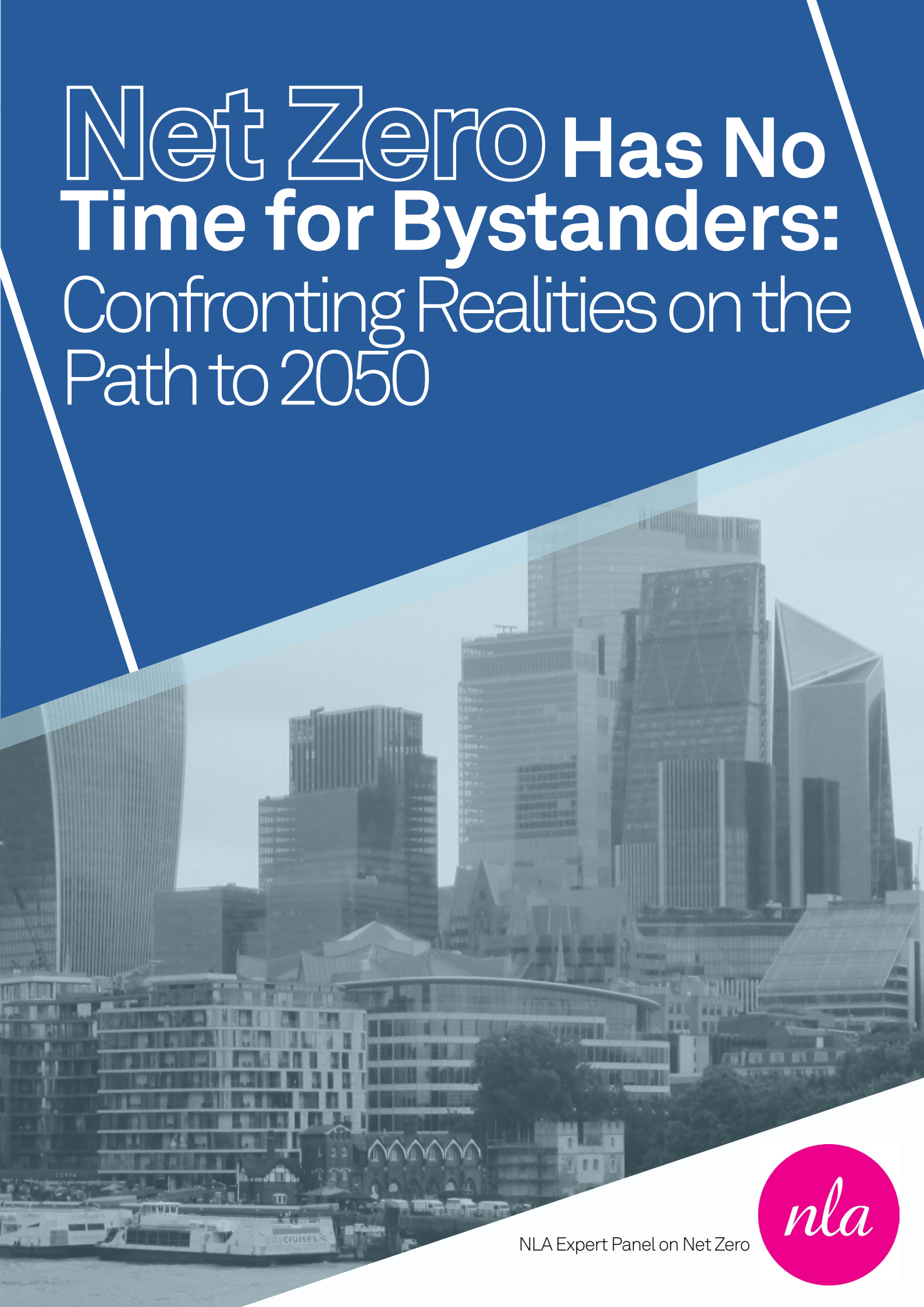
Net Zero Has No Time for Bystanders: Confronting Realities on the Path to 2050



