ZURICH

Beyond 2030

The Future of Construction

Meet tomorrow prepared

Contents

Foreword

Construction is the constraint on how quickly economies can change.

> Resilience is not a constraint on progress, but the foundation for it.

The construction industry approaches the 2030s facing a paradox: Ambition, capital and technology are accelerating change, yet are narrowing the ability to deliver it. Labor, enabling systems, financial models and insurance are falling out of sync with the pace and scale of what is being asked of them.

The result is a widening gap between what societies aspire to build and what can realistically be delivered – shaping not only which projects proceed, but how they are designed, sequenced, financed and governed.

This is not a cyclical issue: It is structural because pressures are now tightly coupled. Workforce shortages accelerate automation; automation enables tighter schedules; compressed programs reduce tolerance for weather, defects and disruption; climate volatility undermines assumptions embedded in design and materials; capital becomes less forgiving of delay. In this environment, disruption is more likely to cascade from individual assets across projects and portfolios.

Many of these dynamics are most visible at the leading edge of construction, where demand is concentrating in highly capital-intensive, time-critical projects, such as data centers, energy systems, advanced manufacturing and healthcare. These projects are increasingly larger, faster and more concentrated than much of what the industry has delivered before. For contractors, they demand highly skilled workforces and advanced execution capability. For owners, they introduce new forms of portfolio exposure. For insurers, they test accumulation limits and traditional capacity assumptions.

These projects matter not because all construction will come to resemble them, but because they reveal the direction of travel: greater concentration of risk and less room to recover once programs slip.

The coming years will be shaped less by single shocks than by how organizations navigate these reinforcing pressures across people, technology, climate and capital. Drawing on the perspectives of industry experts, our analysis does not predict a single base case future, nor does it offer a comprehensive state-of-play. Instead, it focuses on the most influential intersections of risks facing the sector – and on their governability, because the choices made today in response will shape resilience over the decade ahead.

Not all stress is negative – it forces adaptation. The industry is responding to these pressures through new approaches to sequencing, technology adoption, capital structuring and standardization. The critical distinction, however, is between adaptations that genuinely build resilience and those that simply move risk elsewhere – from owners to contractors, from projects to portfolios, or from the present into the future.

The future of construction will favor organizations that anticipate change and design for resilience early, to convert these stresses into long-term advantage.

Kelly Kinzer
Global Head of Construction & Surety

Key findings

Construction sits at the center of every major transition – from digitalization and decarbonization to energy security and infrastructure renewal. Demand is strong, but delivering complex, capital-intensive assets is becoming more difficult and less predictable.

Three risks stand out over the next five years: Extreme weather and natural disasters, financial market vulnerabilities, and labor market dynamics.

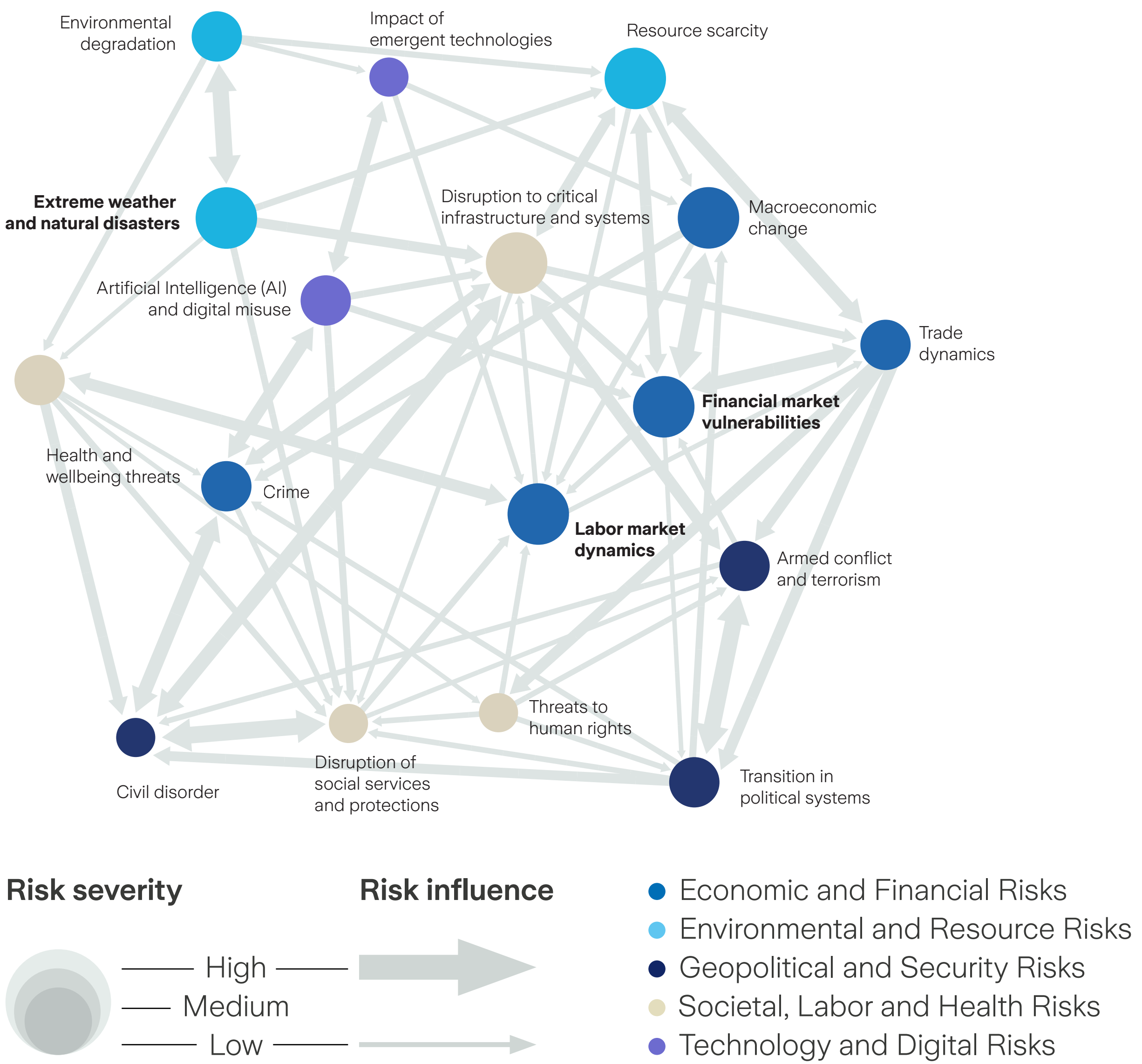
On their own, each is familiar and, in principle, manageable. What will define the 2030s will be how they combine – increasing disruption and reducing the ability to recover. Financing structures leave less room for delay. Weather disruptions are harder to absorb in tighter schedules. Labor shortages create bottlenecks at critical project stages. Disruption spreads across programs and portfolios, amplifying losses and exposing weaknesses in traditional delivery and financing models.

In short, risk is emerging earlier, spreading further and being felt faster. In practice:

- Feasibility, insurability and financial viability are determined earlier – and increasingly outside the project boundary.
- Performance is shaped by system dependencies, not individual components.
- Recovery capacity is shrinking under tighter schedules and financing constraints (see What changes in practice).

Beyond 2030: The Future of Construction

Risk network



What changes in practice: Risk arrives earlier and spreads faster

Five shifts will drive this change over the next five years and beyond, reshaping how risk accumulates – and where value is won or lost:

Enabling infrastructure sets the outer limits of demand

AI-driven demand is outpacing infrastructure capacity. Projects now depend on early access to power, water, grid capacity and specialist equipment, which often sit outside the project team's control.

See Gridlocked intelligence.

Capability failures are system failures

Skills shortages – from aging workforces to technical complexity – are concentrating risk in a few critical roles. The capability gaps that arise can delay multi billion-dollar projects.

See Workforce without workers.

Solutions scale faster than insights

Standardization of designs, systems and delivery models is accelerating delivery, but can also spread defects. Scaling is outpacing learning, and when designs fail, they fail at scale across portfolios.

See Standardized futures.

Financing structures narrow tolerance for error

Financing models are imposing tighter performance thresholds, thinner buffers for error and stricter insurability requirements. Delays that were once manageable translate more quickly into financial stress.

See Impatient capital.

Tight schedules erase the safety margin

Speed is built into how project are delivered. Commissioning overlaps construction. Weather buffers erode. Interfaces lock in early. But speed without shock absorption leaves little margin – turning disruption into failure more quickly.

See Acceleration trap.

Where the next opportunity lies:
Complexity becomes the source of advantage

While these pressures reduce flexibility, they also make the sources of resilience clearer. Advantage is shifting to organizations that actively govern construction complexity.

1. **Treat infrastructure as a key risk**
   Infrastructure cannot be assumed to be available when you need it. Grid access, water, material sourcing and critical equipment can make or break successful project delivery. Unfortunately, too often these are treated as side assumptions. Plan for and lock these down early, assign ownership and escalate fast when things slip. If key dependencies sit outside your control, align your timelines with reality, not optimism. Delays of this nature, don't just impact schedule. They impact financing, insurability and overall project viability.

2. **Plan for successful interfaces**
   As projects become larger, more automated and integrated, risk doesn't only sit within the trades, it also sits between them. Design, fabrication, assembly and commissioning are steps where issues emerge. Shift focus from trade-level oversight to actively managing these interfaces. Map handoffs early, assign accountability and test where systems are intended to connect. If you don't control the interfaces, you don't control the outcome.

3. **Design for durability**
   Performance at turnover is only one small part of overall success. Build in a way that systems can be resilient, repeated and adjusted while in use. Plan every step and system with a durability plan. If it fails, how will it fail? How will it be fixed? How long will it take? Resilience is not theoretical, it is operational.

4. **Identifying portfolio-level risk**
   Only thinking about risk project-by-project can be ineffective. The real risk sits across the entire portfolio. With multiple shared dependences such as grid capacity, skilled commissioning teams and standardized designs, one issue can actually cause multiple projects to fail all at once. In order to mitigate this, one must manage risk at the portfolio level.

   The same goes for cyber. With shared platforms, software and vendors, one single weak link can disrupt an entire enterprise. Setting standards and enforcing them are key across the ecosystem.

5. **Shift insurance from a lagging to leading indicator**
   Insurance is not a post-planning consideration. It is one of the clearest early indicators of project risk. If premiums rise, exclusions widen or capacity tightens, don't just negotiate around it, pay attention to it. These are potential signals that something in the delivery model may not work.

   Use insurer feedback and risk engineering insights to identify weak points early, before they show up as losses. Treat insurability in a similar lens as cost, schedule and safety planning.

Construction: A sector under stress

As construction moves towards the 2030s, ambition will remain high, but the compounding interaction of risks will define what can be built, how quickly, and under what terms.

Extreme weather and natural disasters (#1) top the perceived risk profile for the construction sector over the next five years. Climate volatility is no longer limited to historically exposed regions, and events are disrupting schedules, damaging partially completed works and shortening recovery windows. At the same time, environmental degradation (#8) and resource scarcity (#5) are tightening water, materials and land availability. Climate resilience has moved from aspiration to a condition of project viability, directly reshaping insurability, access to capital and tolerance for delivery risk.

Access to capital is following the same trajectory. Financial market vulnerabilities (#2) and broader macroeconomic change (#4) are amplifying delivery risk. Highly leveraged financing structures, tighter liquidity and rising public debt levels reduce tolerance for delay and convert disruption into financial stress earlier in the project lifecycle. Capital remains available, but far less forgiving.

Labor market dynamics (#3) rank among the most severe perceived risks – not simply because of shortages, but because capability is becoming concentrated. Aging workforces and rising technical complexity mean that failure is increasingly triggered by gaps in commissioning, system integration and digital coordination, rather than by headcount alone.

Beyond 2030: Top risks facing the construction sector

Perceived severity of risks in the construction sector over the next five years

Seven-point scale (1 = Extremely low, 7 = Extremely high)

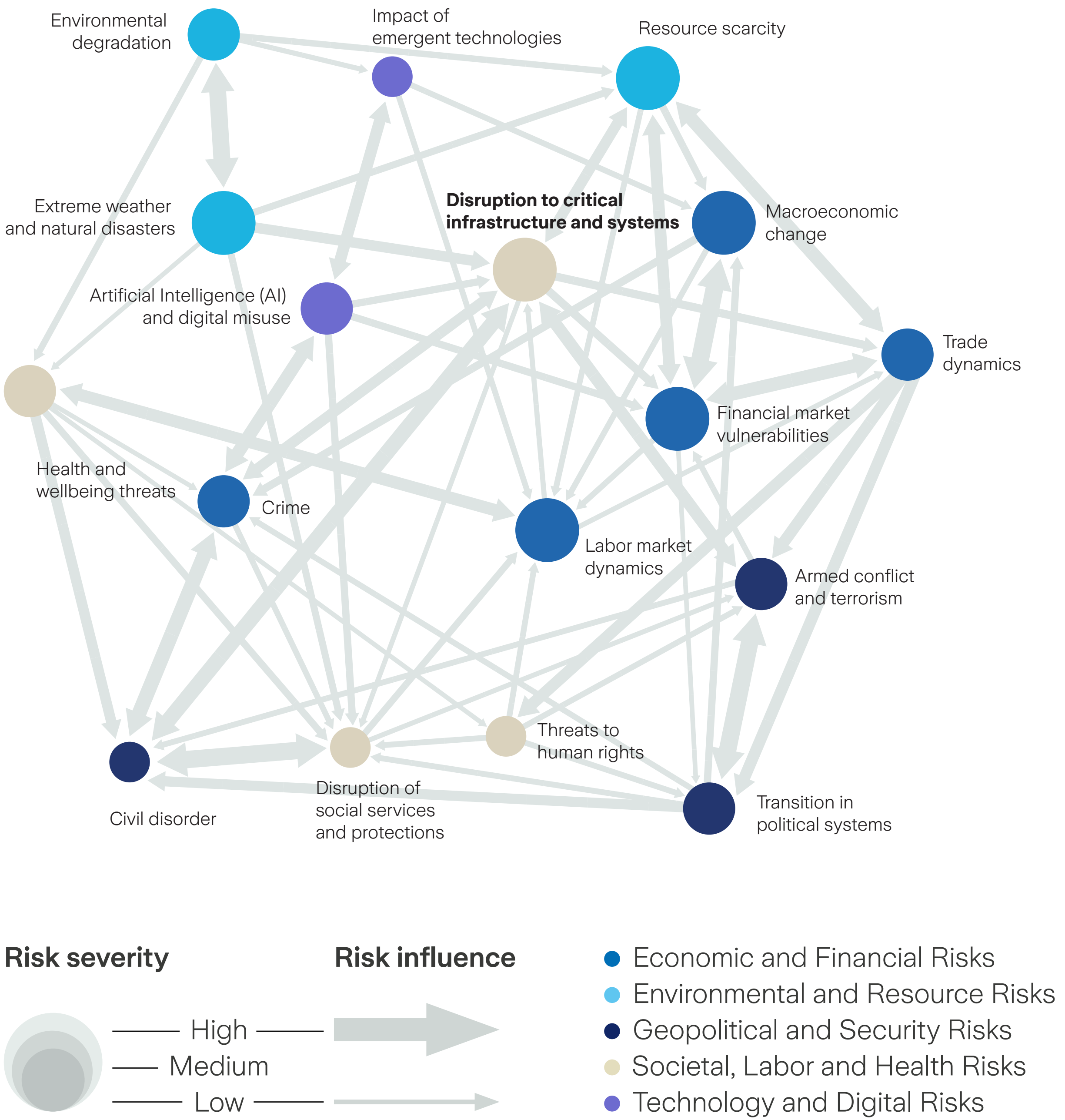
Rank	Risk	Severity
1	Extreme weather and natural disasters	6.2
2	Financial market vulnerabilities	5.7
3	Labor market dynamics	5.6
4	Macroeconomic change	5.6
5	Resource scarcity	5.2
6	Disruption to critical infrastructure and systems	5.1
7	Artificial Intelligence (AI) and digital misuse	5
8	Environmental degradation	4.8
9	Trade dynamics	4.7
10	Transition in political systems	4.6
11	Crime	4.5
12	Armed conflict and terrorism	4.2
13	Health and wellbeing threats	4.2
14	Civil disorder	4.1
15	Impact of emergent technologies	4.1
16	Disruption of social services and protections	3.6
17	Threats to human rights	3

Viewed in isolation, these risks rank highly. Viewed as a network, their interaction explains why disruption now spreads faster, earlier, and across portfolios – particularly where assets share common infrastructure dependencies.

At the center sits disruption to critical infrastructure and systems (#6). While it ranks only sixth by perceived severity, it is the most highly connected risk in the network – most likely to both be triggered by other risks, and to amplify them.

Risk is spreading earlier in the project lifecycle and outward – from site execution to enabling systems, from individual assets to portfolios, and from recovery to feasibility. In the 2030s, delivery success will hinge less on demand – which remains buoyant – and more on the ability to govern interacting pressures across climate, capital, capability and infrastructure.

Beyond 2030: The Future of Construction
Risk network



Micro trends: Where stresses become strategy

Gridlocked intelligence:
Resource dependences in the age of AI

AI is not only a technology story. It is a test of physical infrastructure, where enabling systems set the outer limits of strategic demand, and electricity, water, interconnection, permitting, and equipment supply determine feasibility far more than chips or capital alone.

