – across energy, asset management and weather - is key

Robotics powered asset operations and grid resilience are the dominant funding themes in 2025

Thematics with strong robotics exposure have seen significant growth this year. For example, the asset digitisation vertical has had a strong year on the back of robotics foundation model developers (incl. Physical Intelligence, FieldAI and Skild AI) raising blockbuster $300M+ Series A rounds. Similarly, the asset operations vertical saw major inflows with building operations robotics (e.g., Apptronik, The Bot Company) leading the way.

All deal stages
Noa taxonomy key:

Asset Digitisation • Built World Finance • Construction Operations • Building Materials • Manufacturing Automation • Building Efficiency • Building Electrification • Building to Grid • Asset Operations • Urban Logistics • Risk Management



Built world tech's fastest growing investment themes sit at the intersection of artificial intelligence, energy and industry

Digging deeper into the specific investment subcategories, it's clear that rapid innovation is unlocking new capabilities across materials discovery, robotics, manufacturing, and advanced analytics. Simultaneously, frontier AI labs are increasingly deploying capital to address bottlenecks caused by the limitations of data centre and power generation capacity.

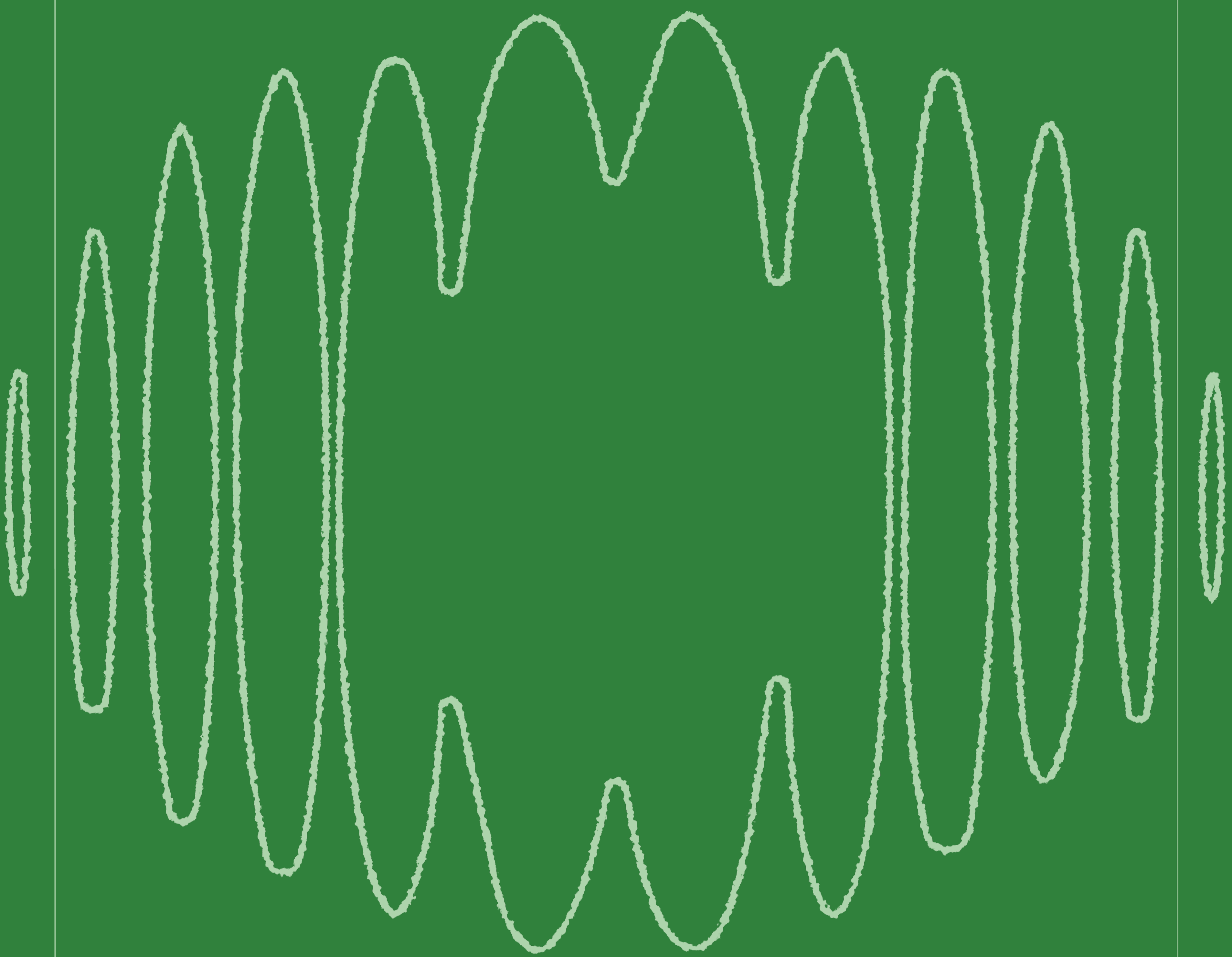
Early stage (Pre-Seed to Series B)

Investment $: >100% · 45-100% · <45%
Number of deals #: >20% · 10-20% · <10%

noa taxonomy	Investment $: 2025F investment ($)	Investment $: 3-yr CAGR	Number of deals #: 2025F number of deals (#)	Number of deals #: 3-yr CAGR
Materials discovery	59M	151%	<10	N/A[1]
Turnkey data centre development	96M	135%	<10	N/A[1]
Nuclear (SMR)	149M	87%	<10	N/A[1]
Subsurface mapping	143M	83%	11	7%
Robotics foundation models	568M	53%	19	24%
Grid orchestration	160M	49%	23	1%
Building operations robotics	1.1B	37%	79	7%
Wildfire risk response	90M	32%	13	18%
Logistics management	64M	24%	17	29%

1. Thematic with large aggregate investment but fewer than 10 deals excluded from # deals CAGR due to large YoY volatility

ENERGY RESILIENCE



Solving the interconnection queue

Surging demand from electrification and data centres has exposed limits in European and US power infrastructure. Europe's data centre electricity use is set to rise 150% from 96TWh in 2024 to 236TWh by 2035 [1]. In major hubs like Frankfurt, London, Amsterdam, and Paris, data centre consumption represents 33–42% of local electricity use, and a staggering 80% in Dublin [1]. Meanwhile, US data centres already consume 3.5% of national electricity, and is expected to rise to 8.6% by 2035 [2]. Grid congestion has led to rising interconnection wait times of 7–10 years across most western economies [1].

Notably, interconnection queues and their associated costs disproportionately affect green power (Figure 2, next page), with renewables or hybrids currently representing 94% of the US interconnection queue [3]. Wait times aside, renewables and energy storage developments are often located in more rural areas than gas schemes where the existing transmission system is weaker, requiring costlier network upgrades [3]. Software can play a role in easing these costs across the value chain, from permitting and interconnection studies through to economic modelling and performance optimisation.

Figure 1: Technology to address the interconnection queue

	Site identification	Design & Layouts	Economic modelling	Permitting & diligence	Interconnection studies	Asset performance
Solar PV	Glint Solar	PVcase Glint Solar	TYBA orkestra			METRIS TYBA OMNIDIAN
Wind	CaeliWind	CaeliWind VIND	VIND	CaeliWind		RTDT twindo
BESS			TYBA orkestra			TYBA TWAICE Re-Twin Energy
Agnostic (renewables)	PACES BLUMEN		Gridcog	Spark aevy PACES TetraxAI BLUMEN	CAMUS PIQ ENERGY	GridStrong Delfos aevy
Nuclear		nuclearcore.ai EVERSTAR		Nuclearn		Nuclearn
Data Centres	GridCARE	PVcase				
Transmission & Distribution	BLUMEN	CONTINUUM INDUSTRIES		BLUMEN	CAMUS Nira	SPLIGHT CAMUS neara Heimdall Power

[1] Ember (2025): Grids for data centres: Ambitious grid planning can win Europe's AI race
[2] Bloomberg NEF (2025): Power for AI: Easier Said than Built
[3] Lawrence Berkely National Laboratory: Queued Up: Status and Drivers of Generator Interconnection Backlogs (2025)

Reducing the complexity of energy market participation

Figure 2: Median interconnection cost for completed US projects

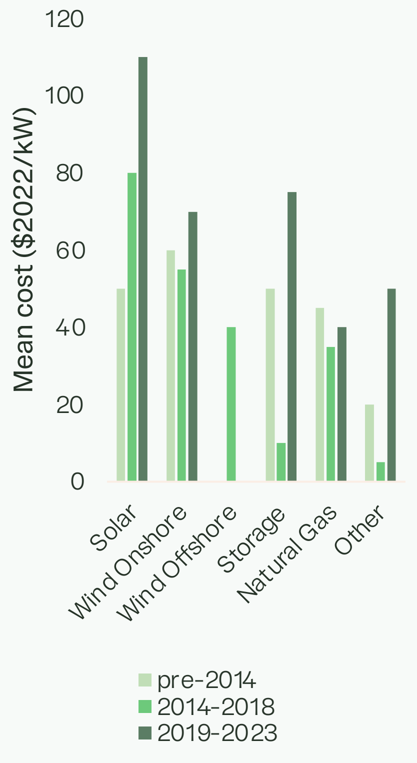
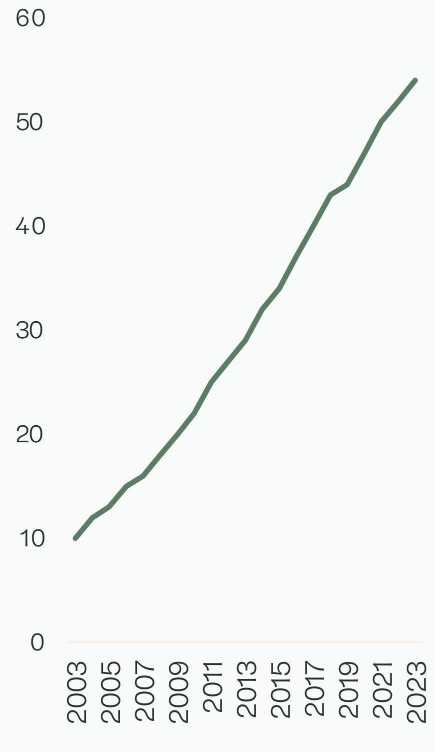


Figure 3: Median interconnection duration for US projects (months)



Rising modelling costs for developers and large energy users.

As much as 63% of UK renewable energy projects never begin buildout [4]. This is due to a confluence of factors, from mishandled permitting to flawed grid assumptions. Early-stage feasibility studies typically represent 1–5% of total project budgets for small projects, 2–7% for mid-sized, and up to 10% for major projects like offshore wind or hydrogen. Notably, economic analysis alone makes up 10–30% of feasibility study costs, while interconnection study fees can run from $100k to $1mn per project. There are signs that large energy users – such as data centres and industrial loads - will increasingly be required to take on the cost and complexity of interconnection challenges. In June, Texas approved SB6 to demand greater interconnection cost contributions from large energy users. A flat fee of at least $100k will be required for initial transmission screening studies for large loads, with additional fees for expanded capacity requests [5].

New legislation creates both opportunity and complexity for new market participants.