NLA Expert Panel on Net Zero

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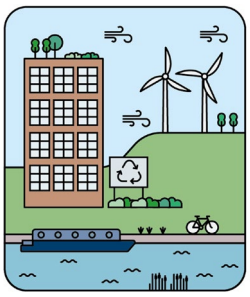
NLA Expert Panel Report:

Net Zero has No Time for Bystanders: Confronting Realities on the Path to 2050



Between February 2025 and January 2026, the 2025 Expert Panel for Net Zero convened a programme of formal sessions, sub group workshops, and investigative meetings to examine the key challenges shaping the built environment's transition to net zero. This report presents the Panel's insights, conclusions, and recommendations arising from its work over the past year.

Introduction

What Net Zero Leadership looks like in 2025-2026

'Net Zero Leadership' recognises the profound interdependence between people and the natural environment: that they are not mutually exclusive domains, but parts of one living system. Yet, today, Net Zero leadership has become highly politicised. What was once a generally accepted 'good idea' is now a tool for polarisation. Criticised as an economic ruse, weaponised in public debate, and still, shortsightedly, viewed as a 'bolt on' rather than a fundamental requirement.

We recognise 'Net Zero Leadership' is squarely under threat.

The physics and equation of 'Net Zero' remains unchanged: for our world to continue 'life' the volume of greenhouse gases removed from our atmosphere must equal the volume we emit. Historically, human progress has too often ignored the core reality that we are one unified living system. That is why the signing of the Paris Agreement (adopted through COP21) was a truly rare moment of global clarity, when 195 countries stood together and recognised that our futures rise and fall as one. It recognised we share one atmosphere, that emissions have no 'national' boundaries and that the only true path forward in arresting the deleterious impact of emissions is to work together.

Today Net Zero Leadership is at a critical axis of accountability. We are not edging closer to a fully embraced renewal energy sector, rather arriving at a planetary tipping point. In contrast to leaders who drive Net Zero outcomes, we are seeing bullish markets with a resilient reliance on fossil fuels; administrations which reverse or deny zero/low carbon advancements despite years of developing environmental protections, and reinvestment in sectors that ought to have been closed. With most countries who have signed the Paris Agreement failing to meet the agreed 1.5°C aligned pathway, Net Zero Leadership is being kicked down the 'generational' street.

Over the past year, the NLA Net Zero Expert Panel has reached a collective conclusion:

There are no bystanders in the pursuit of Net Zero.

Leadership in this space demands participation, integrity, and decisive action across every layer of the built environment.

The Panel's work is underpinned by several universal truths:

- **Scientific reality:** Humanity is part of a single global ecosystem on which our survival depends.
- **Accelerated warming:** Rising CO_2 emissions and energy intensity are driving rapid planetary heating.
- **Collective agency:** Every sector, organisation, and individual has the capacity, and obligation, to reduce emissions and protect both people and the planet.
- **Fragmented progress:** Neither globally nor nationally are we acting in a unified or sufficient way to transition to clean energy and reduce pollution.
- **Paris-proof challenge:** We are currently not on track to achieve the goals of the Paris Agreement. 2024 indicates it's the first 12 month period in which global average temperature exceeded 1.5°C above pre industrial levels. Whilst the Paris Agreement is based on a 20 year average to remove single year variability, with sustained year-on-year emissions activity exceeding the cap (or failing to remove greenhouse gases at an equal rate of emission) we will breach the 1.5°C ceiling.

The UN's 2025 assessment of national climate plans reinforces this warning. While momentum towards decarbonisation is growing, the global construction and built environment sectors remain on an unsustainable trajectory. More than 60 countries have submitted updated Nationally Determined Contributions (NDCs), yet several major emitters — including China and the EU — have not finalised theirs, leaving significant data gaps that make it difficult to measure global progress. Even if current pledges are met, emissions would fall by only around 10% by 2035 compared with 2019 levels — barely a fraction of what is required to limit global warming to 1.5°C.