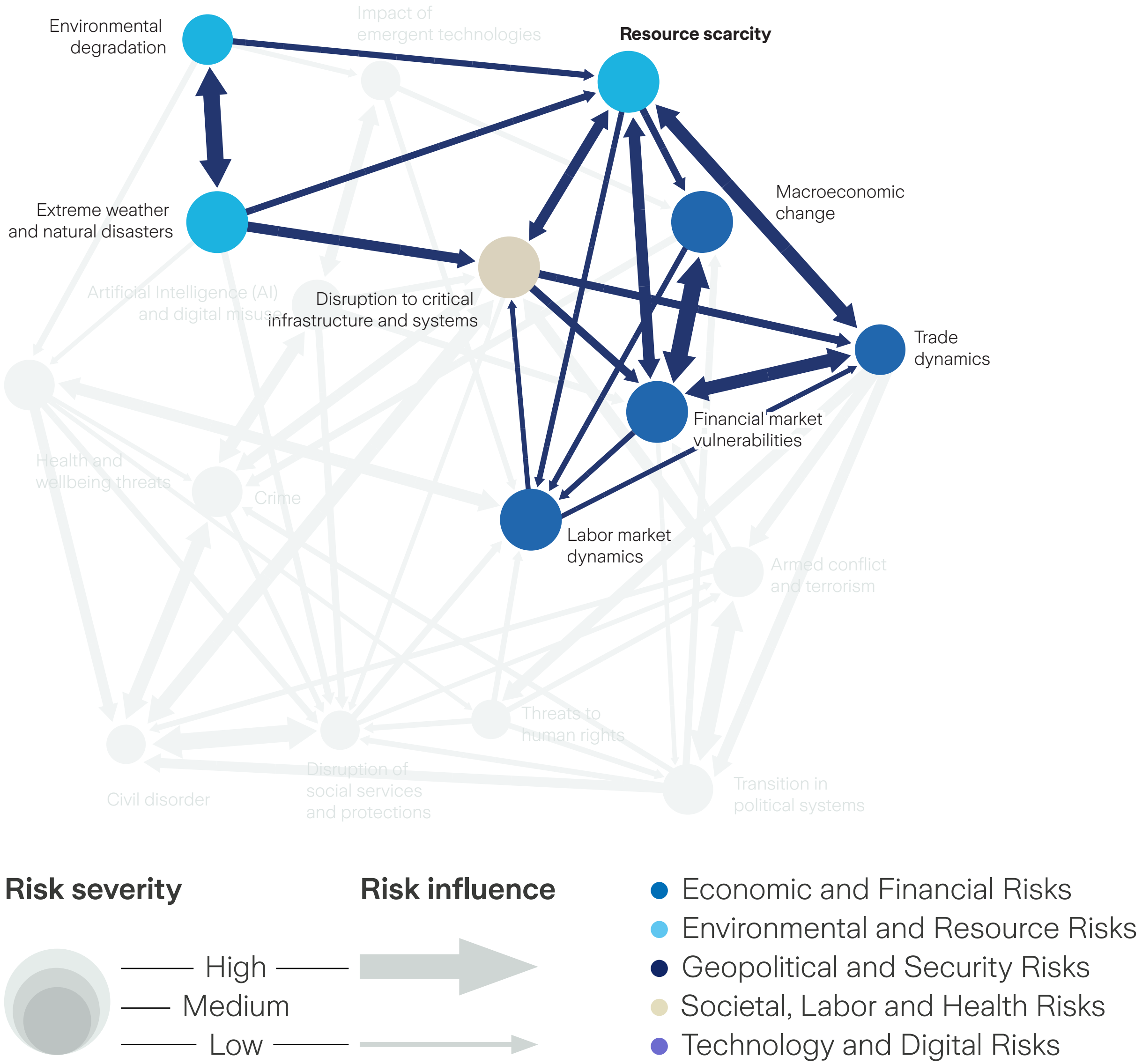
AI and other emergent technologies are accelerating demand on infrastructure systems with limited spare capacity. Extreme weather, environmental degradation, and accompanying resource scarcity are raising the frequency of service disruption and reducing the usable capacity of power and water systems. At the same time, trade dynamics and concentrated production are extending the lead times of critical components, delaying the ability of these systems to scale.

What distinguishes the 2030s will be how project feasibility fails upstream of construction. Data centers sit at the leading edge of this shift because they combine high power density, continuous cooling demand, and strong clustering effects. But the underlying issue is far broader. Across advanced manufacturing, logistics, healthcare, and defense-adjacent industrial facilities, projects can meet capital, design and permitting thresholds, yet still stall if the grid cannot deliver power on time, cooling systems cannot be supported, or critical components cannot be procured fast enough.

For the construction industry, delivery risk for large-scale infrastructure is less defined by engineering complexity or access to capital, but by access to power, water, permits, and long-lead equipment – shifting success or failure well before a project breaks ground.

Gridlocked intelligence

Risk network of resource scarcity



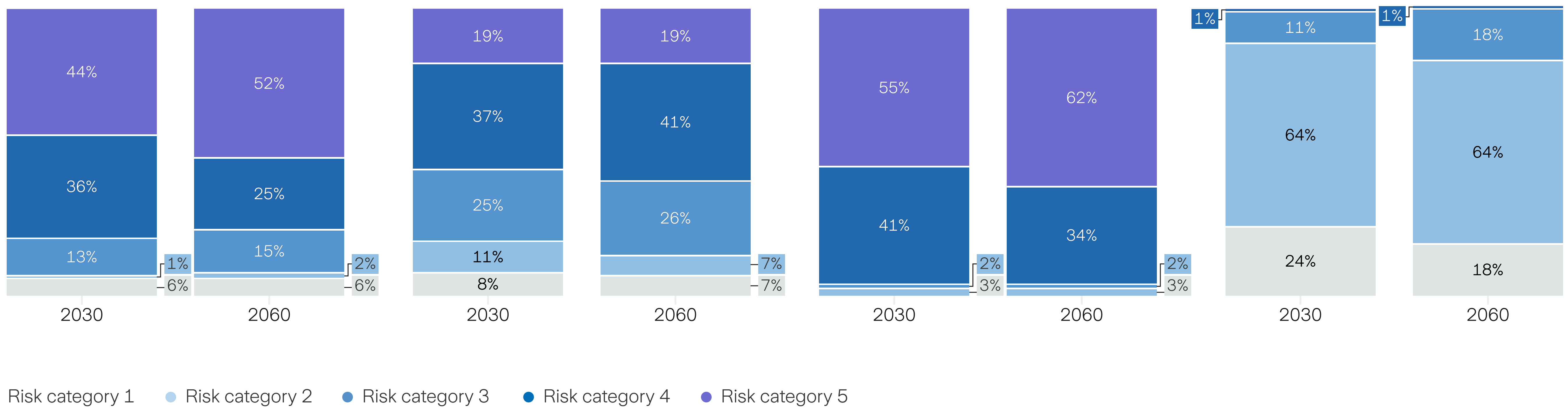
Climate constrains capacity – and drives resilience by design

Enabling infrastructure is already exposed to environmental stress it was never designed to withstand. Heat, drought, flooding and extreme weather are undermining assumptions embedded in power generation, cooling systems, substations, transmission assets, and other backbone systems built for a climate that no longer exists.

Climate exposure is no longer a question of future damage, but of present day performance. The reliable operating range of power and water assets is narrowing under climate stress, and the same risks are affecting both systems simultaneously. For example, around 75 percent of future renewable capacity in ASEAN is expected to face critical risk (Categories 4 and 5) by 2030. Hydropower is particularly exposed – around 96 percent is at critical risk overall, while the share in Category 5 increases from 55 to 62 percent by 2060 as drought and flooding intensify.

Climate risk category of future renewable generation assets in ASEAN

% of future generation assets, weighted by generation capacity, by operating status under SSP2-4.5 (2°C warming scenario)



Source: Zurich Resilience Solutions. Powering Through: Building Climate Resilience into Southeast Asia's Energy Future (2026).
ASEAN 10 countries, excluding Timor-Leste.

Critically, this exposure does not stop at enabling infrastructure. Dependent assets inherit these constraints by default. Where grids, water systems, or cooling infrastructure operate close to tolerance, incremental load or heat can trigger disproportionate performance loss, outage risk, or regulatory intervention. Climate risk now propagates through infrastructure networks rather than remaining isolated within individual assets.

Water reliability is an illustrative case. Large data centers can consume up to 19 million liters of water per day for cooling – equivalent to the daily water use of a town of up to 50,000 people.[1] Around one-quarter of today's facilities, and nearly one-third of those under construction, are in regions projected to face greater water scarcity by 2050.[2] Aragon, one of Spain's most water-stressed regions, has sought EU support to address drought impacts, even as large data center developments advance and operators apply for expanded water permits.[3]

The resilience of enabling systems will become a clear and critical constraint with two implications. First, construction capacity will be diverted towards hardening, upgrading and extending the life of existing systems. Unlike past upgrade cycles, resilience measures must perform under future climate conditions rather than historical norms, making resilience by design a prerequisite for revenue continuity and long-term asset value.

But high public debt levels in many economies make that diversion harder to fund and slower to execute. Where investment is deferred, aging assets degrade further, raising the likelihood that upgrades shift from planned reinforcement to emergency repair. In both cases, delivery risk will shift into sequencing, commissioning, and system integration, as retrofit projects operate within live systems, legacy constraints, and uncertain asset condition.

Second, these physical constraints to enabling infrastructure will likely continue to surface as permitting, reputational and social-license risk to downstream projects. Water and grid-related costs are already being shifted directly onto project developers to reduce impacts on residential customers, while data center permits have been paused or partially reversed over water and climate concerns.[4]

In this context, access to enabling infrastructure will become a front-end constraint – and one that ultimately expresses itself most sharply at the point of grid interconnection.

The grid is the gatekeeper – and procurement is the strategic lever

These constraints are not limited to resource availability alone. Grid interconnection capacity – the systems that connect generation and load – has become a strategic gatekeeper in its own right. Across advanced markets, transmission and distribution systems are no longer scaling in step with demand. For grid-dependent construction – from data centers to energy-intensive industrial facilities – the ability to secure a timely connection can now determine whether projects can proceed at all, not just how quickly they connect.

In the U.S., the interconnection queue exceeded twice total installed generation in 2024, yet only a small fraction of projects have reached commercial operation over the past two decades, with median interconnection timelines exceeding four years.[5] Recent regulatory interventions signal recognition of the problem, but they do not resolve the structural mismatch between grid delivery timelines and private development schedules.[6]

Comparable bottlenecks are emerging elsewhere. Across Southeast Asia, interconnector investment is expected to rise sharply beyond 2030, as part of a broader step change in grid spending required to support regional power trade and renewable integration. While historical investment has been limited, future requirements are set to increase significantly, reflecting the growing importance of the ASEAN Power Grid.[7]

Renewable deployment in India is outrunning evacuation infrastructure as transmission build-out and right-of-way disputes contribute to stranded capacity, while speculative capacity-holding is slowing project progression.[8]

1. Environmental and Energy Study Institute (EESI). Data Centers and Water Consumption (2025).
2. MSCI. When AI Meets Water Scarcity: Data Centers in a Thirsty World (2025).
3. Planet Keeper. Thirsty Giants: Data Centers' Water Crisis in Drought-Prone Aragon, Spain (2025).
4. EthicalGEO. The Cloud is Drying our Rivers: Water Usage of AI Data Centers (2025).
5. Lawrence Berkeley National Laboratory. Queued Up: Characteristics of Power Plants Seeking Transmission Interconnection (2025).
6. U.S. Department of Energy. Secretary Wright Acts to Unleash American Industry and Innovation with Newly Proposed Rules (2025).
7. IEA. Financing the ASEAN Power Grid (2026).
8. Institute for Energy Economics and Financial Analysis. Green power transmission development in India (2025).

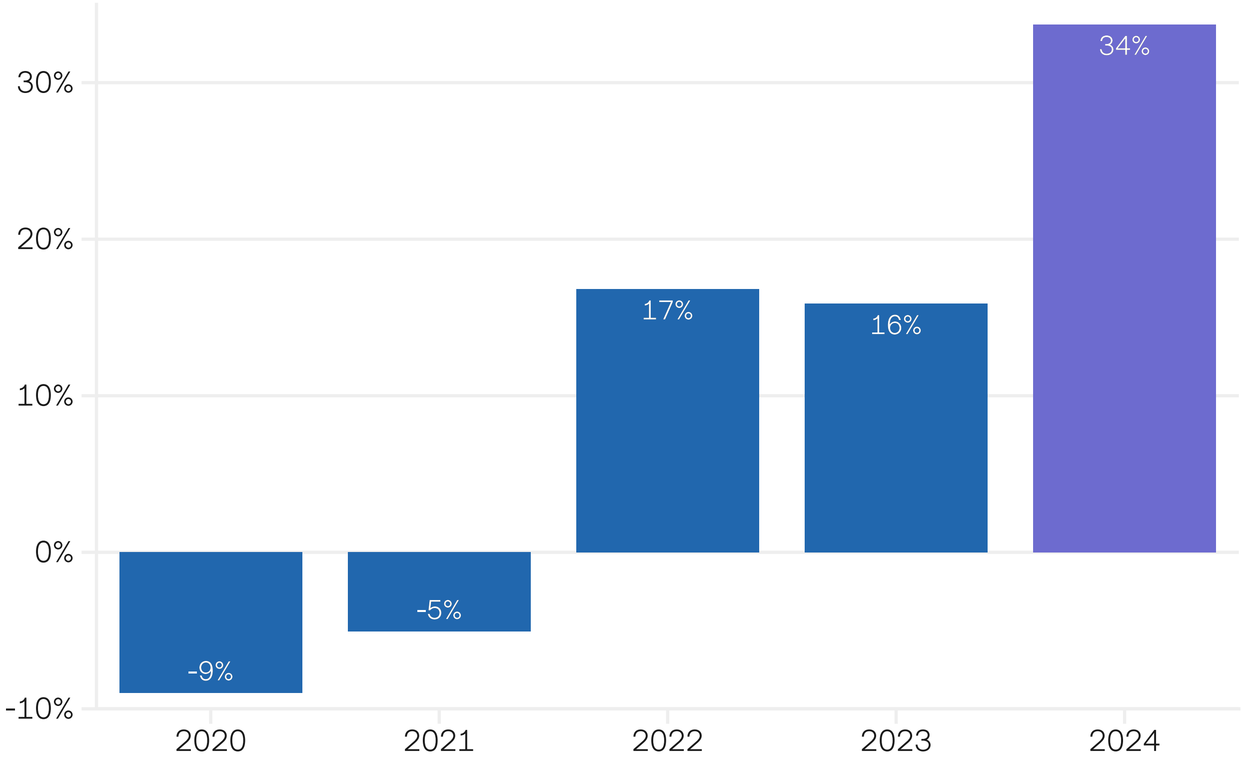
Behind the interconnection queue sits a second, more intractable constraint: industrial equipment scarcity. Transformers, cables, switchgear, and circuit breakers remain persistent bottlenecks. In the 2020s, lead times for large power transformers stretch to up to four years, prices have risen sharply (about 75 percent since 2019 in some cases), and production remains concentrated among a small number of suppliers.[9] Critical inputs such as grain-oriented electrical steel create single-point vulnerabilities exposed to lead time, allocation, quality, and geopolitical risk.[10]

These constraints are slow-moving. Even where new manufacturing capacity has been announced, much of it will not come online until late in the decade.[11] For grid-dependent assets targeting delivery in the late 2020s and beyond, relying on utility-led equipment procurement initiated at financial close is no longer sufficient. Projects increasingly require earlier visibility, funding, or control over the equipment tied to their grid connection. While utilities may retain ownership, the timing and financing risk increasingly sit with the projects that depend on the infrastructure.

In this environment, procurement becomes a strategic lever. Reserving capacity early – through advance commitments, co-investment, or pre-payment – can protect schedules, but it also pulls risk forward. Working capital exposure, storage and degradation risk, and liability shift upstream, particularly for high-value equipment that must be stored and handled under tightly controlled conditions.[12] Efforts to reduce delivery risk therefore reallocate risk into inventory, logistics, and governance at the front end.

Power transformer bottlenecks

Year-on-year growth in power transformer order backlog in selected manufacturing companies, 2020-2024



Source: IEA (2025a). Based on order backlogs of Hitachi Energy, Schneider Electric, Siemens Energy, GE Vernova.

9. IEA. Building the Future Transmission Grid (2025a).
10. National Infrastructure Advisory Council. Addressing the Critical Shortage of Power Transformers to Ensure Reliability of the U.S. Grid (2024).
11. Wood Mackenzie. Power transformers and distribution transformers will face supply deficits of 30% and 10% in 2025 (2025).
12. IEA (2025a); Aon. Building Bankable, Resilient Data Centers: From Site to Operation (2026a).