At the same time, regulatory advancements are seeing a wave of new market participants begin to interact with energy markets. The UK's electricity market is among the most advanced worldwide, and recent legislation, including the introduction of P415 at the end of 2024, will transform participation for large energy users [6]. P415 enables owners of BtM assets - such as batteries and EV charging fleets - to appoint independent aggregators, allowing proactive entry into the wholesale energy market and thereby incentivising increased participation. Despite the clear commercial opportunity, navigating the complexity of market participation is challenging. Economic viability is dependent on numerous factors, including interconnection complexity, asset sizing, and economic scenario modelling. Contractual decisions around aggregation, PPAs, and tolling agreements add further complexity. Software solutions have long focused on site identification, geometry modelling, predictive maintenance and reporting. Yet beyond energy consultants, there has been little in the way of software for non-energy specialists interested in modelling, maximising and monitoring the economic performance of an energy asset.

Increasingly diverse asset portfolios demand versatility from software vendors.

As energy portfolios and owners diversify, it is increasingly necessary for software to provide multi-asset solutions. Europe anticipates ~29.7 GWh of BESS capacity will come online in 2025, a 36% increase from 2024, following years of rapid growth [7]. Similarly, the U.S. has seen grid-scale storage capacity expand sixfold over the past three years [8]. This underscores the importance of advanced optimisation software capable of managing multi-asset energy portfolios, spanning solar PV, wind, EV fleets and BESS – from economic modelling through to asset management and reporting.

[4] Prospect (2024): Majority of UK renewable projects fail at planning stage
[5] Jackson Walker (2025): Senate Bill 6 & Upcoming Changes to Texas Electric Regulations
[6] Gridcog (2025): Understanding P415: What it is, who it's used for, and how to participate
[7] SolarPower Europe (2025): European Market Outlook for Battery Storage 2025-2029
[8] EIA: Solar, battery storage to lead new U.S. generating capacity additions in 2025
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Figures 2 & 3: Lawrence Berkely National Laboratory: Queued Up: Status and Drivers of Generator Interconnection Backlogs (2025)

What we're watching

Techno-economic modelling for large energy users.

Planning clean energy projects has become highly complex – from solar and wind yields to battery economics and tariff arbitrage – extending far beyond the capability of spreadsheets. Tools like Gridcog enable developers and investors to model, optimise, and manage projects at both the asset and portfolio level through quickly testing various "what-if" scenarios. Similarly, Tyba maximises the value of battery storage deployments, combining a development simulation module for planning new storage sites with an asset operations module that automates real-time dispatch and market bidding.

Faster interconnection studies.

Engineers commonly use power flow tools including PSS®E or PowerFactory to create DSO/TSO compliant interconnection study simulations at sub-second intervals. Startups such as Nira Energy enable non-specialists to identify sites at the earliest project stages that hold the greatest chances of grid approval and lower interconnection fees. This is assessed based on substation capacity, congestion, and upgrade costs. Map-based interfaces screen opportunities and estimate upgrade expenses, with interconnection queue progress tracking for live schemes. Meanwhile platforms like Gridcog enable users to model time-varying export schedules, such as California's LGPs, which automatically curtail DER exports in simulations and inform DER sizing and dispatch optimization. Coupled with flexible import schedules, this modelling helps developers to assess the economic and operational impacts of various interconnection scenarios.

AI enabled permitting and due diligence.

AI-first solutions are transforming legal data management in renewable energy development by synthesising complex regulatory documents into actionable insights. For example, Spark AI rapidly interprets zoning codes, land-use ordinances, environmental impact reports, and local government records to enable the early identification of permitting obstacles, restrictions, and community sentiment. Meanwhile, Tetrax AI integrates AI-powered regulatory assessments with historical project data, automating due diligence, and extracting critical permitting pathways plus community feedback from multiple sources. During the due diligence and asset management phase, Aevy enables asset owners to search unstructured legal and commercial documents.

In conversation with:

Dave Brend

SEGRO (Energy Director)

When it comes to energy resilience, what are the biggest concerns you have at SEGRO?

Our customers include data centres and large industrial energy users, and so power reliability is always top of mind. Grid availability and connectivity to provide this has become such a key issue. That means more uncertainty around connection periods, and not just when but the quality of that connection from a resilience point of view.

So, it's not just the power, the capacity, but resilience to the right specification now and in the future. From a sustainability perspective, there is a clear drive to Clean Power 2030 in the UK. The grid is getting greener, but we need to get the connectivity and the infrastructure resilience and bring the two together in a meaningful time frame.

From a pricing point of view, power prices are obviously inextricably linked to gas pricing - still. And recent years have seen that exacerbated by geopolitics and issues of imported gas supply. This continues to put the UK in one of the highest price brackets for industrial power globally. As we build more embedded generation and decouple ourselves from the grid, this will create resilience from different energy vectors and start to reduce that overall energy price for end users.

At SEGRO, we are increasingly seeing the need to find bridging power for the next 3-5 years on certain sites while we wait for grid power to come in, in some areas of Central Europe this could be longer. Microgrids have a strong role to play, not only for bridging power but to unlock new business models through exchanging excess power and flexibility with the grid. So that in the future we're not just taking from the grid, we're being good grid citizens and providing benefit into the overall energy system as well. We have a lot of building blocks already in place to achieve this.

What role can microgrids play in industrial power resilience?

We have somewhere close to c.130 MW of installed rooftop solar across our portfolio. Some of those sites also have battery energy storage systems. For our strategic sites that are power critical and where we have future grid connectivity in the pipeline, we’re starting to look at long duration energy storage, and other emerging technologies such as industrial scale carbon capture in conjunction with various generation technologies.

ABOUT SEGRO

SEGRO is a UK Real Estate Investment Trust, listed on the LSE and Euronext, and is a leading owner, manager and developer of modern warehouses, industrial property and data centres. Its properties are located in and around major cities and at key transportation hubs in the UK and in seven other European countries.

Can you give us an example of how this works in practice?

A good example is our joint venture SmartParc SEGRO Derby. It's effectively been built with a private network, and there's a symbiotic relationship with the various occupiers on that site sharing power, heat, and cooling. Interestingly they're all food production businesses, so some of that heat is a byproduct of their operations.

When you try to apply that to a normal industrial or logistics context, whether that's on a licensed distribution network or private electricity network, there is a lot of regulatory complexity around metering and energy settlement with customers wanting to get their supply of electricity from their own suppliers. This makes socialising and then trying to share locally-generated energy and available power capacity very difficult.

The UK market still isn't set up to enable that degree of sharing to happen while maintaining freedom of choice from a grid supplier point of view. That said, I think we are at an inflection point where this is going to be required. This might be in small clusters within large sites, where microgrids can help address bridging power and provide flexibility benefits, similarly as E-HGV requirements increase, the need to maximise utilisation of charging capacity across shared infrastructure, that is optimised with microgrid solutions, will be necessary.

So, we need to be creative in how we do that while complying with all the different regulatory requirements from a metering, generation and network infrastructure point of view, while giving our customers the choice they require.

Where do you see the opportunity for technology to simplify some of these workflows?

There's so much interactivity across the energy system. I want to see technology enable us as an ecosystem to understand that interactivity so that, as an example, we don't bring 15km of new cable into a location, and then 3 years later be in a situation where somebody else needs to do that again because the system hasn't been forward looking enough to build in contingent infrastructure.

Network owners are now required to build capacity ahead of demand but getting that right with capital upgrade programmes, coordinated along with competitive connection options, has a way to go.

So, enabling interactivity and scenario modelling is key but it is needed now as the next 5 years are critical to securing growth and that needs power.

At the same time, technology can play a role in providing fast and pre-emptive feedback during connection application processes. Often post application, you wait a certain amount of time, feedback comes, and you then need to modify your application or re-submit. The feedback may be a conditional offer with lower levels of resilience than required and then a protracted process of trying to get to the root cause and negotiating alternatives begins.

Part of that challenge is because licensed network owners are compelled to provide the lowest cost option – a single option. This stops other scenarios being communicated that may otherwise improve the position or value to the applicant – so cost versus value isn't readily understood and can hold back better solutions. Technology could improve this position, not only by continually automating and optimising the application workflow, but also by accelerating the optioneering process and the provisioning of feasible alternatives that could be considered.

Multiple parallel planning initiatives add complexity to energy provision, but technology can help streamline these efforts, especially as 2030 approaches. Local authorities develop Local Area Energy Plans (LAEPs) that inform Distribution Network Operators' (DNOs) regulatory business plans, though boundaries don't always align with Grid Supply Point Strategic Development Plans.

DNOs also produce Distribution Future Energy Scenarios, while transmission owners create similar forecasts, all contributing to future business strategies. At a national level, NESO oversees Transitional Regional Energy Strategic Plans (TRESP), which progress toward the RESP, alongside the Strategic Spatial Energy Plan and the Centralised Strategic Network Plan.

“We are increasingly seeing the need to find bridging power for the next 3-5 years on certain sites while we wait for grid power to come in”

Ensuring effective energy generation and network infrastructure strategies is crucial for meeting CP2030 and 2050 objectives. Despite this future multi-faceted energy system planning, developers still face connection delays for the next several years. Connection reforms aim to eliminate inactive projects, but challenges with delivery, and approvals remain, leading to further delays. Technology should help simplify and streamline processes, improve visibility, and promote cross-domain collaboration to boost progress and productivity.

It’s a question of whether this alignment will happen fast enough to meet the acceleration in power demand that we will see in the next 2-7 years in certain regions and markets. So, there is a clear role for technology to simplify this complexity and make it easier for asset owners to understand grid connection availability and options, and how we can adjust our own schemes and strategic objectives to access that quicker and secure resilience, whether through the grid, a microgrid or combination. Noting that overall downstream lifetime value and resilience will always trump the lowest cost connection option, especially if it is slow and complex to secure.

Then technology has a role in maximising the infrastructure we have, a lot of this already happens in the cloud for fault location etc. but how do we get to a world where “virtual resilience” becomes a reality due to smarter networks and interactive assets, rather than relying on building more hardware, that as we know is a slow and expensive process.

As we deploy more generation and storage assets on microgrids, we’ll need more advanced control and protection systems to manage how different sources of power interact and how their outputs are managed and optimised, not just from and operational perspective set on rules-based algorithms, but also from an economic one too. This is a complex problem that needs technology to help resolve it in a more dynamic environment.

In conversation with:

Fernando Llaver

SPLIGHT (Founder & CEO)

ABOUT SPLIGHT

Splight is addressing the global challenge of clean energy at scale. It takes a fresh approach, using real-time data and AI algorithms to bridge the gap between technology and energy, unlocking millions of terawatts of clean energy trapped by how energy grids are currently operated.

To your mind, what are the key factors underpinning slow interconnection times in the US and Europe, and how can technologies such as Splight solve them?

Interconnection queues are holding back at least 1.5 TW of generation and a similar number in data centres. An imbalance of know-how, knowledge, and the right tools has created a dynamic akin to black and white film versus modern IMAX movies. Specifically, the combination of studies based on stale data in a highly dynamic environment combined with a lack of physical capacity on existing transmission lines are two key factors limiting the acceleration of interconnection timelines.

Splight's newest product modernises the first factor – stale studies – by incorporating its AI-based technology into studies based on the most up-to-date data. Not just a traditional electrical study, this new offering is an AI-powered simulation of the grid in real-time that can show the real system with detailed scenarios of pre and post contingency.