In parallel, global conflict continues to compound this challenge. The wars in Ukraine and Gaza/Israel are not only humanitarian and geopolitical crises — they are also climate crises in disguise. Independent analyses estimates that the warfare, destruction, and reconstruction of these regions will together **add around 200–290 million tonnes of CO_2-equivalent** to the world's emissions trajectory. Beyond the immediate devastation, this highlights a critical truth: the rebuilding of shattered communities will demand enormous quantities of concrete, steel, glass, and other high-carbon materials, many of which are sourced from the same global supply chains that serve the wider construction sector. Traditional structures of war, defence, and invasion have no place in a clean, transition economy; they directly undermine collective climate goals and demonstrate how deeply interconnected our systems of material production, security, and sustainability truly are.

This shortfall underscores the challenge for the construction industry, which accounts for nearly 40% of global CO_2 emissions. Achieving meaningful progress will require systemic transformation — from low-carbon materials and circular supply chains to resilient infrastructure and regenerative design. As UN Climate Chief Simon Stiell stated, 'Change is happening, but not fast enough.' Immediate acceleration and coordinated leadership are now essential to align global infrastructure and building practices with the 1.5°C pathway.

Effective leadership in the built environment must therefore reconnect design and construction practices with ecological understanding and long-term stewardship. It must be visible, accountable, and grounded in shared purpose.

It requires a different system led thinking to what has gone before. As Jim Skea, Chair of the Intergovernmental Panel on Climate Change, stated recently, Net Zero and the critical reduction in global warming 'is not a political choice'.

Ireland, for example, provides a compelling case of change where its State Architect acts as both a political and public figurehead, shaping a national vision for quality, sustainable design. This model demonstrates how leadership, when embedded within public institutions, can unite policy, professional practice, and citizen engagement behind a common goal of environmental responsibility.

In addition, Ireland convened The Timber in Construction Steering Group (Ireland) in November 2023, which among other things looked at procurement and demonstrator projects exemplifying use of timber buildings and proposed 10 actionable recommendations to unlock the use of timber in construction.

In England, the government has similarly published the Timber in Construction Roadmap, which outlines strategic actions across procurement, demonstrator projects, skills & supply-chain and whole-life carbon data to unlock timber in construction and advance built-environment decarbonisation. The roadmap identifies seven priority themes and sets targets for public demonstrator buildings and increased home-grown timber supply.

These are a few examples of the great work that is taking place across the region, showcasing how we can bring new ideas and new architectural principles that will underpin our commitment to a cleaner, stable and ecologically protected world.

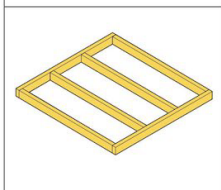
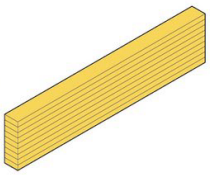
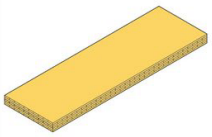
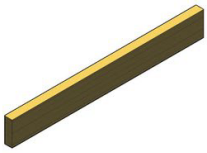
Timber in Construction Roadmap

Priority themes:

- 1: improving data on timber and whole life carbon
- 2: promoting the safe, sustainable use of timber as a construction material
- 3: increasing skills, capacity, and competency across the supply chain
- 4: increasing the sustainable supply of timber
- 5: addressing fire safety and durability concerns to safely expand the use of engineered mass timber
- 6: increasing collaboration with insurers, lenders, and warranty providers
- 7: promoting innovation and high performing timber construction systems

The government's 'Timber in Construction' Roadmap outlines strategic actions across procurement, demonstrator projects, skills & supply-chain while identifying the following priority themes.

Over the course of this year, we have explored four central themes. It is our hope that you find our analysis and thought leadership valuable in strengthening your own work and leadership in advancing Net Zero and climate resilience within your area of influence. We also encourage you to consider how you can accelerate Net Zero accountability across your wider sphere of influence and throughout your supply chains.