Demand outruns infrastructure – turning operators into developers

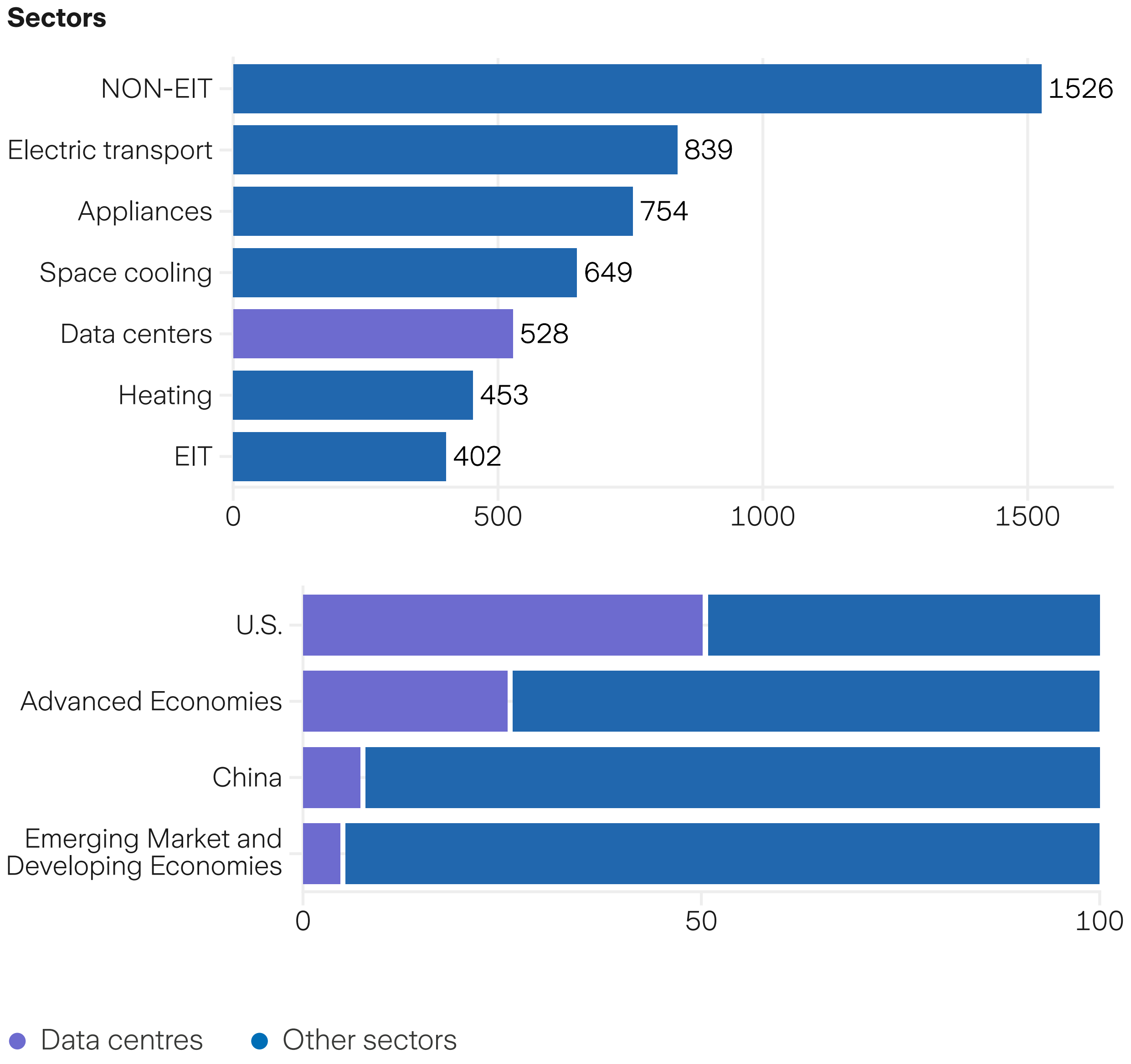
AI-driven demand will accelerate electricity and water consumption into grids already stressed by climate exposure, slow interconnection, and industrial scarcity.

The scale is significant, but the risk is not the global aggregate – it is the concentration. Even a tripling of electricity consumption from data centers by 2035 would account for less than 10 percent of total global electricity demand growth.[13] But geographically, concentration is extreme: 85 percent of new data center capacity additions over the next decade are expected in the U.S., China and the EU.[14]

As a result, local grid stress can be disproportionate, even when global totals appear manageable. In the U.S., data centers are expected to account for nearly half of electricity demand growth this decade, with domestic energy use projected to double or triple by 2028.[15] New builds also tend to cluster near existing hubs – regions already operating with limited headroom.[16]

Efficiency gains in AI-optimized chips and models will likely moderate energy intensity over time, but deployment lags and continued growth in compute demand mean system-level load will likely still rise through the next decade. A gradual shift towards a mix of hyperscale campuses and more distributed nodes may ease specific bottlenecks while introducing new points of exposure, redistributing permitting, grid connection and operational reliability challenges across a larger footprint.

Global growth in electricity demand, 2024-2030
in TWh and % of total



Source: IEA (2025b).
TWh = terawatt-hour; Heating = space and water heating in buildings; EIT = energy-intensive industry.

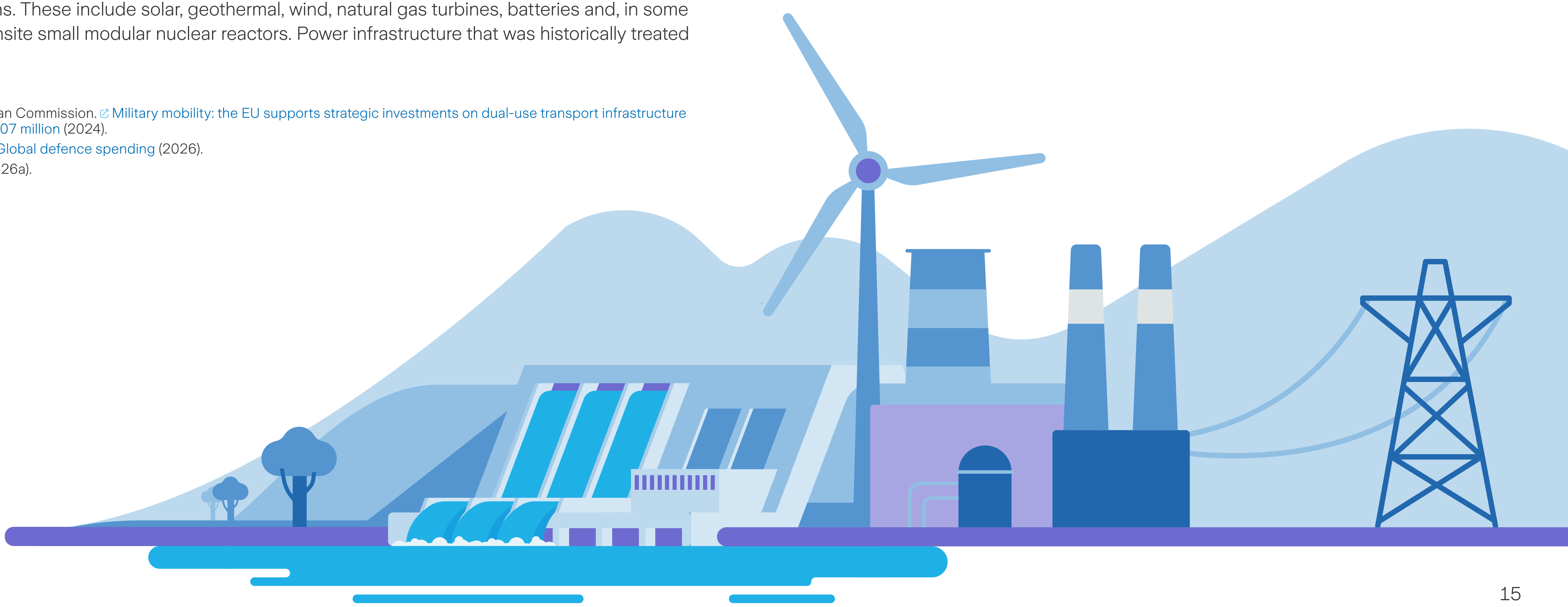
13. IEA. World Energy Outlook 2025 (2025b).
14. IEA (2025b).
15. IEA (2025b).
16. IEA (2025b).

Competition for the same enabling systems may further restrict available capacity in the medium term. Defense and security priorities draw on the same power, water, ports, logistics corridors, and specialized industrial capacity that civilian construction depends on – and the scale of global defense spending continues to rise (USD 2.6 trillion in 2025).[17] It should be noted however, that some of the most relevant investments are explicitly framed as dual-use, creating the possibility of shared uplift where assets also allow for civilian access.[18]

In response to these constraints, the largest operators are increasingly acting as infrastructure developers in their own right, co-investing in generation, storage, grid upgrades and water infrastructure, while deploying behind-the-meter, on-site energy solutions to secure operating conditions. These include solar, geothermal, wind, natural gas turbines, batteries and, in some cases, onsite small modular nuclear reactors. Power infrastructure that was historically treated as adjacent to the data centre is, in some developments, becoming operationally integrated with it. Redundancy, backup feeds, storage and alternative cooling strategies will directly affect bankability, insurability, uptime and lifecycle value.[19]

These strategies do not eliminate systemic risk; they relocate it. Dependency risk may be reduced, but capital cost, system complexity, and safety and commissioning burden increase, extending the scope of execution risk well beyond the project boundary. On-site generation, storage and cooling redundancy also raise the specialist skills and supervision required to commission and operate systems safely (see Workforce without Workers).

17. European Commission. Military mobility: the EU supports strategic investments on dual-use transport infrastructure with €807 million (2024).
18. IISS. Global defence spending (2026).
19. Aon (2026a).

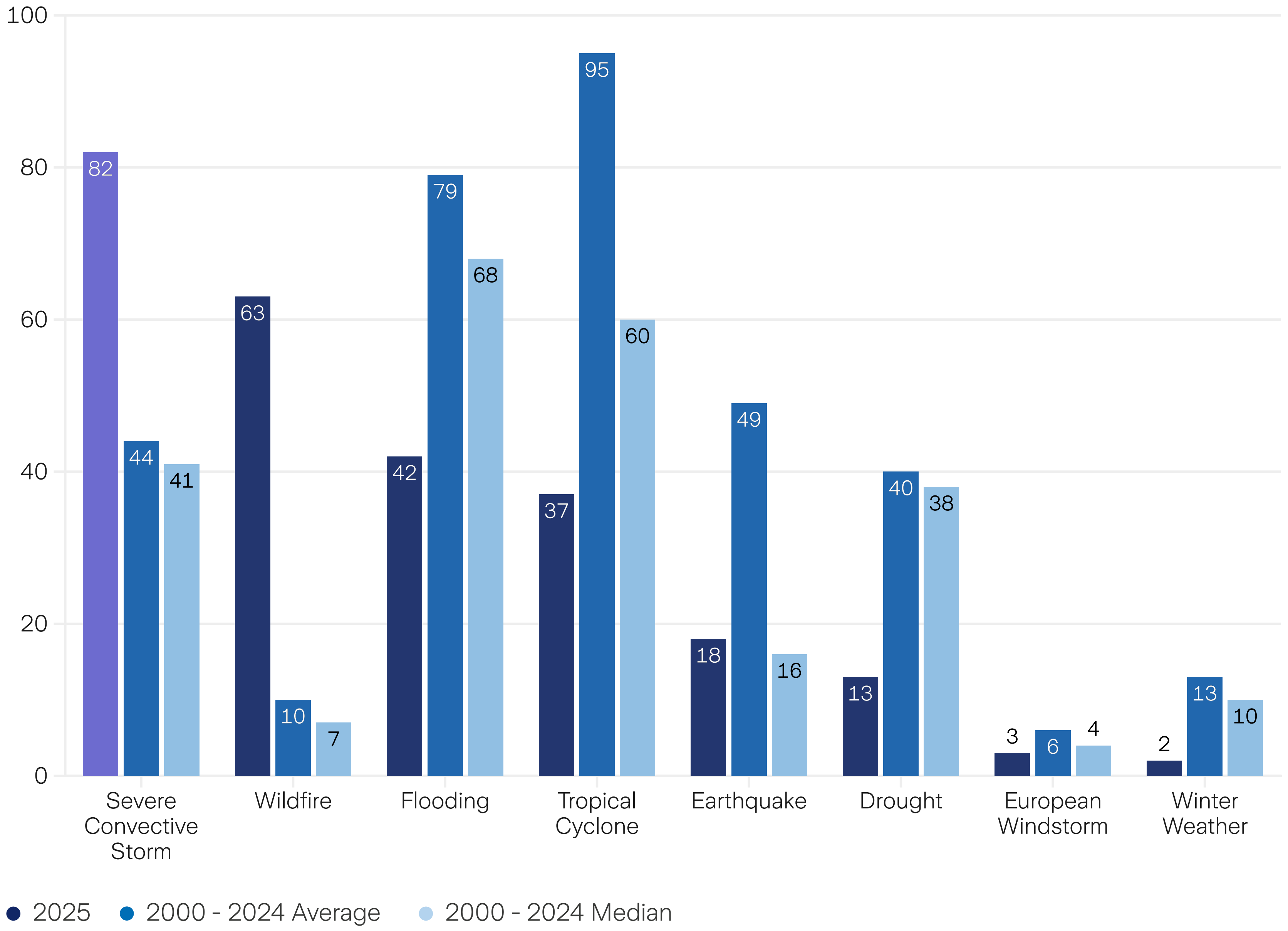


What changes in practice:
Resource-first construction

Over the next five years and beyond, a new siting logic emerges. Energy and water availability become primary determinants of site selection, with assessments of grid headroom, basin stress and delivery corridors taking precedence much earlier in planning cycles.

However, resource-first siting can also create feedback loops. Projects migrate towards available capacity, but may inherit new hazard profiles, emergency response limitations and insurance exposures that reshape design assumptions and schedule buffers.[20] For example, some data center developments are being sited in regions with high exposure to severe convective storms - a leading contributor to global natural catastrophe losses in recent years.[21]

Global economic losses by peril
USD bn, 2025



Source: Aon (2026b).

20. Ceres. Drained by Data: The Cumulative Impact of Data Centers on Regional Water Stress (2025); IEA (2025a); Aon (2026a).
21. Aon. Climate and Catastrophe Insight (2026b).

Spotlight

Terrestrial constraints define digital capacity

Pressure on terrestrial resources and systems is now severe enough to prompt exploration of options that would have seemed implausible a decade ago.

Small modular reactors (SMRs) provide firm, carbon-free power aligned with the needs of large data center campuses, and can be factory-built for co-location. Major technology companies have already committed significant capital, but deployment timelines stretch into the early 2030s, with material regulatory, fuel supply, and labor constraints (see Workforce without Workers).

A new class of ocean-based systems seeks to bypass terrestrial grid, land and cooling constraints entirely, by placing AI compute directly at sea – powered by wave energy, cooled by the surrounding ocean, and connected via satellite links.

Some are pushing beyond terrestrial and maritime limits through the exploration of orbital data centers. In low Earth orbit, solar power is continuous, and cooling can be achieved passively through radiation into space. For highly-specialized workloads – such as defense, remote sensing, or edge AI – this offers theoretical efficiency and resilience advantages. But the barriers are substantial: Launch costs remain high, radiation accelerates hardware degradation, latency limits most real-time use cases, and regulatory risks around debris and spectrum are unresolved.

When the world's most capital-rich companies turn to solutions of this kind, it signals a structural infrastructure gap – one that is reshaping how digital capacity will be delivered over the next decade.

Where the next opportunity lies: Constraints set the terms

In the age of AI, the real competitive edge is not just access to compute, but secure access to the grid, water, equipment, and approvals needed to make compute real.[22] The most resilient operating models recognize limits early, price them realistically, and design around them deliberately.

1. **Treat infrastructure as a key risk**
   Grids, water, permits and critical equipment cannot be assumed to be available when needed. These are not background conditions – they are gating risks that determine whether a project proceeds at all. Secure access early, assign clear ownership and escalate fast when timelines slip. Where dependencies sit outside your control – such as grid upgrades or long-lead equipment – align schedules and capital commitments to what is realistic, not what is planned.

2. **Pull feasibility risk forward**
   The biggest risks are often identified too late. By the time constraints become visible, capital is already deployed and options are limited. Assess grid capacity, water stress, climate exposure, permitting constraints and supplier risk upfront, before scaling investment. Move from static feasibility checks to dynamic scenario testing – using AI, geographic information systems (GIS) and telematics to understand how conditions shift under real demand, climate and policy stress. Done well, this prevents late-stage redesign, stranded capital and avoidable commissioning risk.

3. **Manage shared dependencies as portfolio risk**
   Manage shared systems – substations, transformers, interconnection corridors, water basins, supplier networks – as portfolio-level exposures, not isolated issues. When one shared dependency fails – for example, a transformer backlog or delayed grid upgrade – several projects can slip simultaneously. Stress-test for correlated disruption and track where dependencies overlap. Monitor insurability alongside cost and schedule – tightening terms are often an early signal of systemic weakness.

22. Ceres (2025); IEA (2025a).

Workforce without workers:
Automation as a survival strategy

Construction is not only facing a labor shortage, but a capability shortage. Aging workforces, tighter migration regimes in certain markets, and rising technical complexity are shrinking the pool of people able to deliver complex infrastructure, even as demand rises sharply in power, transport, and digital assets.