The second limitation – scarce additional transmission capacity – is precisely what Splight's flagship Dynamic Congestion Manager™ (DCM™) product was developed to solve: by using machine-learning to provide the grid with a new layer of real-time protection, DCM allows Splight's customers to access previously inaccessible capacity on the existing grid in a fraction of the time it takes to build new transmission lines.

In both cases, the main factor is the difference between seeing and not seeing. With Splight's technology, participants can see what is happening in the grid in real-time – without Splight, they are running completely blind in operational terms.

The core problem we are solving is how grid participants manage risk. The world built the transmission network nearly a century ago. At that time, it made sense to build twice the capacity you needed so that you would have the complementary idle capacity waiting in case an anomaly or disturbance, like a failure, occurred. Even though technology has come so far, we are still running grids the same as a century ago. This means that we still have roughly half of transmission capacity going unused.

“We unlock idle capacity using a new approach to risk management. We use AI algorithms and data in real-time to deploy a new safety layer, that can tackle contingencies in real-time using the technology that wasn’t available a few decades ago”

We use AI algorithms and data in real-time to deploy a new safety layer, that can tackle contingencies in real-time using the technology that wasn’t available a few decades ago, but is now being deployed now on grids across the globe, like IBR, batteries, and other kinds of operating system like BMS.

As power demand continues to surge, the interconnection requirements of a large energy user today will likely look very different than in 5 years’ time. How can utilities futureproof new grid connection approvals to ensure revisions and new applications are not required again later down the line?

Utilities are already making great strides to limit revisions and new applications. Notably, they have realised that they can buy themselves both time and flexibility for the future by leveraging modern technology that exists today and has been successfully commercialized – like Splight’s DCM – to free up substantial capacity on existing transmission lines. Not only does DCM allow utilities to satisfy more interconnection requests in the near-term by unlocking more transmission to which renewables and data centres can connect, but it also allows utilities to target their resources where they are needed most urgently in both the medium-term and long-term.

For these hugely impactful technologies like DCM to reach their full potential, it is imperative that the information used in electrical studies reflects only the most up-to-date planning for generation, transmission, and load. We’ve noticed repeatedly that traditional electrical studies do not fit the needs of data centres seeking interconnection. They are seeing significant demand, but they are useless to solve the problems that data centres have. Until we modernise this process to ensure that all stakeholders are using the same, correct information in their planning and decision-making, revisions will be required perpetually and the potential of many game-changing grid technologies like DCM will be restricted.

That’s the problem Splight solves. We unlock that idle capacity using a new approach to risk management.

In conversation with:

Andy Haigh

GROSVENOR (Director, Climate Positive Solutions)

ABOUT GROSVENOR

Grosvenor is an international organisation whose activities span urban property, food and agtech, rural estate management and support for philanthropic initiatives. Grosvenor develops, manages and invests to improve property and places across many of the world's leading cities.

This year we've seen the conversation shift away from ESG and towards resilience. How are you thinking about resilience at Grosvenor?

US political upheaval has dampened momentum around ESG. Whilst in private, most players are continuing at pace, publicly they are quiet. Smart leaders are aware that whilst political opinions come and go, climate change is baked in, and failing to respond will impact their bottom line.

The conversation in the industry around sustainability has certainly shifted significantly from ESG towards ensuring risk mitigation and avoidance. For a long-term property owner like Grosvenor, the question is: how do you build resilience within your business model and assets so they can withstand shocks? We see sustainability in real estate driving significant value uplift and asset value protection both now and in the long term; it is therefore essential that we embed sustainability into decision making.

A clear example of this is ensuring our strategic planning process considers physical and transition risk. We address this by accounting for the carbon implications of our financial decisions and embedding physical and transition risks within our wider risk management processes. Being proactive about understanding the risks and opportunities around sustainability will make us a more resilient business in the long-term and ensure we future-proof our assets.

How are you approaching building energy resilience into your portfolio?

Our energy resilience focus is really about removing fossil fuels as fast as possible across the portfolio, working with local authorities to ensure there is sufficient capacity within the grid.

We are increasingly experiencing power outages across the UK a result of an overloaded grid, so timing the removal of fossil fuels and the electrification of our estate is a real and growing concern. Solving for this enhances the resilience and attractiveness of our assets long term because it avoids the risk of asset stranding and portfolio devaluation.

Energy exports to the grid aren't a priority for us. This is because at the asset level our roofs are small relative to our building size, and many of our sites are constrained - old buildings with slope roofs, chimneys, etc. As a result, when we put solar on roofs, it can only offset a small component of the energy bill. Reducing the energy intensity of our buildings remains the key driver.

We've explored a number of avenues to reduce power price volatility for our tenants. A few years ago, we bought green energy and resold it to tenants. However, that model posed considerable corporate risk - if a tenant went bankrupt or moved out, we'd be left with the unpaid bills. We've since stepped back from directly buying energy for tenants but within our green lease clauses, still require them contractually to buy green energy products.

Another option we explored in the past was developing infrastructure-scale projects ourselves where we would generate green power and buy it back via PPAs. Given the size and complexity of these projects, coupled with grid capacity restrictions, we found it challenging to progress. We asked a district network operator when we'd have grid capacity to connect a solar array of over 1MW, and the answer was 2037.

What challenges are Grosvenor encountering regarding grid capacity and energy supply?

Grid congestion is becoming a real constraint across the UK. It affects both development - getting grid capacity for temporary construction works - and the operation of new buildings. Demand is continually increasing on the grid, and the problem can only be partly solved by on-site energy generation.

For example, even if you have on-site renewables or battery storage to limit your peak load requirements, you still need to request a grid connection sized as if all your on-site generation is not working.

We have to ensure the grid has the capacity both for our large developments as well as smaller retrofits when we decarbonise heating. If we were to retrofit whole streets, the grid load would be too high if it were done all at once.

We need to better understand the peak demands of our buildings, and how these can be reduced during peak periods. By collaborating with local authorities and partners, we can collectively improve our understanding of the nuances around grid constraints and work to reduce potential points of failure. Our ongoing challenge is how we can build in more resiliency to our assets and across our portfolio.

"If we were to retrofit whole streets, the grid load would be too high if it were done all at once. We asked a district network operator when we'd have grid capacity to connect a solar array of over 1MW, and the answer was 2037 "

ASSET RESILIENCE

Chapter 4

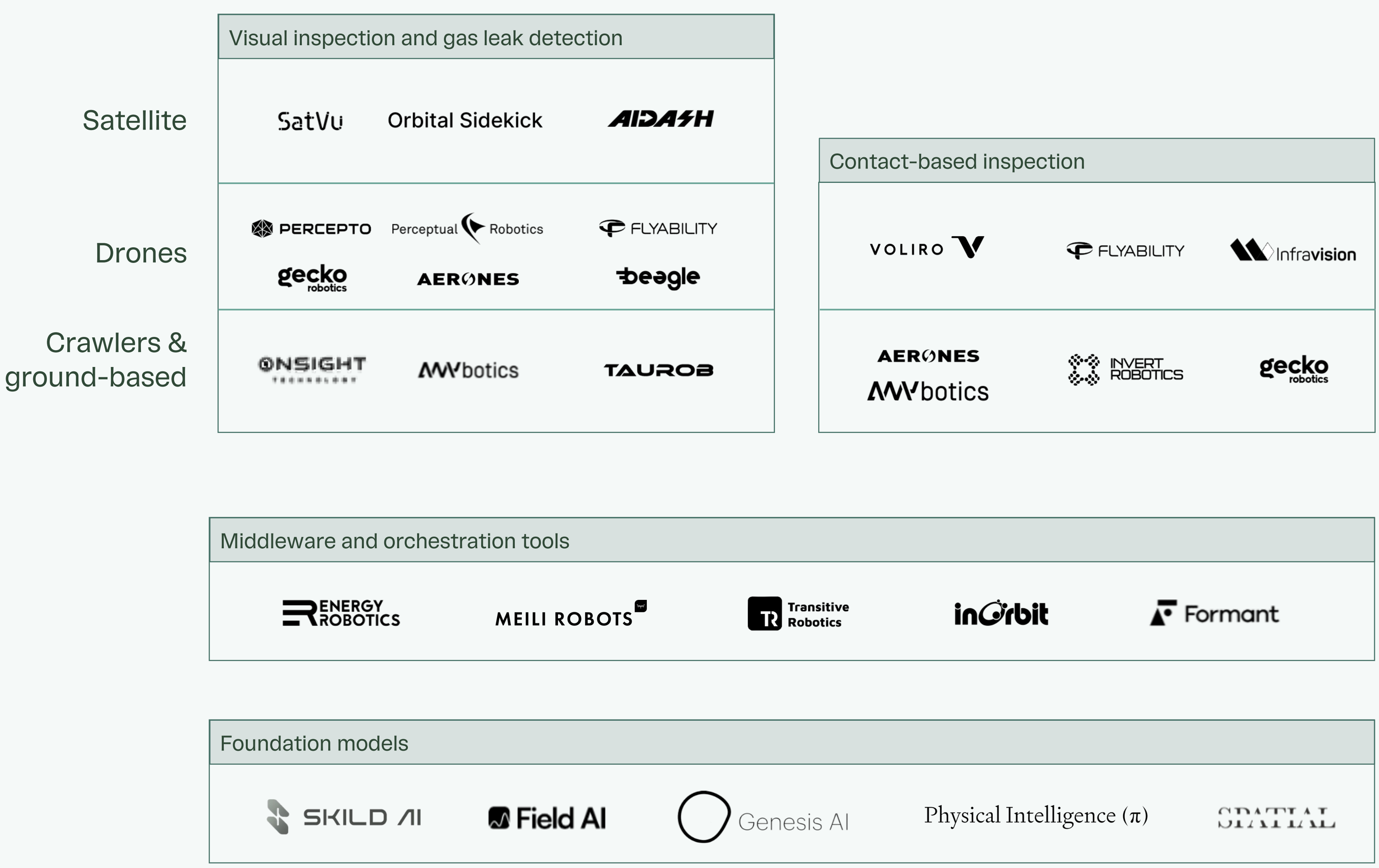
28-36

The case for asset resilience

A confluence of rising downtime costs, chronic labour shortages and health and safety risks are driving a shift towards robot-led infrastructure monitoring and predictive maintenance. Critical infrastructure assets - including oil and gas, heavy industry and renewable energy sites - lose billions annually in downtime. These costs have been rapidly rising, fuelled by inflation, complex supply chains and persistent labour shortages. Heavy industry downtime costs, for example, surged 319% from 2019-2023 to reach +$320bn per year [1], while related costs in the automotive sector climbed 119% over the same period [2]. At the same time, the rapid buildout of renewable energy infrastructure intensifies labour demand for monitoring and maintenance workflows - essential not only to reduce downtime, but to maximise energy generation efficiency.

Chronic labour shortages across the board are exacerbated by downtime events which require companies to pay premium labour rates, or risk extending the outage. Increasing labour supply is complex amid an ageing demographic. At the same time, the majority of infrastructure assets are physically difficult to inspect and maintain, with ageing infrastructure responsible for up to 30% of major European industrial accidents [3]. The data is clear: ensuring asset resilience in an ageing, labour constrained economy requires a transition to autonomous inspection and maintenance.