	Lightweight Timber	Mass Timber Components		
	Studs and joists	**Glulam**	**CLT**	**LVL**
				
Production	Manufactured from structural sawn timber and structural sheathing to form prefabricated open / closed panels.	Manufactured by bonding together layers of parallel timber lamellae, with ends finger jointed	Structural timber boards stacked in perpendicular layers and glued together under high pressure	Made from 3mm thick veneers bonded together under pressure using water resistant adhesive
Typical structural strength **Dimensional Tolerances**	Low Low	Medium High	Medium High	High High
Typical applications	Low-rise residential 	Medium/high rise residential and commercial 	Medium/high rise residential and commercial 	Medium/high rise residential and commercial 

Guides like 'Timber Typologies' demonstrates how the government's roadmap can be put into practice, showcasing how innovative architectural principles using timber can contribute to our commitment of a sustainable world.

Waugh Thistleton Architects and Timber Development UK (TDUK) 2023

Our submission to the NLA on our findings echoes the advice of the United Nations as released in October 2025. While the work and focus of our communities demonstrates actionable responsibility in driving Net Zero trajectories, as the U.N. has implored we need to do more and faster to radically change the way we care for our planet.

As we conclude our year of panel discussion and discovery, we ask you what can you take forward from this report and help drive change?

Each of us has a responsibility not to be a bystander.

1. What are the main challenges in making Net Zero a priority within the built environment industry?

The Hard Truths and Emerging Progress

What we know are the hard truths:

- The UK has a role to play in strengthening a unified understanding of what Net Zero truly means and how it should be delivered. Fragmented policy and regulation across departments and regions have created inconsistent definitions, enforcement, and accountability.
- The construction sector continues to face deep-rooted structural and behavioural challenges.
- Short-term financial objectives too often outweigh long-term environmental imperatives, with many organisations still prioritising immediate returns over sustainable outcomes.
- Low-carbon innovation is frequently perceived as expensive or risky, a misconception reinforced by limited access to open data and shared learning.
- Political and economic cycles, combined with the urgency of the housing crisis, have forced governments to prioritise delivery numbers over climate resilience.
- As one of the largest global sources of emissions, the construction industry's pace toward Net Zero remains slow and uneven, hampered by fragmented regulation, economic pressures, and a skills gap that affects all levels of the supply chain.
- Overcoming these barriers will depend on greater transparency, open-source knowledge sharing, and policy frameworks that reward whole-life performance rather than lowest-cost delivery.

Why Fragmentation Matters

The absence of a single, coherent approach to carbon reduction has left industry and policymakers misaligned. Different standards — RICS, LETI, RIBA, UKGBC, and the GLA among them — define Net Zero in slightly different ways, creating confusion and inconsistency in application.

The **UK Net Zero Carbon Buildings Standard (UK NZCBS)** offers the first credible pathway toward unification, setting a common baseline across all building types and allowing verified comparison between projects. Its long-term effectiveness, however, will depend on consistent enforcement by clients, funders, and regulators, transparent data reporting, and integration across all project categories — from major new builds to refurbishments, fit-outs, and infrastructure.

The Commercial Reality

Financial and commercial structures remain a significant obstacle. Short-term cost planning still dominates decision-making, overshadowing the proven benefits of long-term lifecycle value. Developers and Contractors frequently view low-carbon options as costlier, despite growing evidence that Net Zero buildings can deliver higher valuations, reduced risk exposure, and compliance resilience. The sector needs a shift towards **lifecycle-based investment models**, early policy engagement, and procurement mechanisms that incentivise carbon efficiency alongside financial performance.

Equally, the industry's delivery systems remain siloed. Procurement frameworks often separate design, construction, and operation, preventing learning loops and undermining sustainability performance. In many cases, **whole-life carbon assessment** remains voluntary, meaning insights on embodied carbon reduction are rarely shared or standardised. A true system shift requires **integrated project teams,** early collaboration, full carbon transparency across the value chain, and a credible long-term regulatory roadmap that the market can trust. We need to see projects being established with clear and non-fungible climate resilient briefs and scopes.

Signs of Positive Change

Despite persistent barriers, there is clear evidence of positive movement. When expectations are set, the industry adapts quickly and creatively.