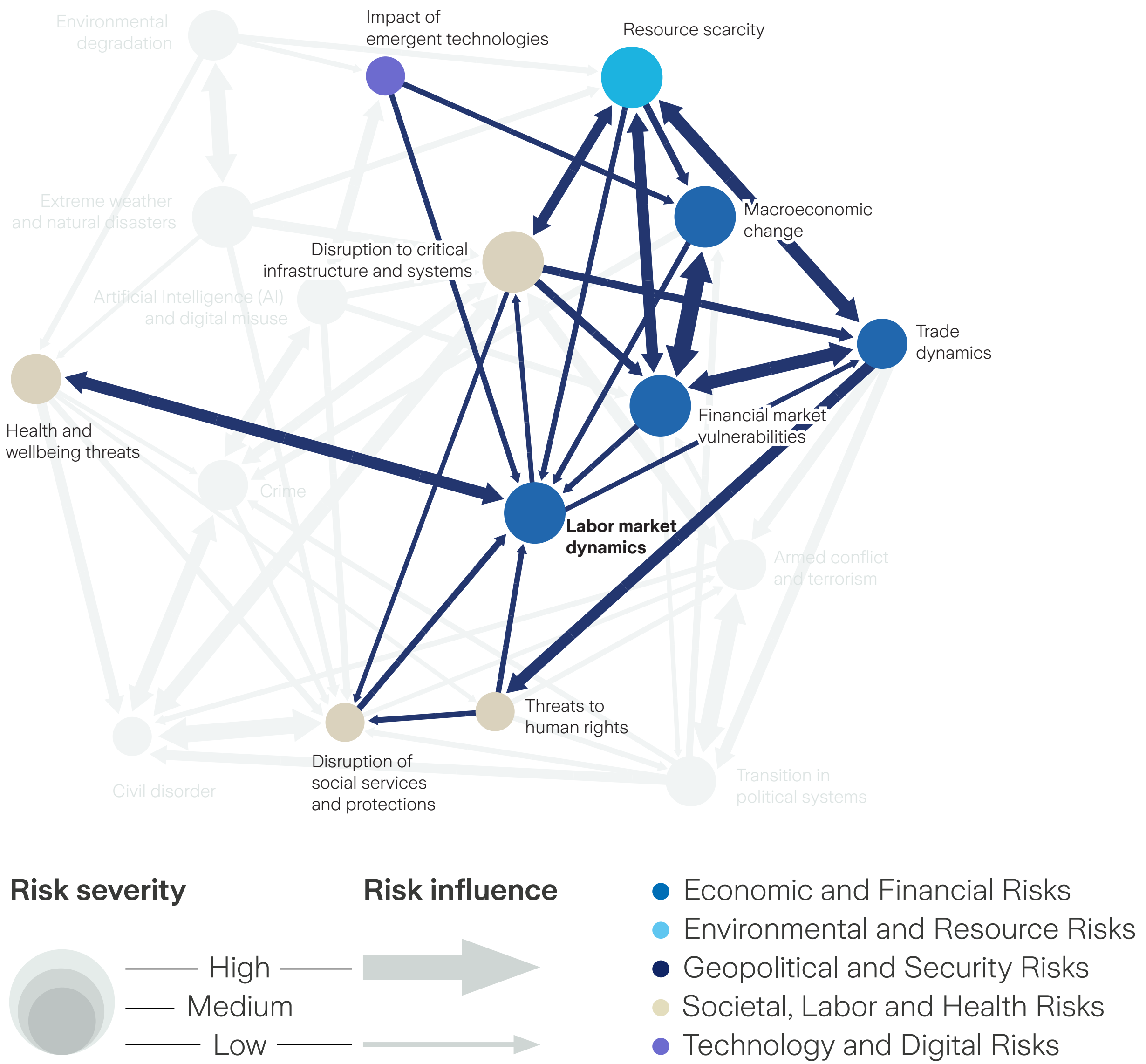
Workforce risk is often reduced to a recruitment challenge, when the deeper risk is whether experience, supervision and specialist capability can be assembled and coordinated reliably across fragmented delivery models. Delivery is rarely executed by a single firm with a stable, in-house workforce. Instead, it operates through multi-tier subcontracting networks, where capability and supervision are distributed across contractors and specialist trades. In that model, deliverability hinges on timing and coordination – bringing scarce expertise together at the right moment, particularly when multiple projects compete for the same narrow skills.

What distinguishes the 2030s will be the way that workforce pressures reinforce one another across labor availability, capability, and automation. Demographic aging and constrained mobility are reducing the stock of experienced workers. At the same time, automation and prefabrication – partially adopted in response to labor scarcity – will concentrate responsibility into fewer, higher consequence roles. As construction becomes more integrated and digitally sequenced, the risk of delay or failure becomes concentrated in a small number of roles where judgement and supervision have few viable substitutes.

The result is a reduction in deliverable capacity: Without sufficient labor, projects cannot be executed safely or at scale.

Workforce without workers

Risk network of labor market dynamics



Labor constrains scale – and accelerates automated productivity

Labor availability limits how quickly the sector can scale. In the U.S, the construction sector already faces labor shortages large enough to affect delivery economics, with an estimated need for 349,000 net new workers this year to keep pace with demand.[23] Similar – and in some cases, more acute – shortages are evident elsewhere: Southeast Asia needs 1.5 million additional skilled workers, while Australia expects a shortfall of more than 300,000 workers by 2027.[24]

Two converging dynamics sit behind this. First, an aging workforce is exiting faster than new entrants can be attracted, trained and absorbed. In the U.S., around two in five construction workers employed around 2020 are expected to retire by 2031.[25] In Europe, aging is widening labor shortages across sectors and migration alone cannot reverse the trend.[26]

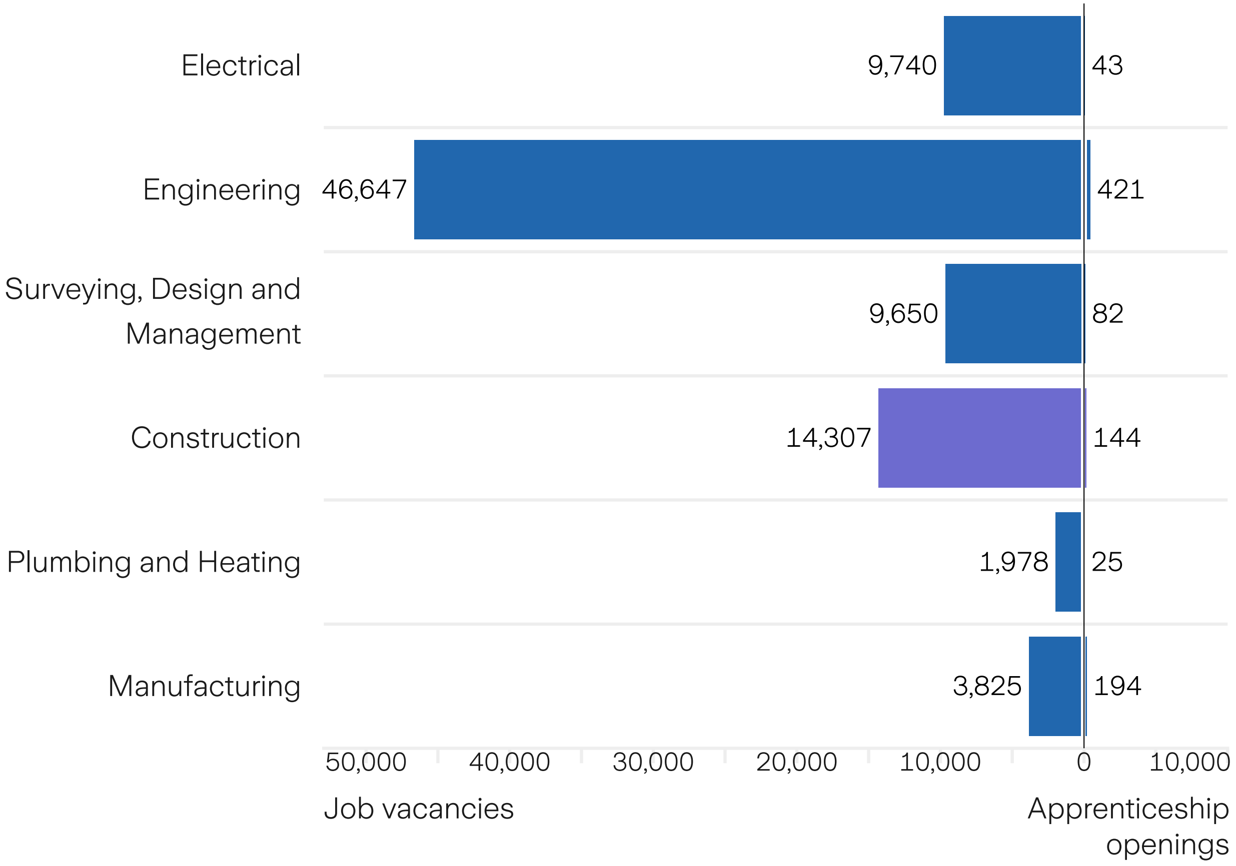
Second, this is not simply a shortage of workers, but a labor mismatch. Under-utilized labor exists in many economies, yet construction struggles to attract that availability because training capacity, credential pathways and completion rates do not scale with demand.

Across advanced economies, apprenticeship or equivalent training systems are projected to deliver only a fraction of the skilled workers required, even before accounting for non-completion or attrition. The number of vacancies in key trades in the UK so far exceeds the training pipeline that more than 100 jobs are competing for each apprenticeship place.[27]

These dynamics collide with a long-running productivity problem. The divergence between construction and the wider economy is striking: While aggregate labor productivity in the U.S. roughly tripled between 1970 and 2020, a construction worker in 2020 produced less value than a construction worker 50 years earlier.[28] In the UK, construction productivity has lagged the broader economy over the past two decades, while similar patterns hold across major European markets.[29]

Apprenticeship deficit

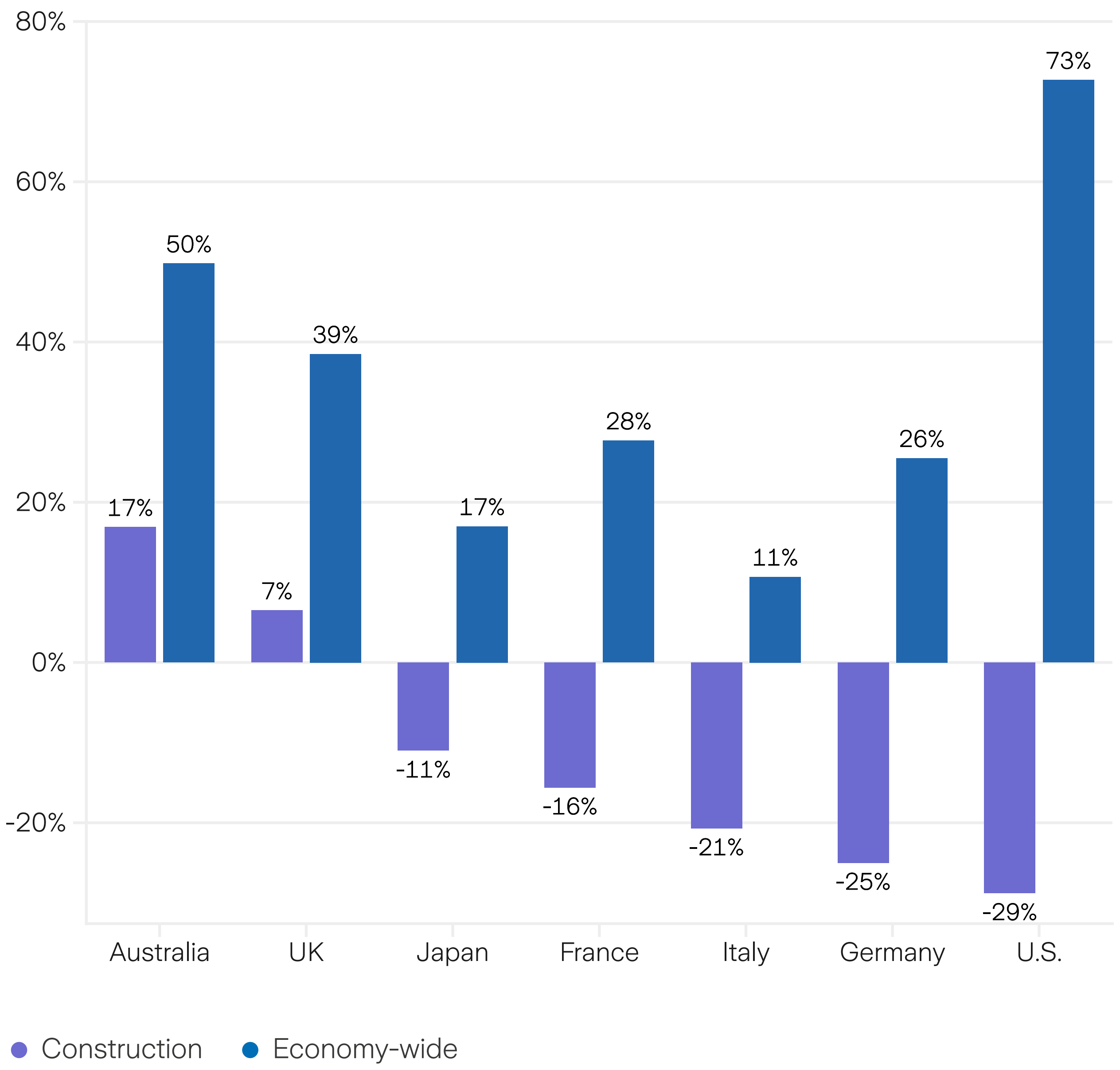
Job vacancies and apprenticeship openings, by trade, UK



Source: Dart (2026).

23. Associated Builders and Contractors. Construction Industry Must Attract 349,000 Workers in 2026 Despite Macroeconomic Headwinds (2026).
24. PlanRadar. 10 ASEAN construction industry trends and challenges to watch in 2025 (2024); Asian Insiders. Asia's Construction Industry 2025: Building for Tomorrow (2025); Diggerman Training. Australia's Construction Worker Shortage Just Got Bigger (2025).
25. McKinsey & Company. Delivering on construction productivity is no longer optional (2024).
26. OECD. OECD Employment Outlook 2025 (2025); European Parliament. Demographic Changes and Labour Migration Within the EU (2025).
27. DART. The UK Skills Crisis: The State of Apprenticeships in 2025 (2026).
28 Chicago Booth Review. U.S. Construction Has a Productivity Problem (2023).
29. Gitnux. Construction Productivity Statistics (2026).

A productivity problem
Change in labor productivity by country (1991-2024)



Source: Goldman Sachs. Why Has Productivity in the US Construction Industry Stagnated? (2026).

When labor tightens, productivity falls further. During past demand surges – such as the shale oil construction boom in the U.S. between 2011 and 2014 – project productivity dropped sharply under labor scarcity (around 40 percent per year), forcing owners to extend timelines by 20–25 percent and driving labor costs to double pre-pandemic levels in some markets.[30] Shortages raise costs, but they also reduce the sector's ability to convert labor hours into output.

Why has technology-driven productivity been so slow to diffuse? A structural feature of the market is fragmentation: thin margins, dispersed subcontracting, and limited incentives for sustained investment in R&D, standardization and process redesign. Where technology investment does occur, it is concentrated among the largest contractors, widening performance gaps rather than lifting sector-wide productivity.

But under tighter labor conditions, automation is becoming unavoidable, to reduce reliance on scarce labor, standardize workflows, and lower some physical barriers to participation. Near-term gains are likely to come from prefabrication, digital coordination, robotics-assisted tasks, and equipment that shifts work from brute-force execution toward supervised production.

As tasks become more standardized, role design can become more 'modular', with work broken into repeatable packages and clearer interfaces between trades – supporting faster training and clearer supervision across subcontractors. And as tasks become less physically punishing, this also creates real opportunity to broaden participation. Women represent 11 percent of the U.S. construction workforce – the highest share in two decades but still the lowest of any major industry – and just four percent of those working directly in the trades.[31] Lowering physical barriers for women, older workers, and other underrepresented groups can help expand the labor pool, but the constraint then shifts towards training capacity, supervision quality, and retention, rather than headcount alone.[32]

30. Federal Reserve Bank of Dallas. GDP gain realized in shale boom's first 10 years (2019).
31. NAHB. Women Represent Highest Share of Construction Industry Personnel in 20 Years (2025); IWPR. Numbers Matter: Women Working in Construction (2024).
32. The Planet Group. Nuclear Energy Jobs Report (2025); European Commission. Robots for gender balance: helping women conquer the construction sector (2023).

Automation concentrates risk – but rewards capability

The more acute constraint will become capability, not headcount: the availability of high-consequence people whose judgement turns labor hours into reliable delivery.

As experienced tradespeople retire, the industry loses tacit knowledge that is hard to codify: how to sequence work on congested sites, anticipate failure points, and coordinate multiple disciplines under time pressure.[33] Even where headcount appears adequate, the loss of this experience has a measurable operational impact. Delays reflect deficits in judgment, supervision and specialist depth, rather than simple shortages of workers.[34]

As automation spreads, the consequences of knowledge loss increase. Even when physical construction is modularized, labor requirements do not disappear. Fewer people become responsible for more tightly coupled systems, increasing the impact of judgement gaps precisely as experience thins. Failure risk moves into integration, supervision and commissioning – stages where delays and errors are harder to absorb or recover from.[35]

33. ASCE. Supervisors' Reliance on Tacit Knowledge and Barriers to Knowledge Sharing in the Electrical Contracting Industry (2021); Atlantis Press. Tacit Knowledge Acquisition and Codification in Construction Industry (2021).
34. Fortune. TSMC complains it can't find enough skilled workers to get its Arizona chip plants ready in time, delaying mass production to 2025 (2023); ABC. Navigating the Construction Worker Shortage in 2025 (2025); CMIC. The Impact of Skilled Labor Shortages on Productivity in Construction (2025).
35. Bain & Company. Labor 2030: The Collision of Demographics, Automation and Inequality (2018); Knowledge Relay. How Nuclear Operators Can Overcome Skilled Labor Shortages in 2025 (2025).