Figure 1: Asset resilience for unstructured environments



[1] Siemens (2022): The True Cost of Downtime 2022
[2] Siemens (2024): The True Cost of an Hour's Downtime: An Industry Analysis
[3] Tech EU (2025): Voliro secures $23M to modernize infrastructure with aerial robotics

Infrastructure 1.0

Recent years have seen a wave of aerial inspection solutions delivering visual analytics on external surfaces and facades - across multiple scales and levels of autonomy. At the global scale, SatVu is equipping satellites with thermal sensors to capture worldwide thermal data with up to 3.5m resolution. This will enable real-time, remote thermal performance analysis of physical assets, from real estate and power stations to oil refineries and solar farms. Meanwhile, at the asset level, aerial drones (UAVs) are lightweight, manoeuvrable, and equipped with high-resolution cameras, thermal imaging, and LiDAR technology. They excel at scanning large structures such as bridges, power lines, and rooftops, providing bird's-eye views without human intervention.

Platforms like Percepto and Raptor Maps use UAVs to capture surface-level imagery across buildings, plants, and solar PV arrays, while Beagle detects methane leaks in addition to visual inspections. While UAVs and satellite imagery cover surface insights, critical data gaps remain, and in complex environments supplementing with human labour can be cost prohibitive. For example, solar PV array inspections require detecting defects or vegetation growth underneath panels. This is best detected through ground-based robots, cameras, and sensors. Other environments require multi-dimensional movement; crawler robots traverse both horizontal and vertical surfaces like wind turbines, while underwater robots inspect submerged structures.

What's changed?

Applications must demonstrate clear positive economics from the outset.

Low bill of material (BoM) costs, high value use cases, and strong self-serve features underpin robust unit economics. In much of the building construction sector, for example, limited robot dexterity and relatively low human labour costs make economics challenging, while industrial inspection benefits from high value tasks, strong downtime and health and safety concerns - fostering much stronger willingness to pay.

Robotics-as-a-Service (RaaS) business models lower adoption hurdles.

Startups increasingly bundle hardware, software, maintenance, and upgrades into subscription models, with distinct one-off setup and training fees. This benefits the long tail of inspection service providers, while supporting buy in from larger asset owner teams.

Multi-robot workflows drive development of horizontal coordination layers.

Effective deployment requires software platforms to manage, optimise, and scale multi-OEM robotics fleets and simulate operations via digital twins. While commercial adoption is nascent, funding is growing for robotics foundational models, orchestrating mixed fleets through unified APIs and stress-tested in virtual environments. This facilitates autonomy and generality across unstructured, hazardous outdoor sites.

Autonomy for beyond visual line of sight (BVLOS) applications in unstructured remains cautious – but directional.

Regulation is moving in favour of unlocking widescale supervised and full autonomy for unstructured environments – but timeframes are uncertain. The US Federal Aviation Administration has repeatedly delayed BVLOS Part 108 amendments that would ease current waivers and constrains on supervised autonomy . Meanwhile the proposed SORA 2.5 framework would permit supervised autonomy in European unstructured environments, but implementation timeframes remain unclear.

What we're watching

Versatile robotics platforms spanning multiple workflows and/or industries.

Where ROI is driven by downtime mitigation, routine inspection tasks often recur monthly or annually. To achieve strong utilisation rates, it therefore becomes essential to serve multiple customer types and a range of inspection activities. Gecko Robotics combines crawlers, drones, ground sensors, and fixed monitoring systems. Meanwhile, Voliro's omnidirectional, stable, contact-based robotic drone platform uses swappable third-party sensor payloads to unlock several non-destructive testing workflows, from corrosion detection beneath insulation to inspecting wind turbine lightening protection systems. Looking into the (not so distant) future, we might even envisage inspection robotics tools extending into certain repairs and maintenance workflows.

Specialised robotics platforms for daily inspections and performance monitoring.

Another clear opportunity lies in applications where ROI is derived not only from avoiding downtime costs but boosting asset performance. This is illustrated in the wind and utility scale solar sectors, where cleaning and vegetation management directly improve efficiency. For example, Aerones' deploys aerial and crawler robots for cleaning, defect detection, and ice management on wind turbines. Meanwhile, OnSight's mobile ground robots and stationary AI cameras to improve inspection accuracy and asset performance.

Foundation models and middleware to orchestrate autonomy.

Foundation models form the cognitive core that guides robots in executing specific tasks. Physical Intelligence develops general-purpose embodied AI that integrates vision, language, and motor control, enabling robots to perform complex, multi-step physical interactions across diverse platforms with high generalisation and adaptability. Google's Genie 3 builds expansive world models that give AI systems a deep, context-rich understanding of their surroundings for more informed and adaptive decision-making. Spatial AI specializes in high-precision environmental perception and navigation, allowing robots to accurately sense, map, and interpret spatial layouts and dynamic changes for safe, efficient movement. Complementing these capabilities, middleware layers deliver robot operating systems, low- and no-code development tools, LLM agent chaining, and fleet management. Sitting between the operating system and foundation models, internal robot management layers add higher-order task intelligence—monitoring resources like battery life, segmenting jobs if needed, planning recharge cycles, and determining when to prompt the user for clarification or adjustments.

Christian Woodhams

“Labour shortages and volatile macroeconomic conditions have driven demand in automation and robotics, which is fast becoming a requirement for tenants, operators and owners to remain competitive. Implementing automation and robotic solutions is shifting asset owners and operators from reactive to proactive management which is resulting in leaner operations, longer-lasting infrastructure and safer environments for occupants.”

CBRE (EMEA Head of Proptech, Partnerships and Investments)

About CBRE

CBRE Group, Inc., a Fortune 500 and S&P 500 company, is the world's largest commercial real estate services and investment firm. The company has more than 140,000 employees serving clients in more than 100 countries. CBRE serves clients through four business segments: Advisory (leasing, sales, debt origination, mortgage servicing, valuations); Building Operations & Experience (facilities management, property management, flex space & experience); Project Management (program management, project management, cost consulting); Real Estate Investments (investment management, development). Please visit our website at www.cbre.com.

In conversation with:

Florian Gutzwiller

VOLIRO (CEO)

ABOUT VOLIRO

Voliro is a leading innovator in aerial robotics founded in 2019 and based in Zurich, Switzerland. A spin-off of ETH Zurich's Autonomous Systems Lab, Voliro develops advanced aerial robots that perform precision inspection and maintenance tasks at height.

What structural or maintenance risks are most commonly overlooked in today's industrial assets?

For decades, asset integrity has been managed in a largely reactive way. Traditional inspection methods - such as rope access, scaffolding, or shutdown-based checks - made it difficult and costly to perform regular inspections, leaving many anomalies unnoticed until they develop into failures. This approach not only increased operational costs and downtime but also exposed personnel to unnecessary risks. Asset owners were often forced to deal with the consequences of problems rather than preventing them. Today, there is a clear shift towards proactive integrity management. Operators now strive to carry out regular inspections that go beyond regulatory compliance, with the goal of protecting both human lives and valuable assets while reducing the likelihood of catastrophic events.

Hard-to—reach areas, however, remain a key challenge. Corrosion under insulation, refractory degradation in flare stacks, or subtle wall thinning in storage tanks and pressure vessels often occur in places that are costly, dangerous, or even impossible to inspect with traditional means. Historically, these blind spots were overlooked, even though they pose some of the greatest risks.

This is where drone-based inspection technology is transforming the landscape. Advanced platforms such as the Voliro T allow for safe, cost-effective and thorough inspection of even the most difficult-to-access areas. With the ability to perform contact-based inspections on vertical, inclined, and inverted surfaces, assets that were once neglected can now be inspected regularly without the need for scaffolding or rope access. The benefits are significant: reduced downtime, improved safety for personnel, full asset coverage, and more consistent compliance with strict regulatory standards.

Looking ahead, at Voliro we are developing the next generation of robotic platforms powered by physical AI built into the robot to enable autonomy, adaptability, and repeatability in the physical world. The goal is a system that not only performs inspections but also learns from its environment, responds intelligently to changing conditions, and executes missions with minimal human intervention.

This evolution will empower asset owners to move beyond inspections as a compliance exercise and toward a future where robotic platforms become trusted, autonomous partners in ensuring the safety, reliability, and longevity of critical infrastructure.

For sectors where inspections today are carried out infrequently, how do you ensure strong utilisation rates?

We ensure strong utilisation through a combination of versatility, modularity, and flexible adoption strategies. The Voliro T has been purposefully designed as a modular aerial inspection platform with interchangeable payloads, meaning the same system can perform a variety of workflows across industries rather than being locked into a single application. For example, one day the robot can be deployed for UT thickness testing on storage tanks, the next for lightning protection system (LPS) inspections on wind turbines, and in other cases for advanced NDT workflows such as detecting corrosion under insulation with Pulsed Eddy Current inspections. This adaptability ensures that customers extract maximum value from their investment, even if individual inspection tasks only occur on a monthly, quarterly, or bi-annual basis.

At the same time, we recognise that adoption itself is a journey. Different organizations move at different speeds, which is why we take a case-by-case approach when introducing the technology. We work closely with asset owners and service providers to map out their inspection needs, identify cross-industry applications, and demonstrate how Voliro can be integrated into existing processes without disruption. Once leaders see the robot in action there is typically no return to just relying on traditional methods.

This approach combines technical flexibility with organizational flexibility; the Voliro T delivers value across multiple inspection workflows, while our team supports customers through the early stages of adoption to ensure they build confidence and momentum. In practice, this not only increases utilisation rates but also helps customers transition from occasional, compliance-driven inspections to a more proactive and predictive maintenance strategy over time.

How is the rise of Robotics-as-a-Service (RaaS), alongside pressures like downtime costs, labour shortages, and safety risks, reshaping the business case for inspection robotics — and which of these factors do you see as most influential? Are there any adoption hurdles?

Downtime costs are the most acute driver. Shutting down systems like flare stacks for inspections can cost days or weeks in lost production, whereas Voliro completes inspections in minutes. Labour shortages are also highly influential: with inspectors ageing out of the workforce, the industry is hungry for tools that reduce reliance on scarce skilled personnel. Health and safety are the underlying catalyst: removing humans from rope access in hazardous zones remains a critical imperative behind adoption.

The rise of RaaS has further accelerated this transformation. Traditionally, adopting advanced inspection technology required heavy capex on hardware, specialised training, and maintenance infrastructure, creating barriers for many asset owners. Voliro's subscription model changes that. By bundling hardware, software, training, updates, and ongoing support into a single service, we transform deployment into a predictable opex. This allows customers to adopt the technology quickly, with minimal upfront investment, and to benefit immediately from continuous innovation as updates and upgrades are rolled out seamlessly.

For asset owners, this model translates into faster deployment, lower risk, and immediate ROI, particularly in industries where downtime carries enormous financial impact. For Voliro, it provides steady recurring revenue, enabling us to reinvest in research and development, ensuring our clients always have access to the most advanced inspection capabilities available. The result is a partnership model where innovation, safety, and efficiency advance hand in hand.