Jobs with the largest and fastest growth

2025 – 2030

Rank	Largest growing jobs	Rank	Fastest growing jobs
1	Farmworkers, labourers and other agricultural workers	1	Big data specialists ●
2	Light truck or delivery services drivers	2	FinTech engineers
3	Software and applications developers	3	AI and machine learning specialists ●
4	Building framers, finishers and related trades workers ●	4	Software and applications developers
5	Shop salespersons	5	Security management specialists
6	Food processing and related trades workers	6	Data warehousing specialists
7	Car, van and motorcycle drivers	7	Autonomous and electric vehicle specialists ●
8	Nursing professionals	8	UI and UX designers
9	Food and beverage serving workers	9	Light truck or delivery services drivers
10	General and operations managers ●	10	Internet of things specialists ●
11	Social work and counselling professionals	11	Data analysts and scientists ●
12	Project managers ●	12	Environmental engineers ●
13	University and higher education teachers	13	Information security analysts
14	Secondary education teachers	14	DevOps engineers
15	Personal care aides	15	Renewable energy engineers ●

● Construction-relevant

Source: WEF. Future of Jobs Report 2025 (2025).

Automation reshapes the workforce by shifting demand toward fewer, highly specialised skills, increasing reliance on scarce capabilities. The expansion of prefabrication, digital coordination, and systems integration will replace manual bottlenecks with greater dependence on commissioning, specialist maintenance, and software mediated coordination. The skill floor rises: Workers require fluency with digital models, coordination software, and data-rich workflows, especially on large, complex infrastructure projects.

Competition for these capabilities will also intensify, both within and outside the industry. The same digital and controls skills are in demand across adjacent sectors, including manufacturing, energy systems, and industrial technology. For example, production start-up of a major U.S. semiconductor manufacturing project was delayed after skilled-labor shortages emerged, despite full financing and political backing – showing how a single capability gap can push a multi-billion-dollar project off schedule.[36]

Within construction itself, the fastest-growing project types – high power, high integration assets (see Gridlocked Intelligence) – will resurface "old" technologies as modern bottlenecks, raising demand for high-voltage commissioning, regulated energy governance roles, and niche engineering capabilities. The same scarce trades and technical managers are needed to build substations, install backup systems, integrate cooling, and bring live facilities into service – becoming constraints across multiple project types at once.

Spotlight

Nuclear power limited by safety-critical scarcity

A renewed nuclear and small modular reactor (SMR) agenda sharpens the scarcity of certified, safety-critical capability.[37]

Nuclear projects often compete directly with data centers, grid upgrades, hydrogen and carbon-capture developments for the same scarce blend of engineering, commissioning, and safety-culture competence.

Labor shortages are already cited as a leading contributor to nuclear project delays.[38] In the U.S., nearly 40 percent of the current nuclear energy workforce is expected to retire within the next decade,[39] with a materially thinner pipeline of younger workers compared to the overall energy workforce.[40] In the UK, a long contraction in the nuclear fleet has created a generation-wide capability gap. Engineers who built earlier plants are retiring, taking decades of institutional knowledge with them. Skills strategies now target roughly 40,000 new jobs by 2030 – which would require hiring at more than double the current rate – while suitably qualified and experienced person (SQEP) requirements and security clearance pathways can take six months or more, lengthening mobilization timelines.[41]

SMRs are even further constrained, with factory-built modules requiring new qualifications and working practices that do not yet exist at scale.

36. Fortune (2023).
37. Innovate UK. Design, Manufacture and Construction of Nuclear Small Modular Reactors (SMR) to Deliver 24GWe of Nuclear Power by 2050 for the UK (2025).
38. World Nuclear Industry Status Report (WNISR). Worker shortage barrier to nuclear ambitions (2024).
39. Amerit Consulting. Atomic Workforce Shortage Delaying Nuclear Energy Projects (2024).
40. U.S. Department of Energy. 5 Workforce Trends in Nuclear Energy | Department of Energy (2024).
41. Mactech. Why the UK's Nuclear Skills Crisis Goes Deeper Than You Think (Accessed 2026).

Spotlight

Analog decision-making in a digital age

Digital models – through Building Information Modeling (BIM) and digital twins – are increasingly effective at identifying design clashes, sequencing risks, and operational vulnerabilities long before they materialize on site.[42]

But a quieter risk is emerging at handover. Many assets are delivered as 'digitally complete' but operationally unsupported. Weak data continuity at handover, limited digital maturity among owners and operators, and insufficient skills to interrogate models mean that sophisticated tools degrade into static records, rather than remaining as living decision systems.[43]

Warnings embedded in models – abnormal equipment behavior or deviations from intended performance – are missed when operators revert to analog decision-making based on experience, spreadsheets, or manual inspection. Poor-quality digital information also complicates defect attribution and delays maintenance responses.[44]

The implications extend beyond operations. Digital models increasingly shape how liability is allocated when failures occur, yet contracts and insurance frameworks often lag digital practice. Where model governance and reliance cannot be demonstrated, disputes become harder to resolve and coverage gaps may emerge.[45]

As digital insight accelerates, organizational readiness – not model capability – could become the limiting factor for performance and insurability.

What changes in practice: Regional labor geographies

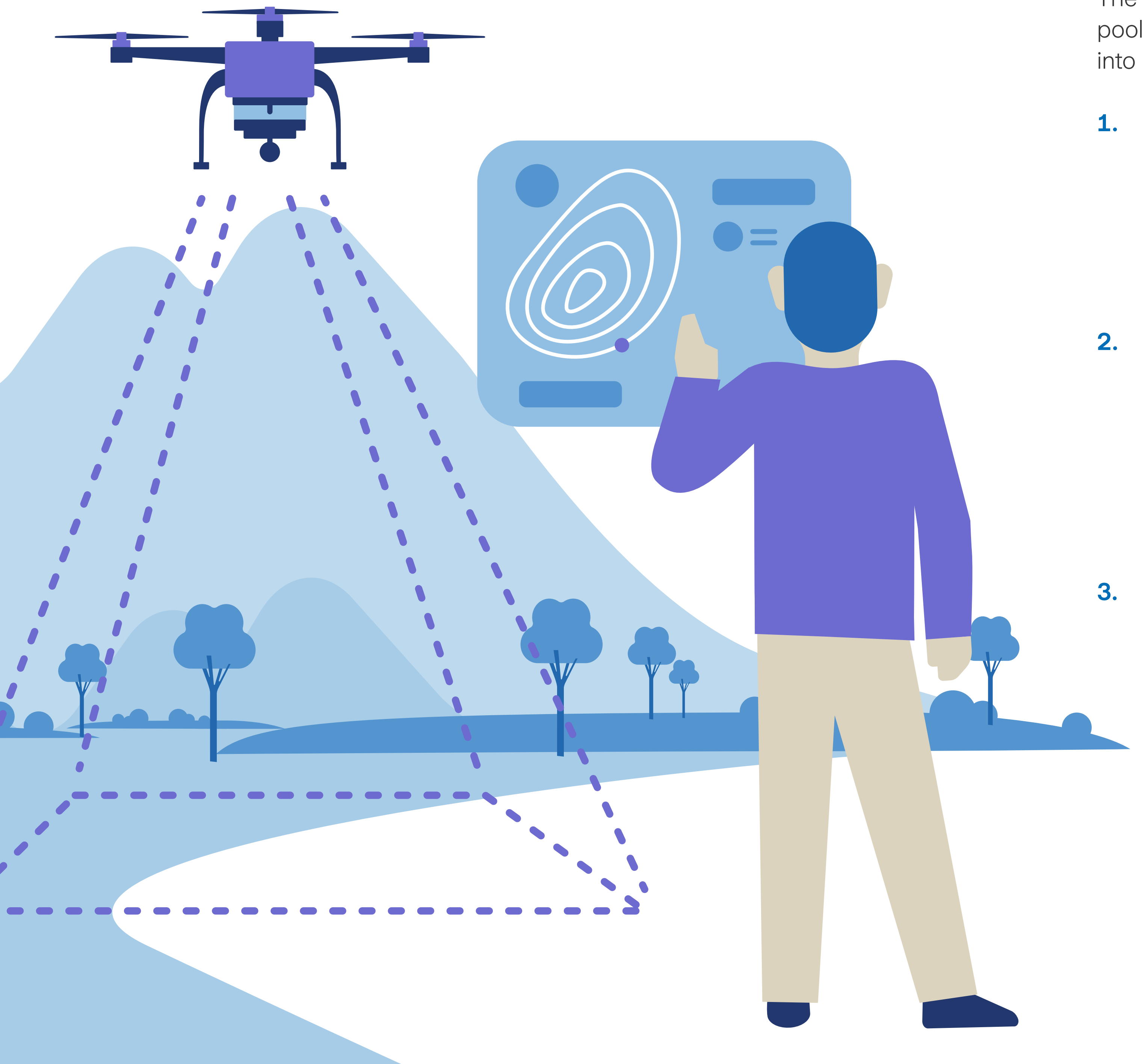
Workforce constraints ultimately surface in where and how projects are delivered. Acute shortages push owners to site projects in regions with existing industrial skills, logistics capacity, and lower community resistance – often former mining or manufacturing hubs with legacy labor ecosystems.

This does not imply a simple revival of local workforces. Site decisions taken by asset owners determine the labor pool available to projects; construction firms then bear the mobilization and retention challenges across the subcontractor ecosystem. Where housing, healthcare, transport, and childcare infrastructure cannot scale with inflows of workers, any labor advantage remains fragile. High churn, absenteeism and retention challenges can quickly erode delivery performance.

And even in highly-automated environments, delivery remains dependent on people. Fatigue, extended travel, remote work, and time-critical commissioning increase the risk of oversight failure and error – particularly on complex, tightly sequenced sites. The growing tendency for grid-dependent assets to locate outside major metropolitan centers adds a further constraint: The supporting ecosystem required to sustain safe and effective work – medical response, safe accommodation, transport resilience – can lag project timelines.

Site decisions then lock in delivery risk. Locations anchored for power, land or permitting reasons then shape the labor ecosystems that projects must draw on, while accommodation planning, local training capacity, and social infrastructure all influence whether labor supply can be converted into usable delivery capacity. Where social license weakens due to pressure on local services, permitting and political risk can re-emerge as constraints in their own right (see Gridlocked Intelligence). But for some communities, this dynamic also creates a narrow opportunity to revive dormant labor pools and rebuild vocational pipelines – if training, housing and services can scale alongside project demand.

42. Royal Institution of Chartered Surveyors (RICS). Digital twins from design to handover of constructed assets (2022); CMAA. How Digital Twins Benefit Contractors and Owners (Accessed 2026).
43. MDPI. Digital Twins Across the Asset Lifecycle: Technical, Organisational, Economic, and Regulatory Challenges (2026).
44. The University of British Columbia. Digital Handover (Accessed 2026).
45. Steven J. O'Neill. Building Information Modeling and Professional Liability: Who Owns the Risk When Digital Models Fail? (2025); Huntersure. Navigating the Impact of BIM on Professional Liability Insurance for Architects and Engineers (2025).



Where the next opportunity lies: Capability defines reliability

The firms that lead in the next phase of construction will likely not be those with the largest labor pools, but those that can convert scarce labor into repeatable capability, and scarce capability into reliable delivery.

1. **Treat labor as a key delivery risk**
   Treat workforce as a constraint on delivery, not a flexible cost. In critical roles –commissioning, quality assurance, safety, high voltage and controls – availability determines whether projects complete on time. Assess labor exposure at the portfolio level and secure these roles earlier than traditional staffing cycles allow. Where delivery depends on market availability, risk is already elevated.

2. **Use automation as a risk trade-off**
   Frame automation as a substitution of risk, not simply a source of productivity. Target investment in prefabrication, digital coordination and robotics where it reduces dependence on scarce labor, without introducing new integration or commissioning vulnerabilities. These choices reshape the risk profile: headcount reduces, but reliance on fewer, higher-consequence roles increases. This needs to be reflected in governance, role design and training pathways from the outset. Without that, risk is redistributed rather than reduced.

3. **Treat site selection as a workforce decision risk**
   Once location is fixed, so are constraints on skills, availability and operating conditions. Where delivery relies on remote rotations or imported labour, fatigue, wellbeing and retention become operational risk factors that directly affect safety, quality and commissioning. Making these exposures explicit early allows them to be managed. Left unaddressed, they tend to materialize later as incident risk, rework, delays and insurance friction.

Standardized future:
Scaling before durability is proven

Owners are changing what they build, at the same time as contractors industrialize how they build it.

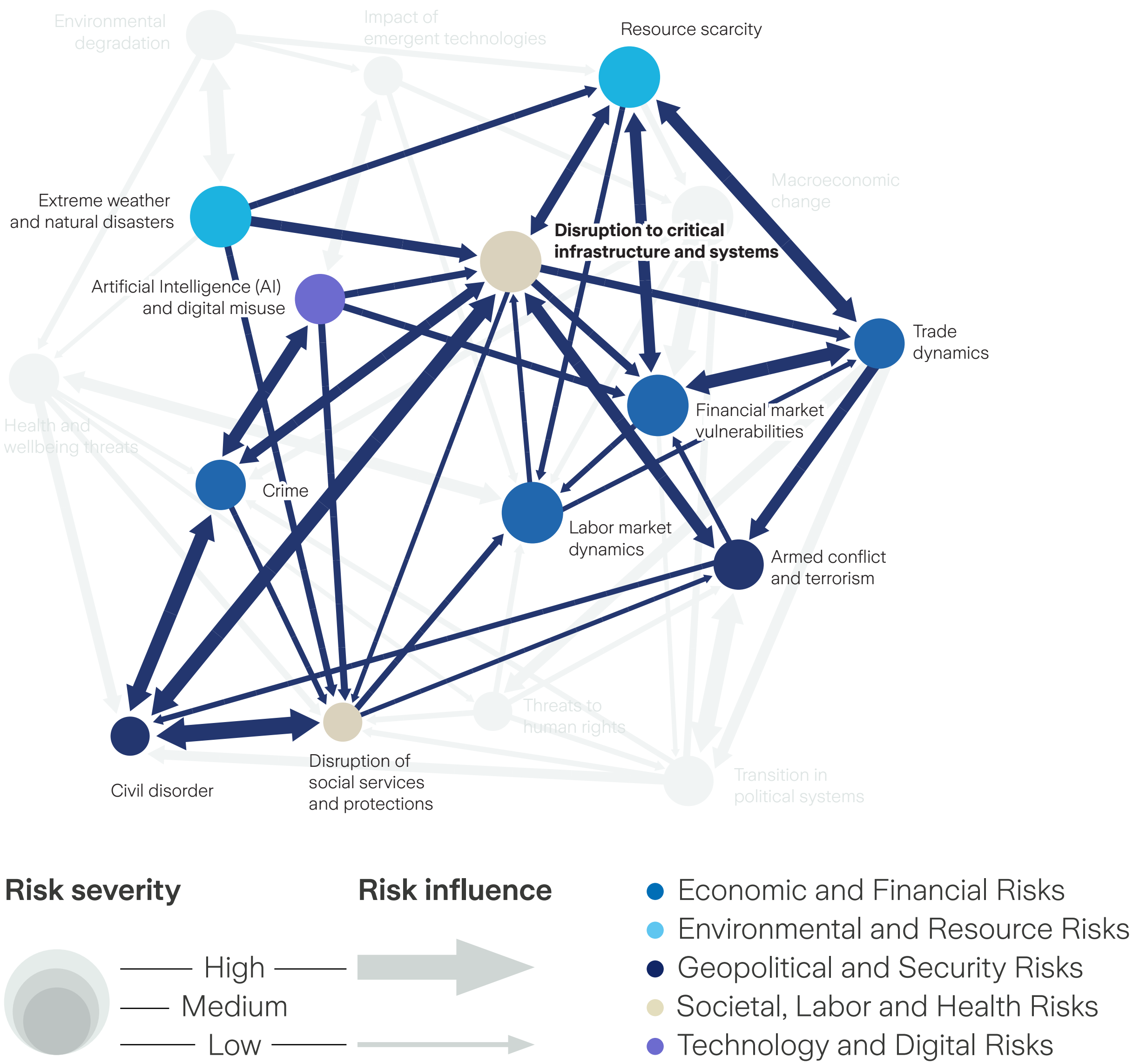
The same systems and assemblies are often expected to serve both resilience and efficiency gains at once. Circular design approaches, new materials, retrofit strategies, renewable systems, and off-site methods are being adopted to cut emissions and adapt assets to more demanding operating conditions. In parallel, designs, components, and delivery models are being standardized and repeated to shorten timelines, control costs and manage labor scarcity.

What distinguishes the 2030s is the mismatch between the speed of replication and the speed of learning. Materials, assemblies and systems are being rolled out across portfolios before there is sufficient evidence on how they age, interact and fail under heat, moisture, cyber disruption and extended use. Performance at completion is relied on in place of long-term performance data under future environmental and operating conditions.

Early design and delivery choices are expected to shape long-term liability, maintainability and recoverability across entire portfolios. Whether today's standards become resilient norms or systemic defects depends on how quickly evidence, learning and governance keep up with scale.

Standardized future

Risk network of impact of the disruption to critical infrastructure



Replication outpaces learning – making scale the risk

Standardization is often treated as a risk reducer, and under controlled conditions it can be. Repeatable designs, platform delivery, factory production and digital coordination typically improve quality, speed and predictability when standards are mature and governance is tight.

But the pace and reach of standardization is accelerating (see Workforce without Workers). Construction is industrializing delivery more quickly, across more projects, and with fewer buffers for learning between deployments. Designs move from concept to repetition at portfolio scale, before their behavior has been tested across varied sites, operating conditions and delivery sequences. This pattern is increasingly visible in commercial fit-out programs, housing retrofits, logistics portfolios and institutional estates.

Adoption rates underline this shift. Modular construction increased sharply between 2023 and 2024, from around 32 percent to roughly 50 percent adoption, while prefabrication rose from approximately 53 percent to over 66 percent.[46] Replication is proceeding faster than long-term performance evidence can be established - particularly on how systems behave at the interfaces between factory manufacture and on-site assembly, where small design or execution gaps are most likely to surface.

As construction systems are simplified to accelerate delivery and reduce labor dependence, quality assurance becomes harder to maintain. Fewer people, tighter margins and faster cycles reduce the time and redundancy required to detect small defects before they scale.

The risk is amplification. The same design decision, component detail or interface condition can be carried into dozens or hundreds of assets before its limitations are fully understood. This is not new: For example, in the early 2000s, a common sealing flaw in standardized dry fire sprinkler heads triggered large-scale recalls and retrofits across hospitals, warehouses, schools and residential buildings, years after installation.[47] What has changed is speed and scale. Standard details, proprietary components and shared procurement allow limitations to rapidly travel with the design rather than remain isolated to one site. Once that happens, the standard itself becomes the vector through which risk multiplies.

Resilience reshapes design – and what can be scaled safely

Scaling speed matters – but so does what is being scaled.

Environmental sustainability and climate adaptation are now central design considerations. Assets are increasingly expected to operate reliably under conditions that are less stable, less predictable, and more variable than those assumed when many design standards were established.

This will change which systems and assemblies are standardized and replicated. Layered façades, hybrid structures, integrated energy systems, storage and complex retrofit solutions behave differently from traditional construction under heat, moisture and prolonged stress, particularly where climate conditions diverge from historic assumptions. Their performance depends more strongly on interfaces, sequencing and environmental control, leaving less room for variation in design, installation and operation.

Variability that can be absorbed in a one-off project becomes exposure at program level when the same system is deployed across climates, usage patterns and maintenance regimes that differ more than most test regimes assume.

That tension is already visible in resilience-led construction choices. Retrofit strategies have been shown to reduce emissions by 50–75 percent compared with rebuild in certain scenarios,[48] but the addition of integrated technologies such as solar installations and batteries also introduce new fire, water and access risks.

Similarly, mass timber can reduce the carbon footprint of a large structure by up to 40 percent when sustainably sourced,[49] but long-term performance depends on how factors such as fire behavior, moisture management, protection during construction, and inspectability are managed over time and across different operating conditions. In each case, performance at commissioning provides only partial insight into performance over decades.

46. BuiltWorlds. 3 Key Takeaways from BuiltWorlds' 2024 Offsite Construction Report (2024).
47. EMC Insurance Companies. Previously recalled sprinklers with O-ring seals: What you need to know (Accessed 2026); National Fire Sprinkler Association. A Quick Peek Above: Making Sense of Sprinkler Recalls (2025).
48. Zurich. Greener buildings: Early engagement is key for managing renovation risks (2025).
49. Zurich. Mass timber: Insuring the future of sustainable construction (2026).

Spotlight

The repairability gap

After a loss, recovery depends on whether systems can be accessed, repaired and returned to service efficiently.

Repairability is a design choice that shapes long-tail liability once systems are repeated across portfolios. A product may perform well in a lab and meet code on completion, yet still prove a poor operational choice if it is difficult to inspect, open up, dry out, replace or recertify without extensive disruption.

Many modern construction systems lack proven repair pathways, even when they perform well in testing or pilot deployments – an issue that becomes more acute as construction relies more on proprietary components, tightly integrated assemblies and specialist low-carbon materials, where access, disassembly and reinstatement are not always straightforward once in service.

This is already visible across residential and commercial projects, where repeated façade, balcony or insulation systems meet performance targets at completion, but prove costly to access, dry or reinstate after moisture ingress or partial failure. As these systems repeat across portfolios, repairability shifts from a project-level inconvenience to a balance sheet characteristic.

Where repairability has not been designed in, losses escalate through downtime, secondary damage and repeated intervention. At scale, this shifts repairability from a project concern to a portfolio exposure, as the same reinstatement difficulty repeats across multiple assets built to the same standard.

Codes and standards – the floor of acceptable design – are scrambling to adjust to evolving climate risk and revised designs. While updates increasingly reflect improved hazard data,[50] code compliance alone does not assure long-term asset performance – a gap that matters more when new systems are deployed at speed.

Building for sustainable resilience will therefore reshape the risk profile of replication. Durability, access and reinstatement will become first order design considerations when systems with narrower tolerances, tighter interfaces and more complex maintenance needs are scaled quickly. Where innovation advances ahead of disciplined risk assessment and clear criteria for inspection, repairability, and replacement, efficiency and sustainability gains will be undermined by avoidable resilience gaps.

50. The 2024 update to the International Building Code incorporated ASCE 7-22 tornado-load requirements and revised wind, earthquake, snow, and rainfall load provisions using updated environmental hazard datasets including 25 years of additional snow load data.

What changes in practice: Digital dependence

Once construction operates through repeated designs, shared suppliers and common digital platforms, control and coordination increasingly sit in the digital layer – and resilience can no longer be managed at the level of a single project or contractor.

Construction delivery is increasingly dependent on shared digital infrastructure (see Workforce without workers). BIM models, connected equipment, common design libraries, digital twins and supplier platforms create efficiency and coordination at scale. But they also create correlated failure points: When data is corrupted, access credentials are compromised or third party systems go offline, disruption cascades across projects that rely on the same digital backbone.

Cyber risk now directly affects delivery, liability, and continuity. Digital disruption can halt work, invalidate designs, interrupt procurement and trigger rework simultaneously across multiple sites. Attackers target the industry precisely because access to project files, operational systems or shared supplier data offers leverage over time-critical delivery.

As a result, construction is one of the most heavily targeted industries by cyber criminals globally.[51] Nearly four in five architecture, engineering and construction firms have experienced a cyber security threat in the past two years, while the sector now faces an average of around 226 cyber incidents per company each year.[52] High-growth construction markets in Asia and Latin America, where subcontracting chains are more fragmented and digital governance less mature, are particularly exposed.

Globally, only 1 percent of economic losses from cyber incidents are insured, with an estimated cyber risk protection gap of USD 0.9 trillion.[53] For construction, this means many of the consequences of ransomware, data loss, or supplier compromise still sit outside traditional transfer mechanisms, leaving owners and contractors to absorb delay, remediation, and dispute costs directly.

41%

year-on-year increase in construction organizations appearing on data-leak sites, driven by an 83% surge in credential-exposure incidents.[52]

51. Corvus. Q3 Cyber Threat Report: The Ransomware Ecosystem is Increasingly Distributed (2024); Industrial Cyber. Honeywell Community Intelligence reveals ransomware surge in manufacturing, healthcare; rising attacks in agriculture and food sectors (2025).
52. ReliaQuest. Report Shows Ransomware Has Grown 41% for Construction Industry (2024).
53. Global Federation of Insurance Associations. Global protection gaps and recommendations for bridging them (2023).

Where the next opportunity lies: Learning governs scale

The main risk is not that one project fails, but that the same failure is multiplied across many assets, many geographies, and many counterparties.

The most mature owners and contractors are responding by shifting attention towards the portfolio effects created by repetition, interdependence and digital reliance. Advantage will sit not with the firms that can copy fastest, but those that copy safely – learning quickly enough to prevent new standards from becoming standardized failures.

1. **Treat standardization as a portfolio risk**
   Standardization accelerates delivery – but it also scales failure. Assess replication risk at program level, not project-by-project. Ensure the speed of rollout does not exceed the speed of learning by using pilot-to-scale governance. Scale only when operating data shows that quality, inspection and repair perform consistently across repeated deployment.

   Involve insurers and risk engineers early on major retrofit, modular, timber and battery-enabled projects. Early technical engagement can surface failure modes and build confidence in insurability before issues are embedded at scale.

2. **Build resilience and repairability into what gets scaled**
   What is scaled today will need to perform under future conditions. Factor climate exposure into material choice and design logic, and stress-test low-carbon and modular solutions against future hazard scenarios, not historic baselines.

   Scale only where inspection, access and repair have been designed in from the outset. Require a clear durability case for new materials and assemblies – covering failure modes, repair pathways and lead times after damage. If assets cannot be restored efficiently, lower upfront cost can translate into higher lifetime risk.

3. **Manage cyber-physical dependence at program level**
   As delivery becomes more digital, system failure moves from isolated disruption to portfolio-level risk. Set program-level standards for cyber hygiene, supplier access and contingency planning. Where platforms, software and vendors are shared, a single point of failure can interrupt multiple projects at once. Controls need to extend beyond the prime contractor to subcontractors, software providers and platform vendors. Without that, exposure sits outside direct oversight but still impacts delivery.

Impatient capital:
Financing structures amplify delivery risk

Capital has not withdrawn from infrastructure. While investors are more selective, funding remains available across many capital-intensive segments, particularly digital infrastructure, energy-adjacent assets, selected healthcare and industrial facilities, and large-scale retrofit and upgrade programs.

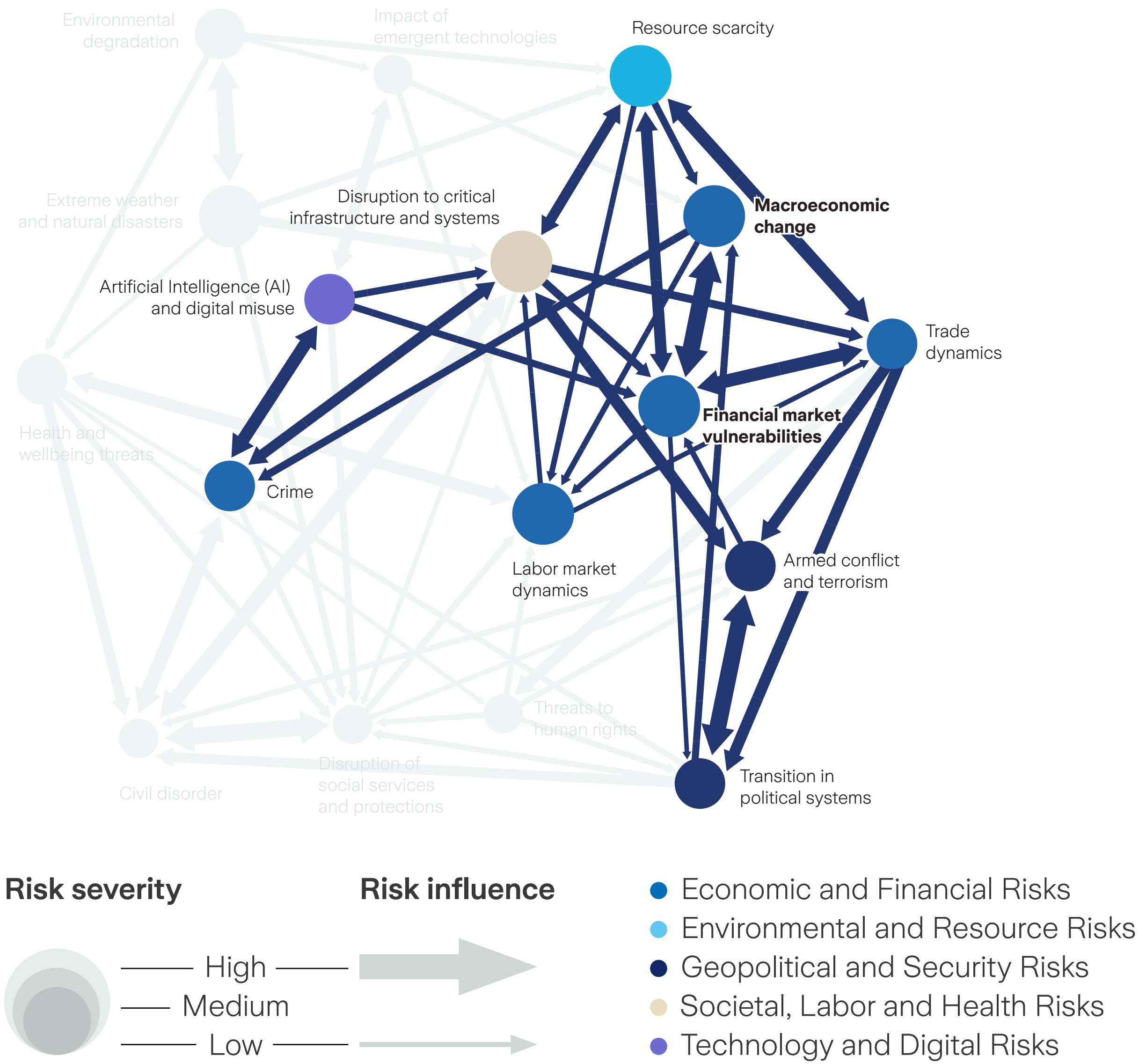
What distinguishes the 2030s is how modern financing behaves under stress. Financing is increasingly designed to cap exposure early, rather than carry delivery variation over time. This dynamic is accelerated by higher rates, tighter liquidity, and trade protectionism, where tariffs, localization requirements and politically-driven supply constraints reintroduce cost and availability shocks into capital-intensive projects.

In practice, financing structures are now built on the assumption that delivery risk is tightly controlled. When that assumption doesn't hold, the financing model itself becomes a source of fragility.

The shift is not just relevant to lenders or sponsors; it reshapes the risk environment in which construction companies operate. Construction issues that were once absorbed through contingency or time surface as financial stress much sooner than in past cycles, with tighter recovery windows and reduced tolerance for delay, rework and resequencing.

Impatient capital

Risk network of financial market vulnerabilities and macroeconomic change



Capital is conditional – tightening tolerance

The most important change in the market is not the volume of funding, but the way it is packaged. Private credit has expanded rapidly, with the global market reaching approximately USD 3.5 trillion in assets under management by end 2024, while capital deployment rose to nearly USD 593 billion in 2024, a 78 percent increase year on year.[54] Capital has become more modular and targeted, deployed through private credit, special purpose vehicles (SPVs) and other off-balance sheet structures.

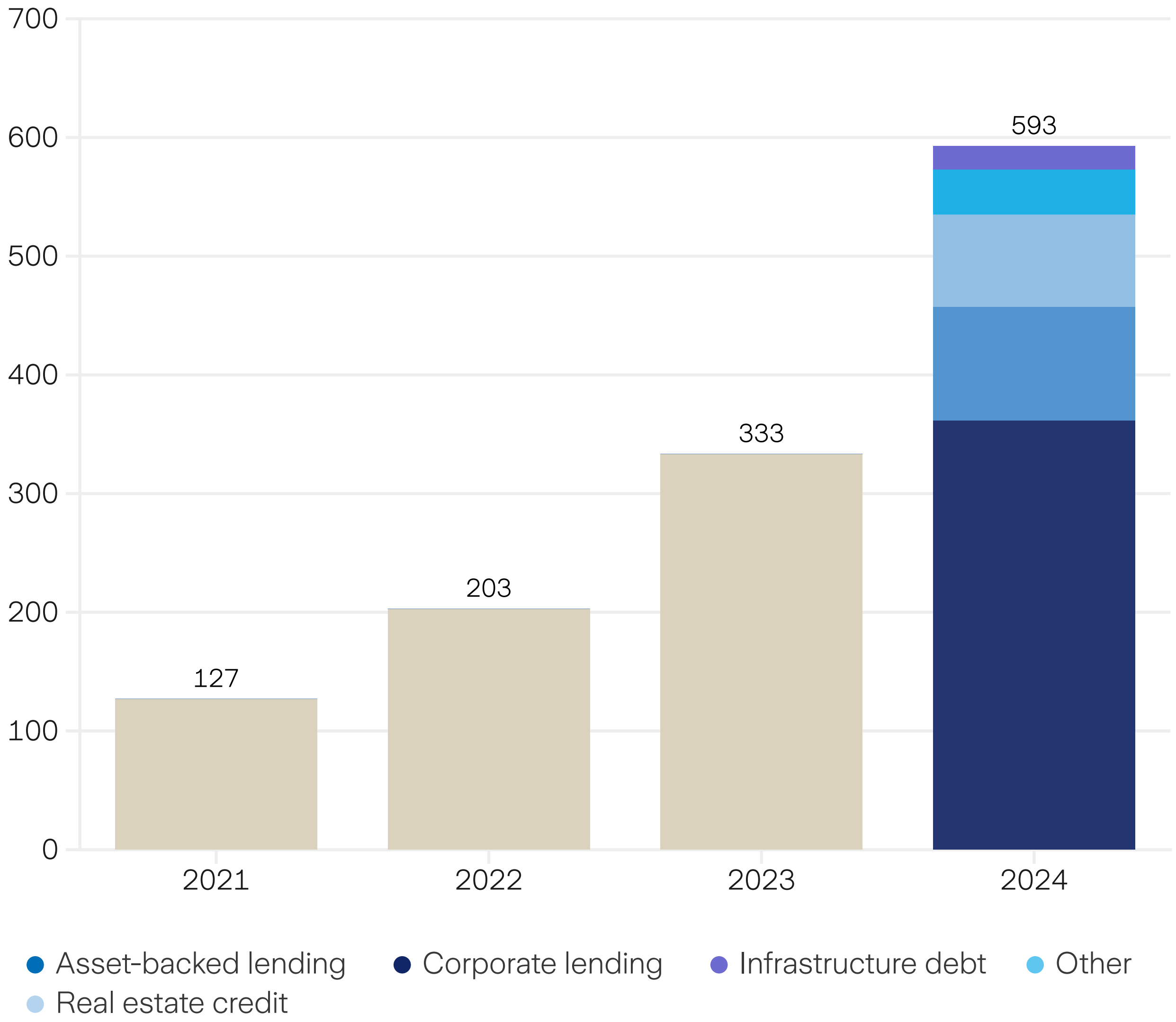
While infrastructure-style project finance represents a smaller share of private credit volumes, it is where construction-phase delivery risk is most tightly priced and enforced. These structures appeal because they offer speed and balance-sheet flexibility. But they also change delivery dynamics. Compared with traditional bank lending, they typically impose sharper performance thresholds, shorter decision horizons, and less capacity for operational deviation.[55]

In such structures, financing is expensive and tightly monitored until projects are complete and operating as planned. Senior debt is often floating rate and priced based on SOFR (Secured Overnight Financing Rate), with construction phase margins materially higher than post-stabilization levels. Costs only ease once systems are commissioned and revenues stabilize, leaving little tolerance for delay during construction.[56]

But the deeper issue is how much delivery variation is tolerated once projects move into execution. Where projects depend on smooth commissioning, rapid ramp up and early stabilization, even modest delays can trigger contractual strain, refinancing discussions or sponsor intervention. In SPV structures with debt to equity ratios approaching 90:10, a 10-15 percent construction cost overrun can fully erode the equity buffer, quickly triggering lender protections and sharply limiting the sponsor's room for maneuver.[57]

Private credit is growing

Annual private credit deployment (USD bn), by strategy, 2021-2024



Source: AIMA (2025). Gross deployment, including refinancing.