RaaS also bridges the adoption hurdles faced by different customer groups. Large asset owners often struggle with fleet standardisation, cybersecurity, integration with digital twins, and organisational change management. Smaller inspection service providers (ISPs), on the other hand, face barriers around capital costs, certification, training, and utilisation risk. Voliro's RaaS model addresses both: asset owners avoid hefty upfront investments while gaining standardised, managed systems, and ISPs gain access to cutting-edge robotics without needing to own or maintain the hardware themselves. This levels the playing field, allowing even smaller providers to compete for larger contracts.

By making robotics both accessible and scalable, Voliro enables the industry to transition from reactive, compliance-driven inspections to a predictive, proactive model of asset integrity management. What was once out of reach (both physically and financially) is now within grasp.

What are the main technical challenges of orchestrating multi-OEM, multi-modal robot fleets in unpredictable outdoor environments?

Enabling fleets of diverse robots presents both significant opportunities and unique challenges. When deployed in outdoor industrial environments, where unpredictability is the norm, two challenges stand out as especially critical:

The first challenge is a lack of standards across robotics solutions. The robotics ecosystem is fragmented. Different OEMs build their platforms with proprietary communication protocols, interfaces, and control systems. This lack of standardisation makes it extremely difficult to orchestrate fleets that combine aerial, ground, and potentially marine robots in one unified operational environment.

Without seamless interoperability, coordination across modalities remains limited, forcing operators into vendor lock-in or requiring costly, one-off integrations. To overcome this, we have adopted an API-first design philosophy. Voliro T exposes standardised APIs that abstract hardware complexity, enabling orchestration systems to issue high-level commands and integrate data without custom translation layers.

Features like interchangeable payloads and a normalised data model ensure that inspection results can be seamlessly combined with data from other robotic or inspection tools.

This interoperability at the software layer allows Voliro T to plug into broader multi-OEM eco-systems without friction, making orchestration scalable and future-proof.

The second challenge is training. Operating advanced robotic fleets often requires highly specialised expertise. In unpredictable outdoor environments, like refineries, wind farms, or offshore assets, operators face not only the complexity of the robots themselves but also dynamic, often hazardous conditions. Weather plays a major role here: sudden gusts of wind, rain, temperature shifts, or even salt spray offshore can disrupt operations, reduce visibility, and increase the risk of human error if manual piloting is required. Voliro T addresses these challenges by embedding autonomy and robustness into its design, and we are continuously advancing the platform to become more autonomous day by day. Instead of relying on highly trained pilots, the system actively deskills the operator's role, providing peace of mind by handling the most demanding aspects of flight and inspection automatically.

This allows operators to focus on what truly matters; collecting, validating, and interpreting inspection data, rather than putting themselves at risk by taking measurements at height. Advanced flight control algorithms keep the drone stable and maintain controlled contact with structures even in challenging wind conditions, while smart safety responses - such as automated checks, force-limited contact, and fail-safe behaviours - activate when necessary to protect both the operator and the asset. By reducing the reliance on human skill and embedding proactive safety measures, drone-based inspections make inspections safer, more reliable, and far less stressful for operators working in unpredictable and hazardous outdoor environments, while simultaneously improving efficiency and inspection regularity.

> "Downtime costs are the most acute driver. Shutting down systems like flare stacks for inspections can cost days or weeks in lost production"

Ricky Bartlett

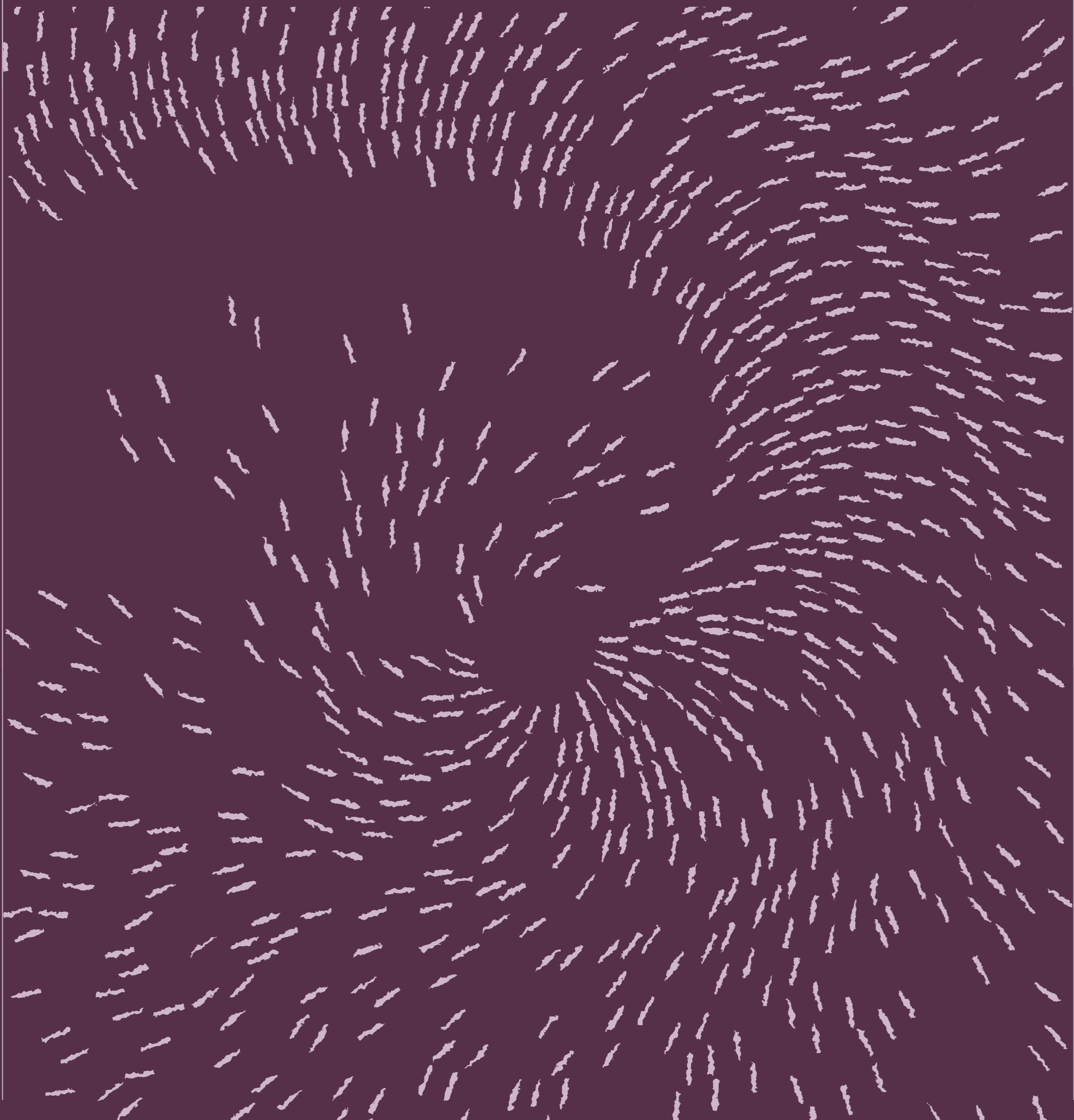
“Automation is already reshaping facilities management for CBRE. We’re shifting from routine, time-consuming tasks to autonomous AI solutions. AI is standardising daily operations like data processing, alarm triage, and inspections – the result is a more strategic approach to facilities management, reducing reactive call-outs and risk, while extending asset life.”

CBRE GLOBAL WORKPLACE SOLUTIONS (UK Lead for Artificial Intelligence and Automation)

About CBRE

CBRE Group, Inc., a Fortune 500 and S&P 500 company, is the world's largest commercial real estate services and investment firm. The company has more than 140,000 employees serving clients in more than 100 countries. CBRE serves clients through four business segments: Advisory (leasing, sales, debt origination, mortgage servicing, valuations); Building Operations & Experience (facilities management, property management, flex space & experience); Project Management (program management, project management, cost consulting); Real Estate Investments (investment management, development). Please visit our website at www.cbre.com.

WEATHER RESILIENCE



Chapter 5

37-44

The case for weather resilience

Extreme weather mitigation alone is not sufficient. Last year, natural disasters caused global economic losses of $320bn and 11,000 fatalities [1]. Overall economic losses in 2024 grew 20% YoY and were nearly 80% above the trailing 30-year average [1]. In January, a series of wildfires in Los Angeles caused projected economic losses of $150bn-$250bn+ [2 & 3] while in July, a flash flood in Kerr County Texas killed at least 82 people [4]. At the same time, water scarcity now affects over 50% of the world's population [5]. The data is clear: we must accelerate weather resilience.

Figure 1: US billion dollar disaster events CPI adjusted [6]

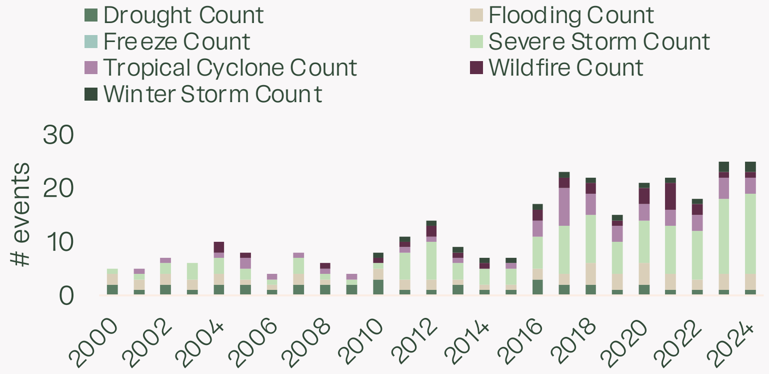


Figure 1: noa's weather resilience market map

Readiness & planning

Near term weather forecasting

tomorrow.io, Jua, meteomatics

Medium to long term hazard analytics

one concern, CLIMATE X, zesty AI, JUPITER, First Street

Detection & monitoring

Hazard-specific detection

PANO, safehub, firewave, DRYAD

Reaction & intervention

Physical infrastructure protection

SHARK Robotics, AquaFence, Seneca, FireDome, Rain, FloodBreak

Parametric insurance & financial protection

Adaptive, FLOODBASE, DESCARTES, Arbol, FloodFlash

Infrastructure monitoring for hazard prevention

Gridware, ORORA Technologies, 7Analytics, LINEVISION, divirod, RHIZOME, PREVISICO

Weather modification & geoengineering

RAINMAKER, make sunsets

[1] MunichRe (2025): Climate change is showing its claws: The world is getting hotter, resulting in severe hurricanes, thunderstorms and floods
[2] ECMWF (2025): 2025 California wildfires: insights from ECMWF forecasts
[3] LA Times (2025): Estimated cost of fire damage balloons to more than $250 billion
[4] Sky News (2025): Why did deadly Texas floods catch people by surprise?
[5] IPCC (2022): Sixth Assessment Report (fact sheet – food and Water
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Figure 1: National Center for Environmental Information (2025)

Well-funded companies of the Climate Risk 1.0 era include Jupiter Intelligence, who leveraged CMIP6 models and the IPCC AR6 scenarios to quantify in 5-year intervals physical climate risk anywhere on the planet up until 2100. From 2019 to 2021, venture funding for climate risk models grew at an impressive ~63% CAGR. New market entrants, such as Climate X, sought differentiation through both better alignment with customer-specific workflows, inclusion of transition risk factors and greater forecasting accuracy, the latter enabled by leveraging a variety of data sources including satellite imagery and synthetic aperture radar data.

As the sector matures and consolidation grows, this year has seen a 95% YoY decline in climate risk model venture funding across all deal stages and a 60% fall in related deal volume. Marginal gains in modelling accuracy for such long-term time horizons are challenging for customers to not only verify but justify any additional spend. Rather, with no independent, government-led regulator in the climate data market the race is on for private players to serve as a voice of truth, gaining credibility through the acquisition of high-profile customer logos.

What's changed?

Real time monitoring becomes essential as insurance providers increasingly won't pay out.

The growing frequency of weather events has dramatically increased insurance premiums and restricted coverage in particularly exposed geographies. The Western US faces heightened fire risk, in part driven by overgrown forests and aging power lines. As a result, climate-related insurance claims have surged by nearly 60% in recent years, while catastrophic California fire seasons in 2017 and 2018 erased over twice the underwriting profits accumulated over the previous 32 years [6]. This has forced many large insurance firms to reduce coverage [7].

Big tech can offer highly accurate, low-cost weather models.

AI advancements have seen tech giants start to challenge traditional physics-based weather forecasts with similar or even superior accuracy, at less cost and lower resource intensity. Notably, NVIDIA's recent FourCastNet 3 model can generate a 15-day global weather forecast in just over one minute, while Google Deepmind's WeatherNext model Gen can accurately generate an ensemble forecast with greater performance than the most widely-used models. Now more than ever, for new market entrants, differentiation will be achieved through specialisation in application.

Hardware advancements solve for the climate risk attribution problem.

A key stumbling block for many of the climate risk models of the 1.0 wave has been the challenge of selling preventative insights for infrequent events while demonstrating ROI. Today's proliferation of robotics and autonomy is enabling not only real time analysis but response. While satellite imagery, IoT sensors, and ultra-resolution cameras for real-time data collection and proactive decision making is nothing new, accuracies are growing. At the same time, the reduced cost of robotic hardware is extending analytics point solutions into vertically integrated risk management platforms. Recent advancements in radar technology, including dual polarisation, higher resolution, and advanced signal processing, are allowing for more sophisticated verification and attribution, fuelling customer sentiment. One clear example is in the case of cloud seeding, where it is now possible to demonstrate that observed changes in precipitation have been directly caused by technological intervention.

What we're watching

Coupling real-time risk monitoring with physical and financial response.

This year has seen early intervention gain commercial traction, with Pano raising a $44mn Series B against reported contracted revenues of $100mn+. Rather than utilising external satellite data providers or individual sensors, Pano uses ultra-high-definition, 360-degree mountaintop cameras and proprietary AI algorithms to continuously scan and detect wildfire indicators in real-time. Other solutions focus on autonomous physical response: Rain adapts military and civil autonomous aircraft with the intelligence to perceive and suppress wildfires for faster response times in remote areas. Meanwhile Floodbase's end-to-end parametric flood insurance platform monitors flood events in near-real time by leveraging various datasets to automatically triggers payouts against predefined thresholds. We anticipate a growing emphasis on vertical integration across long term modelling, real-time analysis, prediction, and autonomous response.

Highly specialised weather models take centre stage.

New market entrants in weather forecasting differentiate through highly specialised use cases to compete with big tech. For example, Jua claims to outperform the ML models of Google and NVIDIA by up to 10% in accuracy and raised an $11mn Series A in June to scale commercial rollout across the energy trading market. Unlike traditional forecasting, which relies on fragmented models and outputs forecasts on a multi-hour basis, Jua's physics model of planet earth treats the earth as one interconnected system. Trained on petabytes of satellite, sensor and observational data, Jua provides rapid, granular forecasts that can be used for decision making in the European intraday spot markets, which operate on 15-minute intervals.

Weather modification tech is ramping up.

This year has seen a new buzz around weather modification technologies, including cloud seeding. Rainmaker strives to solve water scarcity through next gen cloud seeding technology. The company uses self-developed weather-resistant drones to release a seeding agent (such as silver iodide) into supercool clouds to enhance precipitation. As of today, Rainmaker primarily targets governmental agencies on a state level in the US, with opportunities to address federal government and private agricultural stakeholders.

[6] Kousky (2025): Is California becoming uninsurable?
[7] Hollins (2024): Are increased insurance premiums due to climate change inevitable?

In conversation with:

Gabriella Zepf

SEGRO (Sustainability Director)

ABOUT SEGRO
SEGRO is a UK Real Estate Investment Trust, listed on the LSE and Euronext, and is a leading owner, manager and developer of modern warehouses, industrial property and data centres. Its properties are located in and around major cities and at key transportation hubs in the UK and in seven other European countries.

What climate risks do you see as most pressing for SEGRO's portfolio, and how are you approaching them?

Heat stress and water-related risks are the main concerns. They dominate other risks when considering commercial operations, although wind/storm risks are increasing too. The key issue is relativity - what risks justify action? For example, an estate flooding every five years may see little change, while one flooding for the first time in decades can be more problematic. In some locations, occasional minor flooding is considered more of an inconvenience than a risk as most existing buildings can handle it.

The real question is what truly triggers the need for adaptive measures. Our conversations focus on physical risks - flooding, storm damage, maintenance needs - and whether these affect occupiers now or later. At SEGRO we are piloting detailed assessments with engineers and external partners to better answer these "so what?" questions and ensure we invest in priority measures.

How are you deciding which assets to analyse, and do you see this becoming part of the investment process?

We're starting with two sites where a range of climate hazards were modelled and where we want to take a wider view of future resilience. We will be learning from these initial assessments, and will then decide where to expand.

I'm keen to see climate risk assessment even more firmly embedded into the acquisition process. Given how easily accessible good quality climate data is now, screening potential purchases regularly against a wide range of modelled risks should be straightforward.

I expect more of this type of screening to be built into BAU processes. We also expect these assessments will help us identify specific adaptations we could be making to new developments or larger retrofits.

Can you share some examples of resilience measures you've already put in place?

On some estates, we've installed early-warning flood sensors and deployable barriers. The sensors don't automatically deploy barriers - we still need people to physically put them up. Regarding infrastructure risks, like flooding of nearby roads, we bring in infrastructure experts during assessments.

For instance, one of our estates near the North Circular Road is known to experience surface water flooding after heavy and prolonged rainfall, and we monitor any impact on our customers as it could especially impact logistics and last-mile operations. That means the area around us is important too. When we are aware of potential flooding risks, we take proactive steps to ensure drains are clear, which can help keep roads accessible.

What are the biggest challenges in building internal buy-in for climate resilience without regulation forcing the issue?

Some regulations, such as the TCFD in the UK, provide that push for organisations to take a closer look at climate related risks, mainly physical. Although the regulation is external reporting focussed, the work we do to produce our report is extensive and is used to inform our business' risk process.

In addition, local planning regulations across our markets are increasingly explicit with specific resilience and adaptive measures. We expect that to increase and tighten up relatively quickly. Both these aspects naturally lead to conversation around resilience. I would say the biggest challenge is the often still the uncertain timeframe and severity of climate related issues.

"The key is to make these insights truly actionable. It's not enough to know an asset is at risk, we need to know what it means for our customers, our income, and our long-term strategy, and then have the tools and processes in place to act on it"

Looking ahead, what's your outlook on the future of climate risk technology?

We need much more systems-thinking - looking not just at single assets but how they fit into wider infrastructure and financial systems. Linking potential losses to actual financial data will become more common, helping make scenarios more decision useful. Advanced modelling connected to insurance that then triggers climate resilience measures. And of course, we need to continue to do our utmost to play our part in reducing our own carbon emissions and supporting our customers with their challenges.

At a macro level, moving away from fossil fuels means we are closely following developments in EV and eHGV charging, battery technology and PV. A little bit more out there, but potentially interesting are developments to provide hyperlocal weather forecasting. The key is to make these insights truly actionable. It's not enough to know an asset is at risk, we need to know what it means for our customers, our income, and our long-term strategy, and then have the tools and processes in place to act on it.

In conversation with:

Kamil Kluza

CLIMATE X (Co-founder and COO)

ABOUT CLIMATE X

Climate X is the world's only fully integrated climate risk platform, helping financial institutions to price, manage and build resilience to climate change impacts on the built environment. They provide climate financial risk data to global banks and asset managers, defending global economic stability against the impacts of climate change.

How is weather unpredictability changing how asset owners approach climate risk modelling and related capex and insurance decisions?

Increasing weather volatility is shortening planning horizons and pushing asset owners to embed climate resilience into asset design, siting, and maintenance planning. Capital expenditure decisions now routinely factor in resilience ROI — such as the payoff from flood-proofing or elevating critical infrastructure to minimize future operational losses.

Insurance strategies are also evolving. Many owners are moving toward blended approaches that mix traditional coverage with parametric triggers, higher deductibles, and selective self-insurance — a way to manage escalating premiums and tightening policy exclusions. The adaptation market has been particularly active, with asset managers and insurers leading the way and banks beginning to follow suit.

We're also seeing the growing frequency and intensity of climate events reshape how organisations assess risk. The focus is shifting from distant 2050–2100 scenarios toward operational timeframes — planning for the next five years or even preparing for a "one-in-X-years" event that could strike tomorrow. Platforms that combine near-term event probabilities with long-term structural projections are enabling both crisis preparedness and strategic asset allocation.

Emerging demand is now centred on "dual-mode" systems that integrate seasonal and annual forecasts with multi-decadal climate scenarios, bridging short-term operations with long-term resilience strategy.

What gets in the way of operationalising climate risk, and how do buyers judge ROI beyond accuracy? How can companies establish trust in climate data without an independent regulator?

Generally, we see that data sources are fragmented and siloed, and formats are inconsistent. At the same time, many organisations lack the internal capability to interpret climate models. Underpinning this is a fundamental misalignment between asset lifecycles, which are often 10–40 years, and typical corporate decision horizons of 3–5 years.

Smaller CRO pockets exist when looking only at risk, but financing the change is a greater opportunity as it comes with bigger budgets. In addition, regulatory uncertainty reduces confidence in long-term assumptions.

At Climate X, we don't bet on increasing ARR by improving accuracy by just a few percentage points, and we never have. Our models need to pass stringent MRM standards, and that level of rigor is sufficient for our customers. Their issues are less about marginal gains in accuracy and more about translating science into business decisions and embedding this data into their processes. That is what we are experts in.

To build trust, we need to see transparency on methodologies, uncertainty ranges, and data provenance. External validation via academic or industry partnerships is essential, as is a proven track record of model back-testing against historical events. Independent audits and ISO/TC 207-type certification would also help where possible.

As AI-based weather models become more accessible, what are their relative strengths and weaknesses and how do they fit into the climate risk stack? How do you see the sector evolving?

AI models have speed, cost-efficiency, and the ability to ingest non-traditional datasets. However, they also have opaque "black box" processes, potential for bias, and limited robustness in unprecedented events.

Ultimately, we believe AI models are a win for Climate X as we're moving up the value chain to focus on AI UX and customer workflows, cost and revenue impacts, with pure climate and hazards being just one of the inputs that will reduce in value over time.