54. Alternative Investment Management Association (AIMA). Financing the Economy 2025 (2025).
55. Freshfields. Private Capital Finance: Outlook for 2026 (2026); Techstrong. Financing AI Data Centers: Trillions Needed, Protections Lacking (2026); Quinn Emanuel. Client Alert: Emerging Litigation Risks in Financing AI Data Centers Boom (2026); Forbes. The Shifting Role Of Insurance Capital In Private Credit Deployment (2026).
56. Covenant Lite. Meta's $29 Billion Bet with Apollo on AI Data Centers (2025).
57. Ernest Chiang. Off-Balance Sheet AI: How SPVs Are Financing the Data Center Boom While Hiding Leverage (2025); Covenant Lite (2025).

Projects that drift are therefore not given time to recover. Funding terms harden, scrutiny increases and flexibility disappears earlier in the delivery cycle. For construction companies, this means less tolerance for rework or resequencing, faster escalation of disputes, earlier intervention from sponsors and insurers, and reduced ability to negotiate time-based recovery.[58] This pressure is most acute where delivery partners are thinly capitalized and contractual risk transfer assumes contractors can absorb delay, rework and dispute costs that financing structures no longer tolerate.

The shift in financing mechanisms is already visible in data centers and other digital infrastructure, where capital stacks are large and execution timelines compressed.[59] Private credit exposure linked to large technology companies has reached around USD 450 billion, up roughly USD 100 billion year on year,[60] while recent financing of a data center in Louisiana is among the largest private credit financings on record.[61]

But the same logic is increasingly evident in healthcare estates, manufacturing campuses and large commercial retrofit portfolios, where slim contingencies and performance-linked financing structures leave little room for delay. In Latin America, similar SPV and private credit structures are being applied to energy-adjacent industrial zones and logistics hubs, where grid congestion and water stress create comparable tolerance constraints.[62]

USD 3 billion

is the new benchmark for the average Zurich-insured data center project – up from only USD 150 million just five years ago.

Looking ahead, sponsors are likely to seek more control over delivery – not necessarily to maximize margin, but to preserve financing viability. That can mean longer-term supplier relationships, tighter integration across design and procurement, or greater control over commissioning and handover.[63]

Project risk becomes portfolio risk – shifting exposure to correlation

Whereas standardization concentrates technical risk (see Standardized futures), financial risk is expected to increasingly synchronize across portfolios as capital concentrates in a narrow set of repeatable project types. When multiple projects rely on similar designs, suppliers, enabling infrastructure, commissioning capability or even weather exposure, small disruptions can have amplified effects.

Investors and lenders are therefore shifting attention from individual project viability to whether clusters of projects could fail together.[64] For the construction industry, risks are no longer judged at project level alone. The market could penalize sameness when sameness creates hidden concentration risk.[65] Projects that are viable on a standalone basis may struggle to secure funding if they sit within a crowded, correlated exposure set.

58. Browne Jacobson. Insurance Insights 2025: Construction (2025); Freshfields (2026).
59. Insurance Journal. The $3 Trillion AI Data Center Build-Out Becomes All-Consuming for Debt Markets (2026); Aon (2026a); Freshfields (2026); Quinn Emanuel (2026); Techstrong (2026).
60. Techerati. AI's Hidden Price Tag: Record Debt and Off-Balance-Sheet Financing (2026).
61. Global Data Center Hub. Meta + Blue Owl's $27B Bet: Is This the US Blueprint for Financing AI Data Centers? (2025); Ernest Chiang (2025).
62. ION Analytics. Latin America's infrastructure faces a year of contrasts (2025); S&P Global. Water in Latin America: Operational challenges (2022).
63. The Baldwin Group. Data centers: Risk and insurance across the development lifecycle (2026); Freshfields (2026); Quinn Emanuel (2026); Aon (2026a).
64. The Baldwin Group (2026); Quinn Emanuel (2026).
65. UBP. Private Markets Outlook 2026 (2026); Freshfields (2026); Quinn Emanuel (2026).

Spotlight

Horizon mismatch in concentrated risk

Exit pressure for private capital has intensified as holding periods have lengthened. By the end of 2024, over 30 percent of PE-backed companies had been held for at least five years – the highest proportion in nearly a decade – intensifying pressure on fund managers to deliver exits.[66]

But construction risk rarely conforms to those timelines. Performance obligations, latent defects and insurance-related exposures can extend years beyond commissioning. When ownership changes before assets have fully stabilized, residual risk is often inherited by operators or buyers who were not party to the original financing assumptions.[67] Where continuity planning is weak, this leaves long-tail risk stranded.[68]

That horizon mismatch becomes more severe where financing structures concentrate exposure in single asset classes. Analysts have drawn explicit parallels between today's AI infrastructure build out and the 1990s telecom fiber boom, when roughly 80–90 million miles of fiber were laid ahead of demand – leaving an estimated 85-95 percent of it unused as 'dark fiber' for years after the bubble burst.[69]

The structural pattern is similar. When SPV-based financing scales rapidly across a narrow set of assets, using common designs, suppliers and operational assumptions, performance risk stops being independent. If demand signals prove optimistic or technology assumptions shift, oversupply and underperformance emerge together across portfolios.
As a result, private credit is increasingly seen as a source of medium-term financial vulnerability.[70] Given strong interconnectedness with insurers and pension funds, stress could be transmitted to the broader financial system, particularly in the event of valuation shocks or credit deterioration.[71]

What changes in practice: Insurance is a gatekeeper

Over the medium term, financing terms and insurance conditions will tend to tighten quickly when projects slip, even though losses may only be formally recognized later due to valuation lag. Private credit assets, including those held in SPV-based structures, are often valued less frequently than publicly traded investments – raising the risk that losses are recognized with a lag after underlying construction or performance problems emerge.[72]

This delay between problem and signal is precisely why insurance terms, insurer engagement, and delivery governance matter so much: They often surface stress earlier than the capital markets do.

The scale and concentration of large construction programs have stretched traditional insurance markets.[73] In response, insurers – including Zurich – have developed specialized facilities targeted to the needs of these complex projects. This may include, for example, integrated parametric weather cover and optional post-construction operational property coverage.

When coverage is unavailable, heavily excluded or attached at high thresholds, lenders may revise terms, delay close or reduce lending. Insurability is therefore not just post-financing protection; it is increasingly one of the clearest proxies for whether a project is financeable at scale.[74]

66. PitchBook. Aging buyout portfolios reach decade high at 3.4-year hold period (2025).
67. iCapital. The Valuation Gap: How Timing Mismatches Are Shaping Private Credit Risk Perception (2026); Forbes (2026).
68. iCapital (2026); Forbes (2026).
69. Ernest Chiang (2025).
70. IMF. Global Financial Stability Report (2024).
71. IMF (2024).
72. Financial Stability Board (FSB). Promoting Global Financial Stability: 2024 Annual Report (2024).
73. Business Insurance. Data center construction boom fuels insurance demand (2025).
74. Descartes Underwriting. Parametric Insurance Protects Project Financing (Accessed 2026) ; Aon (2026a); Forbes (2026).

Where the next opportunity lies: Capital disciplines delivery

Capital remains available – but it is less forgiving, and its structure now shapes delivery risk directly.

Construction organizations that outperform under these conditions will be those that recognize how financing disciplines transmit into execution and adjust delivery governance accordingly.[75]

1. **Treat financing assumptions as delivery risk**
   Financing assumptions set the boundaries for delivery – not just the funding. Understand how schedule slippage, commissioning risk and climate exposure are priced, and where tolerance effectively ends. These thresholds translate directly into contract pressure, recovery risk and dispute exposure.

   In complex or leveraged structures, delivery risk is increasingly shaped by board-level expectations around scale, growth and returns. Identify the scenarios that trigger lender intervention and define the response before financial close.[76]

   Align financing timelines with liability duration and operational reality. Where ownership horizons are shorter than performance obligations, ensure transition plans, capital backing and insurance coverage are explicit.[77] If not, risk is carried forward without clear ownership.

2. **Manage correlation as a portfolio risk**
   Shared dependencies turn isolated issues into multi-project events. Review correlation across grid access, transformer supply, commissioning talent, weather exposure and standardized designs.[78] Where multiple projects rely on the same constraint, a single failure can disrupt delivery at scale. Manage these exposures at portfolio level. Without that, risk accumulates silently and materializes simultaneously.

3. **Use insurability as an early warning signal**
   Insurance signals often surface delivery risk before it becomes visible elsewhere. Track changes in pricing, exclusions and capacity as leading indicators of fragility.[79] Feed these signals back into decisions on design, materials and delivery models – particularly where approaches are being replicated.

   Insurance structured around full asset values (for example, total or estimated completion value) can tie up scarce market capacity and increase cost without meaningfully improving protection. Align coverage to realistic loss scenarios. This preserves capacity and avoids unnecessary cost pressure.

75. Aon (2026a); Quinn Emanuel (2026); Techstrong (2026).
76. Browne Jacobson (2025); Freshfields (2026).
77. iCapital (2026); Forbes (2026).
78. Financial Stability Board (FSB) (2024).
79. Zurich North America. Zurich launches first-of-its-kind Builders Risk data center solution (2025); Aon (2026a).

Acceleration trap:
Hard wiring fragility into delivery models

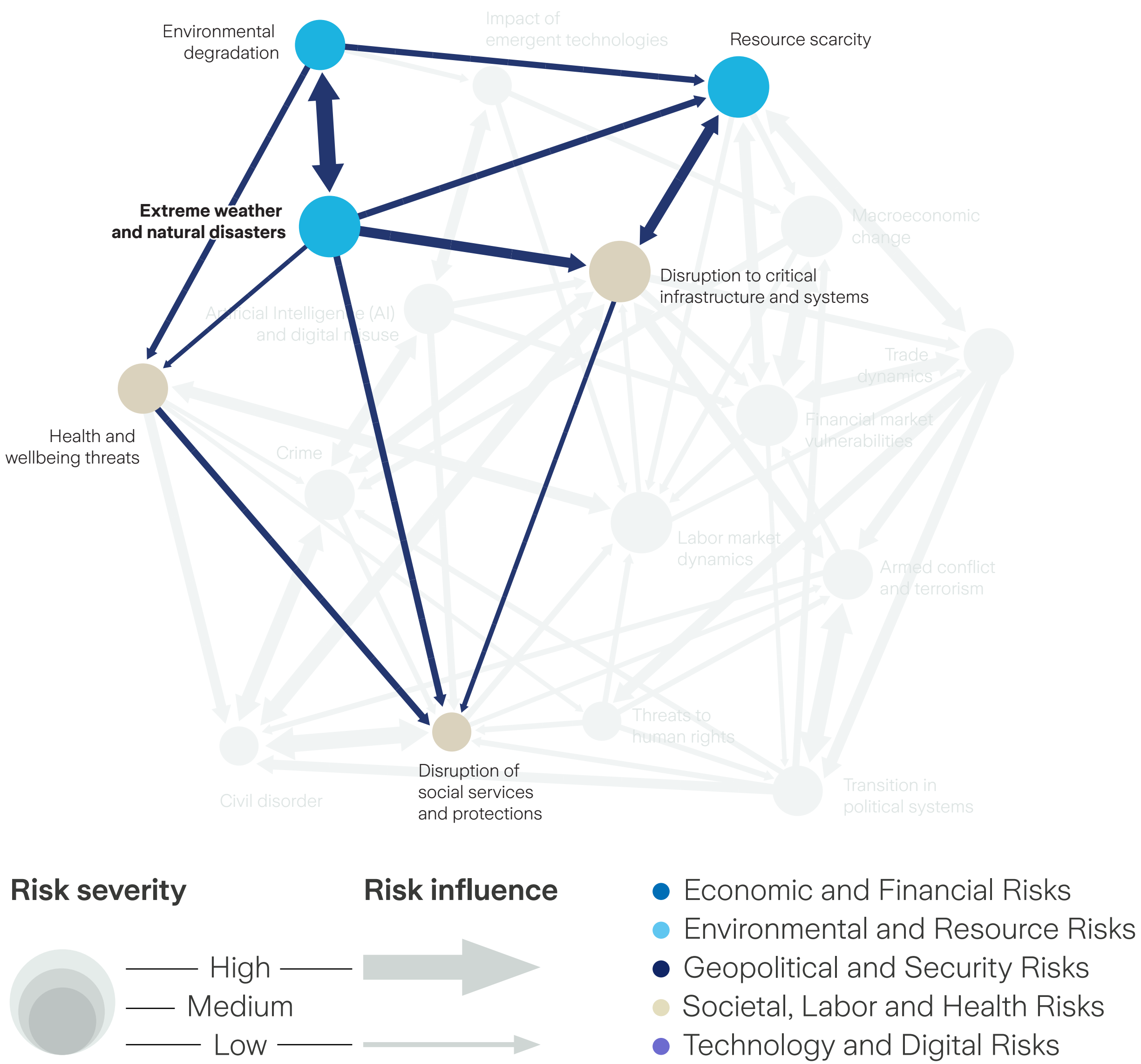
Acceleration has become a default delivery posture across construction markets. Inflation shocks, capital pressure, and geopolitical disruption have pushed many projects into crisis-response mode. Faced with rising costs and increasing uncertainty around when assets can be delivered, many programs compress timelines to protect commercial viability and maintain momentum.

Acceleration is not reckless behavior. It is a rational response to constraint. Across construction, delivery timelines are tightening as demand rises, capital is deployed faster, even as access to enabling systems - from grids and permits to specialist labor and components - become harder to secure on predictable timelines. Political urgency, market competition and technology-driven demand reinforce the same signal: time is the scarcest input.

This shift is most visible in data center construction, where AI- and cloud-driven demand has normalized fast track delivery as a baseline (see Gridlocked intelligence). But the same logic is spreading well beyond hyperscale assets. Public infrastructure programs, industrial facilities, healthcare developments, and large commercial portfolios are increasingly designed on the assumption that overlap is unavoidable.

What distinguishes the 2030s is how and when speed is introduced. Increasingly, construction accelerates before uncertainty has been resolved - before designs are mature, interfaces are proven, systems are stabilized or recovery pathways are secured.

Acceleration trap
Risk network of extreme weather and natural disasters



Speed becomes structural – narrowing recovery capacity

Acceleration has emerged as a practical response to multiple pressures converging early in the project lifecycle.

Disruption to enabling infrastructure – power and water – has destabilized traditional sequencing logic (see Gridlocked Intelligence). To protect access to scarce capacity, projects pull procurement and commissioning forward, even when earlier dependencies remain unresolved. Teams act early because waiting risks missing the window altogether.

At the same time, labor scarcity, demographic aging, and competition for specialist capability are reducing the sector's ability to surge staffing without sacrificing quality (see Workforce without Workers). Heat stress and extreme weather also directly affect productivity, by cutting effective working hours precisely during the periods when accelerated programs assume sustained peak output.[80]

In parallel, digital coordination, modularization and platform delivery reduce some forms of execution risk but also enable faster replication of tightly coupled systems (see Standardized Futures). When combined with compressed schedules, they narrow the window to observe, test and learn before designs are rolled out at scale.

Finally, macroeconomic volatility has raised the financial cost of delay (see Impatient capital). Higher interest rates, inflation sensitivity, and tighter financing structures mean even modest slippage now erodes project economics more quickly. Time is financial exposure.

Despite decades of process improvement, large capital projects still exhibit average cost overruns approaching 80 percent and schedule delays of over 50 percent – suggesting that delivery models have not adapted to the risk environment they now operate in.[81]

Projects are responding by compressing activities that were historically sequential. Procurement is pulled forward ahead of final design resolution. Commissioning proceeds alongside construction. Interfaces are locked in before they are fully coordinated. Fit-out begins before full enclosure. Systems are energized in phases while adjacent scopes remain incomplete.

Forms of fast-tracking and phased handover have been used for decades, but the intensity and the context in which they are applied is changing. Under current conditions, multiple constraints – capacity bottlenecks, workforce limits, climate disruption and financial pressure – are acting simultaneously.

As a result, fast tracking is becoming an embedded assumption rather than a selectively applied strategy. Applied under these conditions, risk is pushed downstream in delivery – out of plans and into execution, where it is harder to see, harder to manage and more expensive to correct, particularly where responsibility is fragmented across multiple parties.[82] Interface failures, rather than trade competence, now dominate cost and schedule escalation in complex programs.[83]

Claims Insight: Built to beat heat – vulnerable to cold

In one data center under construction, equipment staged in unconditioned spaces was hit with sudden uncharacteristic cold, then fast rewarming – triggering condensation and corrosion (i.e., white rust) on sensitive, critical components.

80. BMC. Heat exposure and productivity loss among construction workers: a meta-analysis (2024); Nature. Heat stress and the labour force (2024).
81. BuildOps. Failed Megaprojects: 4 Mistakes Behind Costly Overruns (2026); McKinsey & Company. The construction productivity imperative (2015).
82. The International Journal of Research and Innovation in Social Science (IJRISS). Fast Track Construction: A Review of Potential Risks and Strategies in Project Management (2025).
83. MDPI. An Analysis of Factors Contributing to Cost Overruns in the Global Construction Industry (2024).

What changes in practice: Speed without shock absorption

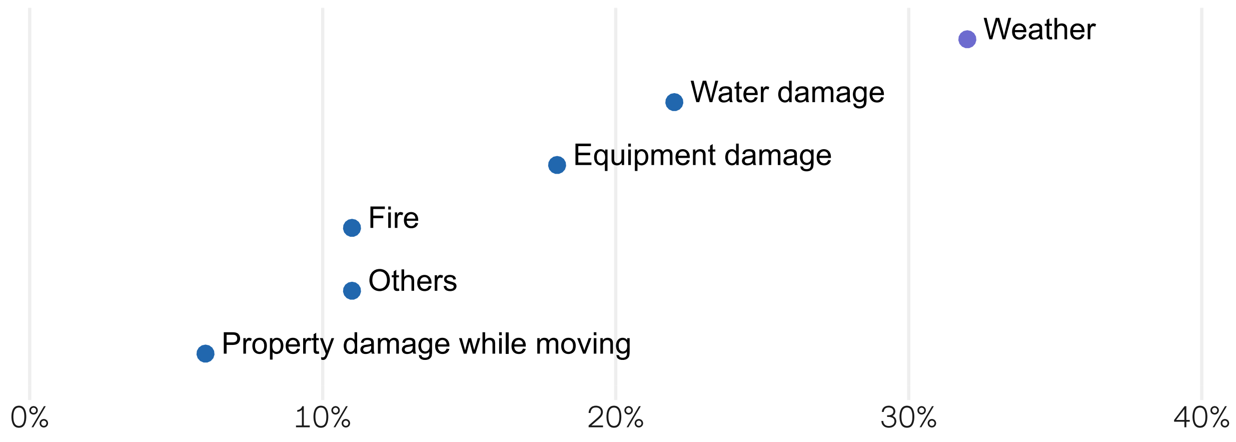
Delivery risk no longer sits primarily with who does the work, but where work overlaps.

Compressed schedules shorten or eliminate float. There is less time to dry, test or retest systems. Fewer opportunities exist to pause safely when site conditions deteriorate. Procurement pulled forward leaves limited scope to substitute when quality issues or delays emerge.

As a result, relatively modest issues – late design changes, short weather windows, partial system failures – are more likely to cascade, with far more severe consequences than under sequenced delivery. This pattern is clearest in sectors where commissioning integrity is critical.

Causes of loss in data centers during construction

% of builders risk claims, Zurich U.S.



Source: Zurich North America. Data center risks right now (2026).

Claims Insight: Built for future floods – hit during construction

A major road project in a river floodplain was hit by a 1-in-50-year rainfall event, exacerbated by controlled dam releases upstream. Flooding overwhelmed exposed earthworks, bridge foundations and site facilities, with water levels exceeding 2 meters at material storage and fabrication areas. Emergency interventions were required as the unfinished alignment and excavated works began to act as a watercourse, amplifying flood impacts. As suitable sites become scarcer, projects are increasingly delivered in locations with complex geotechnical conditions – heightening construction-phase exposure.

In data center construction, for example, compressed timelines require systems to be tested while surrounding scopes remain incomplete and documentation is still evolving. Defects that pass into live operation are far more costly to correct after handover.[84]

The same logic applies beyond digital infrastructure. Healthcare, energy, transport and industrial assets now face tight coupling between construction completion and operational revenue. In commercial and residential construction, the mechanism is different, but the effect is similar: late design change, phased occupation, presales pressure and partial fit-out compress recovery windows, even where technical complexity is lower. Once acceleration has removed options to resequence or recover, tolerance for error shrinks rapidly.

84. SGS. Digital Commissioning in Data Centers: Reducing Handover Risk Through Real-Time Visibility (2026).

Climate risk is a particularly illustrative example. Construction has always been exposed to weather, but disruptive conditions are becoming more frequent and intense, with impacts shaped by how exposed sites operate under compressed schedules, where materials, temporary works and partially completed systems may be left without sufficient protection in place.

Adverse weather affects a large share of construction projects globally and remains the single largest external contributor to schedule disruption.[85] Around one-fifth of all delays are directly attributable to weather, with higher impacts on infrastructure and early-stage building works.[86]

Under traditional sequencing, weather-sensitive activities were buffered by float and staged progress toward enclosure. Under permanent fast-track conditions, those buffers are stripped out. As a result, weather-related disruption reaches further into the program – affecting fit-out, commissioning and testing activities that were previously insulated. Under compressed schedules, weather disruption increasingly drives safety incidents, rework and insurance friction, as work takes place in narrower windows and losses occur on partially complete elements, making claims harder to evidence, slower to resolve and more contested at the boundaries of coverage.

Temporary weather protection and provisional environmental control could become permanent features of delivery rather than short-term contingencies. This introduces compound risk. Incomplete enclosures are more vulnerable to moisture ingress, thermal stress and wind exposure, while temporary systems are themselves harder to assure and more failure-prone. Once damage occurs in these conditions, rework is more invasive and recovery options narrower.

Spotlight

Permanent fast track

What begins as an exceptional response gradually becomes standard practice.

Provisional weather protection is treated as ‘good enough’. Early commissioning is assumed in baseline schedules. Reduced testing windows are normalized. Documentation completeness becomes aspirational rather than mandatory at handover.

Over time, fragility is embedded directly into delivery models. Because these assumptions are baked in from the outset, they are difficult to challenge once procurement is committed and financing secured.

Automation and digital tools reinforce the pattern. Digitally-improved coordination can create a false sense of control, masking physical realities of incomplete enclosure, unresolved interfaces and constrained recovery windows.

The risk is a permanent acceleration regime that reduces resilience faster than it addresses inefficiencies.

85. MDPI. Weather-Related Construction Delays in a Changing Climate: A Systematic State-of-the-Art Review (2021).
86. EHAB. Construction Delay Statistics: Weather Impact Data (Accessed 2026).

Where the next opportunity lies: Speed by design

Avoiding the acceleration trap does not require abandoning speed. It requires reframing where discipline is applied.

The organizations that lead will be those that compress with discipline – preserving sequencing control, interface accountability and recovery capacity even when time is scarce.

1. **Make acceleration a controlled decision**
   Under compressed schedules, the biggest risks are governance decisions, not technical ones – who can change sequencing, what trade-offs are accepted, and which controls replace lost time buffer. Acceleration needs to be explicit, visible and reversible. Without that, decisions are made informally and risk accumulates without clear ownership.

2. **Focus oversight on interfaces, not trades**
   As schedules compress, risk shifts to where work overlaps. Shift oversight from inspecting individual trades to managing interfaces – design to procurement, structure to envelope, envelope to commissioning, and the link between construction and operations. Identify high-risk handoffs early, assign single-point accountability and focus testing where exposure is highest.

3. **Protect recovery capacity**
   Acceleration works only if the ability to recover is maintained. Preserve key buffers in the build sequence – such as enclosure before sensitive works proceed, and commissioning as a controlled proof point, not a catch-up phase. Ensure defects identified late can still be fixed without major rework or dismantling. Where recovery capacity is removed, speed increases short-term but risk accumulates – and delivery becomes more fragile under stress.

What changes in practice

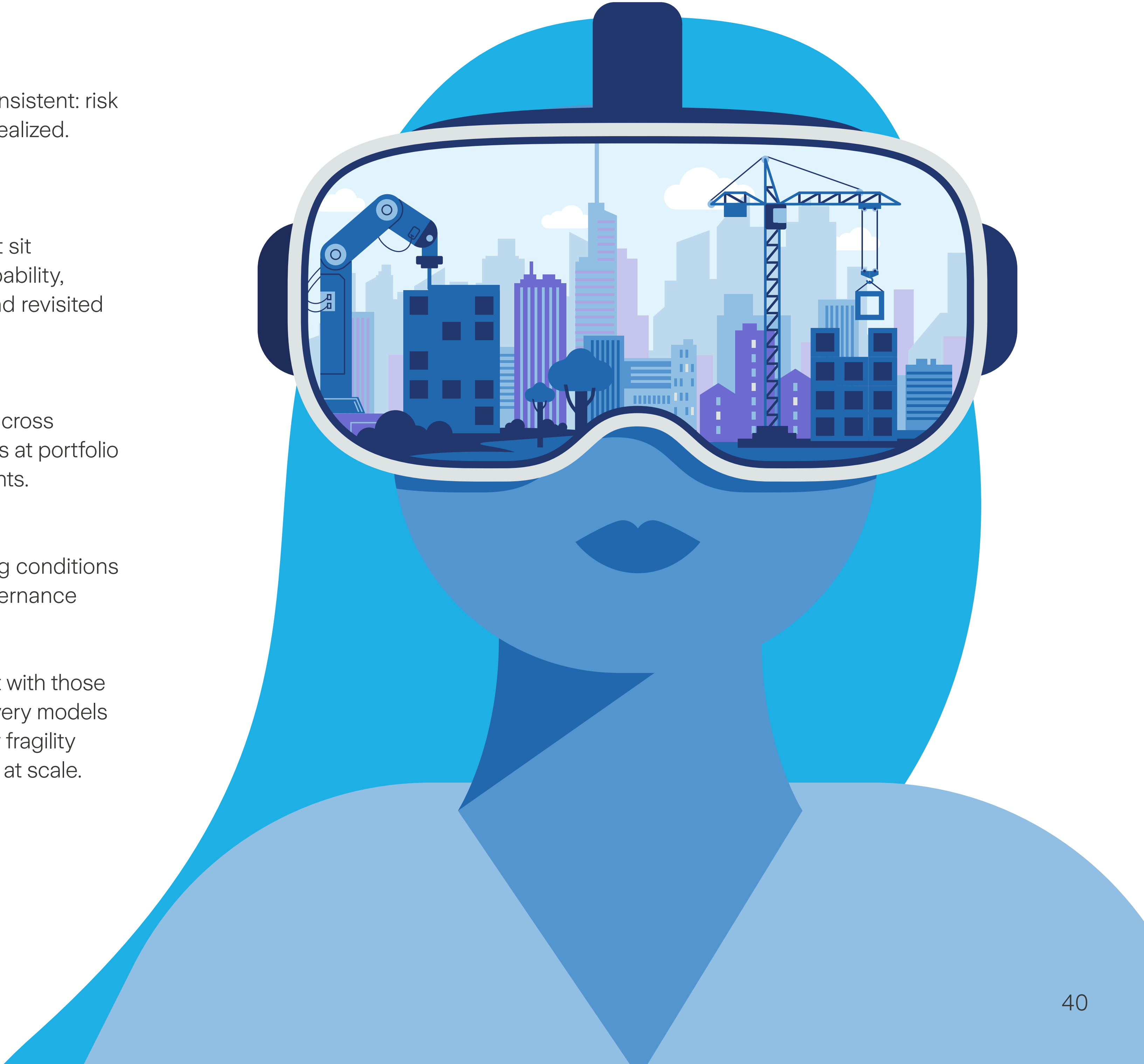
Across each of the micro trends explored in this report, the underlying change is consistent: risk is moving earlier, becoming more interconnected, and harder to recover from once realized. This leads to three shifts in how delivery decisions need to be made:

1. **Feasibility is not fixed upfront.**
   Whether a project proceeds – and remains viable – depends on conditions that sit outside the project boundary: grid access, water availability, commissioning capability, financing tolerance and insurability. These constraints must be tested earlier, and revisited continuously as conditions evolve.

2. **Performance is shaped by dependencies, not components.**
   The most consequential failures arise from how systems interact – at interfaces, across shared infrastructure and digital dependencies, and through correlated exposures at portfolio level. Managing these becomes more important than optimizing individual elements.

3. **Recovery capacity is shrinking.**
   Compressed schedules, tighter financing structures, and more volatile operating conditions mean there is less capacity to absorb disruption. Designs, sequencing and governance approaches must preserve the ability to pause, isolate and recover.

Advantage will not rest with those who can move the fastest or scale the quickest, but with those who can anticipate constraint, manage interdependence, and build recovery into delivery models from the outset. In this context, insurability becomes a critical signal – making delivery fragility visible earlier, and helping distinguish what can be built from what can be built reliably at scale.



Data and methodology

Beyond 2030: The Future of Construction brings together expert insight on the risks shaping the construction sector over the next five years and beyond.

The report relies on structured expert elicitation to map risk interconnections and develop foresight. Similar approaches are designed to work with a small and diverse set of carefully selected internal and external experts, with insights emerging from the quality of expertise, rather than the volume of input. Contributions from 31 experts, including external industry specialists and Zurich colleagues, were collected through private interviews conducted from December 2025 to March 2026 (see Acknowledgments).

The report also integrates findings from a short survey undertaken by a subset of expert participants (n = 19). It included three sections:

1. **Risk severity** invited respondents to assess the likely impact (severity) of 17 risks on the construction sector over the next five years. Results reflect a simple average of responses on a seven-point scale (1 = Extremely low, 7 = Extremely high).

2. **Risk interconnectivity** asked respondents to consider potential relationships between risks. For each selected risk, respondents could select up to five risks most likely to arise as consequences. To limit survey burden, each respondent was shown a random subset of risks from the full list of 17, resulting in a limited number of observations for any given risk. The map is intended to illustrate relative patterns of interconnection rather than a complete risk system. Identified relationships are based on a simple tally of responses, with infrequently observed relationships (<40%) excluded. Circle size reflects perceived severity, grouped into three tiers based on the distribution of observed scores (tertiles) to ensure clear visual separation between risks.

3. **Qualitative input** allowed respondents to share, in free text, which risk they were most concerned about and why.

Risks were presented in alphabetical order in the survey, and included:

Economic and Financial Risks
1. Crime (e.g., cyber crime, fraud, money laundering).
2. Financial market vulnerabilities (e.g., asset bubbles, debt, liquidity, digital currencies).
3. Labor market dynamics (e.g., automation, green transition, aging workforce, talent / labor shortages).
4. Macroeconomic change (e.g., inflation, recession).
5. Trade dynamics (e.g. monopolies / oligopolies in strategic resources, tariffs etc.).

Environmental and Resource Risks
6. Environmental degradation (e.g., biodiversity loss, soil decline, pollution, habitat loss).
7. Extreme weather and natural disasters (e.g., heat waves, floods, wildfires, earthquakes).
8. Resource scarcity (e.g., price hikes or shortages of water, energy, food, arable land).

Geopolitical and Security Risks
9. Armed conflict and terrorism (e.g., war, terrorism, proxy conflicts by state and non-state actors).
10. Civil disorder (e.g., violent or disruptive protests, strikes, social unrest).
11. Transition in political systems (e.g., regime change, elections, coups).

Societal, Labor and Health Risks
12. Disruption to critical infrastructure and systems (e.g., transport, IT, energy, finance).
13. Disruption of social services and protections (e.g., education, healthcare, pensions).
14. Health and wellbeing threats (e.g., pandemics, new diseases, anti-microbial resistance, mental health).
15. Threats to human rights (e.g., erosion of civic freedoms, censorship, child labor).

Technology and Digital Risks
16. Artificial Intelligence (AI) and digital misuse (e.g., privacy breaches, misinformation, online harms).
17. Impact of emergent technologies (e.g., biotech, quantum, geoengineering).

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