Looking at the bigger picture, solutions are likely to become increasingly verticalised for high-exposure industries such as infrastructure, banking, and asset management. Seamless integration across time horizons and workflows reduces friction, accelerates adoption, and strengthens the value proposition.

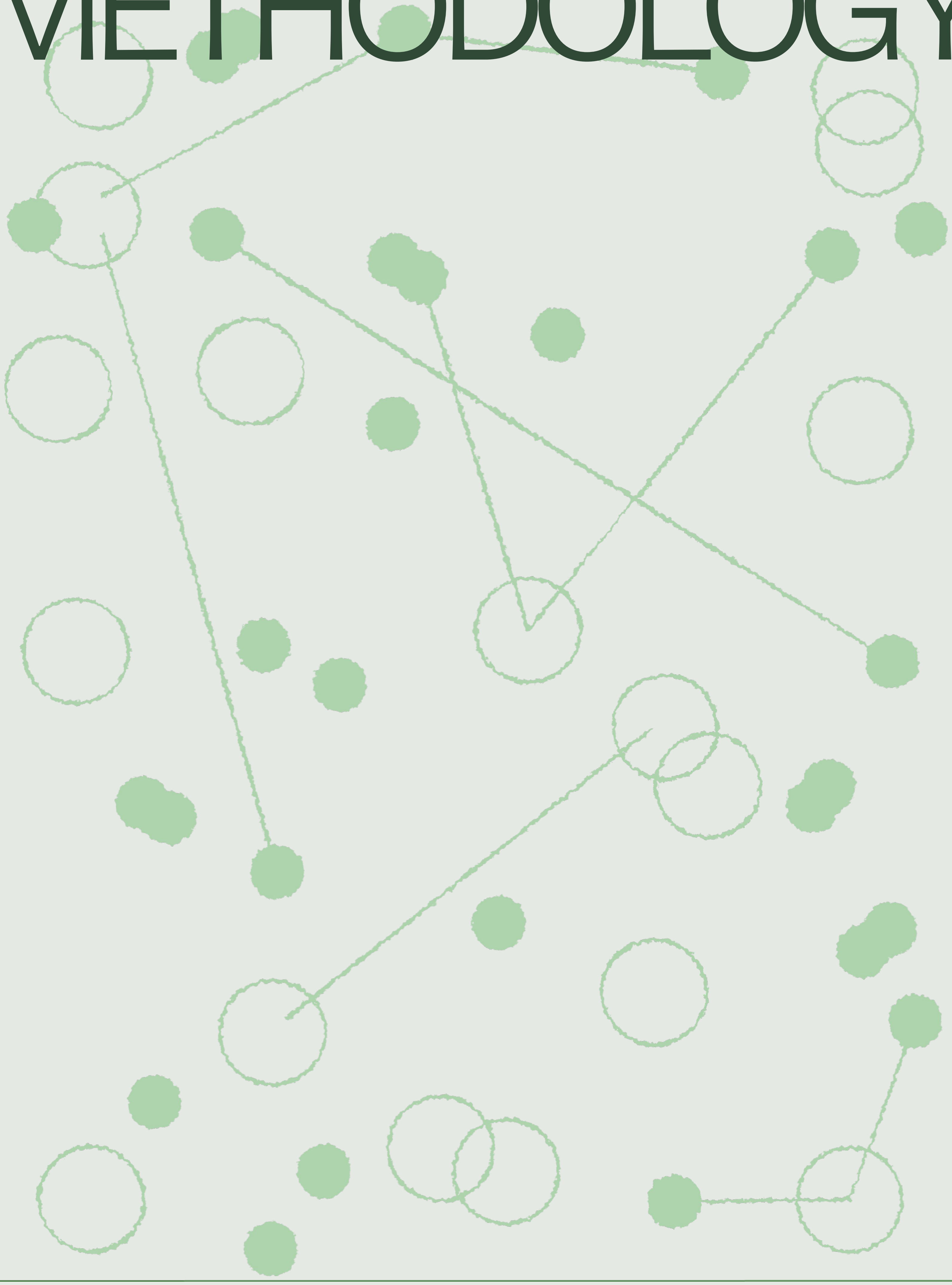
A unified platform that spans short-term event monitoring, medium-term capital planning, and long-term risk assessment could significantly streamline procurement, enhance decision speed, and deepen client relationships. Comparatively, in lower-exposure sectors, modular and interoperable tools may remain preferable — allowing organizations to avoid overinvesting in capabilities they use only occasionally.

And lastly, how important is it to consider transition risk alongside physical climate risk for long term modelling?

It's relevant to a degree (though we don't do that) - especially for sectors with carbon-intensive assets or long investment cycles. Regulatory volatility (e.g., IRA changes) increases scenario uncertainty, but transition risk remains a material driver of asset value, cost of capital, and compliance obligations. Ignoring it risks stranded assets and mispriced investments.

> "Emerging demand is now centred on "dual-mode" systems that integrate seasonal and annual forecasts with multi-decadal climate scenarios, bridging short-term operations with long-term resilience strategy"

METHODOLOGY



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Data collection and analysis

Step 1:
Define a built world taxonomy

- **Built world tech taxonomy.** This analysis leverages noa's internal methodology for classifying built world tech startups, and our associated database of companies. The taxonomy is organised by theme and by category. Definitions of the companies included within these categories and their impact potential are detailed on the following pages.

- **Evolution.** Given the rapidly evolving startup landscape, our segmentation of the market relates only to how we at noa perceive the current state of the built world tech market. Note there are small taxonomy adjustments made on an ongoing basis.

Step 2:
Match companies to the vertical taxonomy and technology

- This analysis has been produced using noa's vertical classification which leverages fine-tuned LLM classification models, while the technology verticals were analysed using NLP from the company descriptions from Pitchbook, company website data, and LinkedIn. Categorisations have been manually checked by our data team to ensure accuracy.

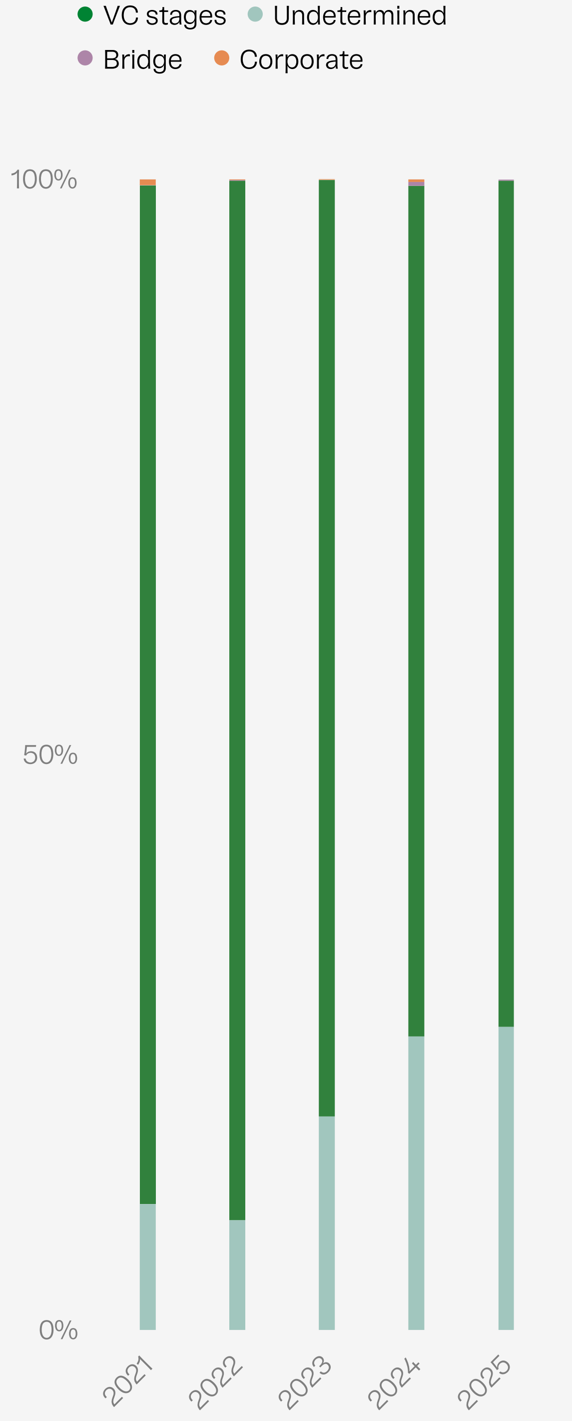
Step 3:
Establish analysis boundaries

- **Time boundaries.** The solutions outlined in this report focus on those that raised disclosed investment rounds from 2015 to 2025 (inclusive). Note all 2025 figures are forecasted using annualised values for Q4.

- **Funding boundaries.** For the capital allocation analysis, we have chosen to focus on venture capital deals. We have excluded grants, debt financing, private equity, secondary transactions, public offerings, M&As, and SPACs.

- **Data availability.** Where an investment's deal size has not been disclosed on Pitchbook, we have used Crunchbase data. Where the deal size is not disclosed on either Pitchbook or Crunchbase, we have chosen not to include the deal in our investment size analysis, but is included in the deal count/volume analysis.

Built world tech venture, $ investment



noa's built world taxonomy

Underpinning our investment thesis is our built world taxonomy, which comprises over 100 thematic subcategories and is detailed on the following pages.

Foundational

Asset Digitisation

• Design Software

Next generation software for the design of buildings, renewables, and infrastructure. Enables low carbon building design through the integration of lifecycle assessments, automated engineering, environmental design optimisation, and automated modern methods of construction. In the renewables sector, design software enables automated system, and plant design, to reduce the soft costs associated with rooftop and utility scale renewable energy projects.

• Construction Site Monitoring

Onsite computer vision and drone technologies to benchmark designs to monitor construction progress in real time. Helps to identify mistakes early on, reducing the volume of material wasted through rework. Also includes subsurface mapping technologies to identify environmental risks prior to construction.

• Earth Observation

Data capture at the global scale using satellites, helpful for all applications across the built world, from thermal imaging to the identification of physical climate risk. This data can be aggregated into GIS platforms alongside other built world datasets and physical risk metrics to provide urban designers and resource allocators with a centralised view of their towns and cities.

• Asset Monitoring

Solutions to create real time digital twins of buildings, electricity grids, water grids, renewables, and infrastructure. Essential for designing deep energy retrofit measures and enabling predictive maintenance through real time monitoring.

- Building Asset Monitoring
- Building Occupancy Monitoring
- Electricity Grid Monitoring
- Infrastructure Monitoring
- Renewables Monitoring
- Water Grid Monitoring

• Digitisation Hardware

Technologies to support IoT and other sensor deployment.

Built World Finance

• CRE Transactions

Digital workflow solutions for commercial real estate professionals during the transaction process - including real estate data analytics and deal management tools - and during asset management, such as capex budgeting and lease administrations.

• Residential Transactions

Digital workflow solutions to reduce tedious and manual processes, serving real estate brokers, homeowners, renters, and landlords. Includes broker software, homebuying platforms, rental management, and home affordability solutions.

• Project Finance

Streamlined and novel financing methodologies for new construction and retrofitting projects, including working capital solutions for subcontractors, and zero upfront capex for renewables.

• Real Estate Investment

Digital real estate investment platforms serving institutional investors and retail investors, including fractional ownership models.

Building Materials

• Material Manufacturing

Manufacture of low carbon or carbon negative building materials or products, including carbon negative cement, green steel, and bio-based building materials.

• Material Procurement

Software and marketplace solutions for the planning, documentation, and purchase of building materials. Enables project teams to swap out polluting materials for low carbon or carbon negative materials during the design process, procure materials during construction, and document all materials used in a project during the construction phase to create building material passports. These can then be used to facilitate material reuse at the point of eventual deconstruction, alongside embodied carbon reporting and analysis.

Construction Operations

• Development Management

Software solutions to automate site identification, acquisition, and permitting workflows for asset developers, as well as end-to-end development models for real estate asset classes including single family homes and data centres.

• Construction Procurement

Digital solutions to optimise construction labour and equipment procurement and management processes.

• Construction Site Management

Digital workflow solutions to streamline the construction tender and bid management processes, alongside optimisation of administrative construction workflows like health and safety.

Manufacturing Automation

• Construction Automation

The deployment of robotics and other automation solutions during the construction process to reduce the delays and material waste caused by human error, as well as to mitigate growing construction labour shortages.

- Building Construction Robotics
- Building Prefabrication
- Infrastructure Construction Robotics
- Renewables Construction Robotics

• Waste Processing

Automated or robotic waste processing and recycling for construction and renewables material and component waste.

- Construction Waste Processing
- Renewables Waste Processing
- Battery Waste Processing

• Carbon Capture + Storage

Direct air capture and point source carbon capture solutions to decarbonise industrial processes. Excludes BECCS and bio-based solutions given low interaction with buildings.

• Indoor Farming

End-to-end indoor growing platforms, alongside infrastructure to support autonomous operations, including sensors, robotics, and computer vision technologies.

- Indoor Farming Infrastructure
- Turnkey Growing Solution.

Building Electrification

- ### Retrofit Installer Tech

Solutions dedicated to growing and supporting the building energy installer workforce, from vertically integrated installers to franchise models and workflow software. Includes the manufacturer, distributor, and installer and operator of EV charger(s) within buildings, as well as the distribution and installation of various building electrification products and energy audits.

- ### Microgrid Management

Solutions to enable buildings in close proximity to share renewable energy production generated onsite through building integrated DERs or local microgrids, to reduce a community's dependence on the electricity grid. Includes community solar solutions and microgrid installation and management platforms.

- ### Building Electrification Hardware

Manufacturer of building energy storage systems, heat pumps, solar technologies (including PV panels, windows and building integrated photovoltaics (BIPV), and solar thermal systems), building integrated wind turbines.

Building Efficiency

- ### Building Energy Management

Smart building automation systems with a strong focus on energy demand reduction in buildings. Includes IoT energy management systems (EMS) and smart building management (BMS) systems.

- ### Efficient HVAC

Ventilation products, air quality monitoring + filtration, smart radiators, efficient boilers, direct air capture from ventilation ducts, low carbon air conditioning, smart thermostats, efficient water heating, and passive heating and cooling solutions.

- Efficient Heating
- HVAC Controls
- Ventilation and Air Quality

- ### Water Efficiency

Onsite greywater /wastewater recycling + treatment, rainwater recycling, water leak detection, water efficient showers + toilets, and water consumption monitoring tools.

- ### Efficient Appliances

Efficient appliances for buildings, including smart home systems, smart light, and other efficient appliances and controls.

- ### Insulation

Duct sealing products, innovative insulation materials, and smart window technology retrofit solutions to reduce thermal heat loss in a building.

- Insulation Products
- Windows and Glass

Building to Grid

- ### Energy Procurement

Energy retailers and software to enable real estate stakeholders to identify optimum low carbon energy procurement strategies for a given building or portfolio, including democratised access to low cost offsite renewable energy through power procurement agreements (PPAs). Includes electricity meter solutions that facilitate the high frequency collection of electricity usage data across buildings and communities, alongside API platforms that simplify access to this data across electricity utilities and smart home OEMs.

- Utility Data
- Power Procurement and Management

- ### Water Infrastructure

Novel technologies for water management and quality assurance at the grid scale, including circular water supply systems and water quality monitoring.

- ### Grid Flexibility

Software solutions to enable grid operators to adapt to the rising number of distributed energy resources on the grid, and to enable distributed energy resources to serve as flexibility assets, thus reducing the need for gas peaker plants. This includes a number of solutions across:

- Battery Management
- EV Charging Network Optimisation
- Grid Orchestration
- Virtual Power Plants

- ### Utility Scale Power

Novel energy generation and storage technologies at the utility and large industrial scale to decarbonise industrial processes and the grid.

- Long Duration Energy Storage
- Hydrogen
- Nuclear

Assets Operations

- ## Asset Operation Robotics

The deployment of robotics across buildings, renewables and logistics assets to account for growing labour shortages and to facilitate predictive maintenance and lower opex

- Building Operations Robotics
- Renewables Maintenance Robotics

- ## Property Management

Streamlined workflows for day-to-day property operations, including access control and repairs and maintenance.

- Access control and services
- Repairs and maintenance
- Interior fitout platforms
- Furniture supply and reuse

- ## Tenant Operations

Tech-enabled tenant engagement solutions for both office and residential buildings, including workspace management and community building. Solutions for hospitality and brick and mortar retailers to adapt to online operations.

- Office Management
- Residential Tenant Engagement
- Hotel Operations
- Retail Operations

Urban Logistics

- ## Smart Cities

Computer vision and sensor-based technologies to streamline parking, waste collection, and traffic management in urban areas.

- Parking
- Traffic
- Waste Collection

- ## Smart Logistics

Tech enabled solutions for logistics operators and last mile delivery and storage.

- Last Mile Delivery
- Storage

Services

Risk Management

- ## Built World Insurance

Digital workflows for construction and property insurance, alongside novel insurance products such as parametric insurance.

- ## Cybersecurity

Solutions to manage and mitigate cybersecurity risk across built world IoT technologies and systems.

- ## Physical Risk

Software and hardware-enabled software solutions to identify and remotely monitor the existing and future risk exposure of built world asset owners, operators, and occupants to physical climate risk factors such as wildfires, hurricanes, flooding, drought, and earthquakes. Also includes solutions to help monitor the built world's impact beyond carbon, including air and water pollution and biodiversity.

- Air Pollution Monitoring
- Biodiversity Risk Monitoring
- Climate Risk Models
- Earthquake Risk Monitoring
- Water Risk Monitoring
- Weather Forecasting

- ## Transition Risk

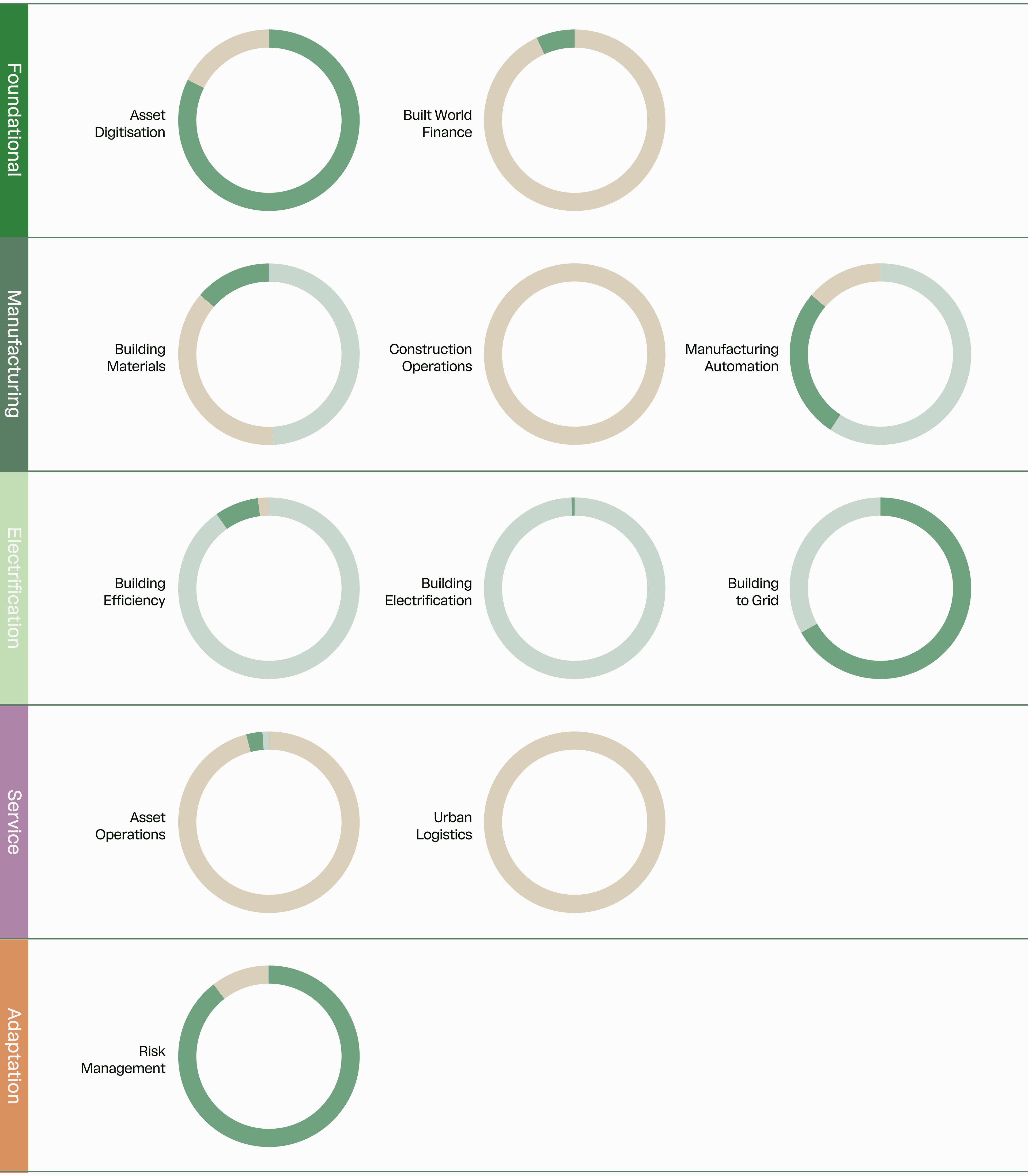
Software to identify, manage, and mitigate exposure to transition risk for built world stakeholders, from carbon accounting platforms for ESG reporting to carbon credit purchase, verification, and management platforms to offset unavoidable emissions.

Adaptation

Impact potential varies by tech investment theme

By cross referencing noa's impact framework against our built world taxonomy and mapping to our database of built world tech companies, the below outlines the typical impact profile by each investment theme for the count of companies that raised venture financing from '21-'25.

Enabling Tech
Impact Catalyst
Impact Native



noa is Europe's largest built world venture capital firm, backing technology to accelerate the decarbonisation of the built world. Launched in 2019 as A/O, noa partners with visionary founders to drive disruption across the entire spectrum of the built world, from structures and materials to energy and environment.

noa is backed by some of the largest and most forward-thinking real estate owners, operators, and family offices in Europe who share noa's determination to decarbonise the world's largest and most polluting asset class, and its commitment to accelerate sustainable living.

For more information, visit:

Linkedin

www.noavc.com