Many leading clients and tier-one Contractors are already **acting ahead of regulation**, setting internal embodied-carbon limits for new developments and major refurbishments. This direction aligns with the proposed **Building Regulations Part Z** — an industry-led framework ready for adoption, which would make embodied-carbon reporting mandatory and introduce defined carbon limits (expressed as $kgCO_2e/m^2$) for new projects. For many programmes in design or delivery, carbon intensity thresholds are now treated as non-negotiable, on par with cost, safety, or planning requirements.

Meanwhile, frameworks such as the **UK NZCBS** and the **Future Homes Standard** are progressively tightening energy and carbon performance expectations for both new and existing buildings through 2030 and beyond, signalling that today's "best practice" will soon become tomorrow's baseline.

Material innovation is accelerating. Products once considered niche — such as **engineered timber, hemp-based concretes (hempcrete), and hybrid timber–steel systems** — are becoming mainstream, insurable, and scalable. Hempcrete, for instance, not only stores biogenic carbon but also provides high thermal efficiency, making it an attractive low-impact substitute for conventional masonry and insulation.

75 London Wall, designed by Orms for Castleforge and Gamuda, is setting the standard as a pilot project for the UK Net Zero Carbon Buildings Standard (UKNZCBS).

Orms

Simultaneously, both government and major public-sector clients are mandating **Modern Methods of Construction (MMC) and Design for Manufacture and Assembly (DfMA)** in public building programmes — particularly in education, health, and workplace sectors — to reduce waste, increase precision, and normalise low-carbon manufacturing. This is no longer experimental: several upcoming national projects require offsite construction and repeatable low-carbon components as standard.

On site, operations are evolving too. Major contractors are switching site compounds, welfare facilities, and temporary power from diesel to **certified renewable electricity and battery storage**, and many now market 'Net Zero site setups' as part of their standard service. This shift aligns with expanding **Scope 1, 2 and 3 emissions reporting**, covering on-site fuel, purchased power, and embodied emissions across the supply chain. Increasingly, funders, insurers, and occupiers demand verifiable carbon data and **post-occupancy performance evidence**, reinforcing the link between transparency and financial value.

The direction of travel is unmistakable: measure carbon across the lifecycle, set clear caps, electrify all operations, industrialise low-carbon delivery, and prioritise materials that sequester or dramatically reduce emissions. The challenge now is to move these behaviours from **'leading practice' to 'standard practice'** at a pace consistent with the 1.5°C pathway.

A Whole-System Response

Insights from the NLA Expert Panel and our collaborative sessions highlight the need for a truly systemic approach — one that connects traditional disciplines with emerging actors across the value chain.

- **Policy and regulation:** Joined-up policymaking across departments is vital to embed Net Zero into planning, procurement, and building control, while ensuring public procurement explicitly favours reuse, circularity, and low-carbon materials.
- **Finance and insurance:** Financial institutions and insurers must help de-risk innovation and reward whole-life value, not short-term capital savings. Insurers in particular should develop viable underwriting pathways for new low-carbon materials and construction systems, rather than excluding them by default. The slow acceptance of cross-laminated timber (CLT) illustrates this challenge — though encouragingly, sentiment is shifting as performance data and certification strengthen confidence, equally so too engagement between the construction and insurance sectors.
- **Industry action groups:** Networks such as ACAN, Do Tank , and The Engineers ReUse Collective are reshaping industry culture by promoting open-source collaboration, reducing demolition waste, and publishing practical guidance on reuse and low-carbon design.
- **End users and communities:** Occupiers and communities are driving bottom-up demand for sustainable buildings — increasingly treating healthy, low-energy, fossil-fuel-free spaces as a baseline expectation rather than a premium product.
- **Professional institutions:** Bodies such as **RICS, UKGBC, RIBA, and LETI** are converging around common frameworks for whole-life carbon assessment and supporting professional development to embed carbon literacy as a core skill across all disciplines.

This interconnected ecosystem shows that leadership already exists across the sector. The goal now is not invention but acceleration. Embedding these practices as business-as-usual and scaling them fast enough can secure a built environment compatible with a 1.5°C future.

2. Who are the key actors involved in the built environment's transition to Net Zero?

Achieving Net Zero in the built environment depends on coordinated effort across a complex, interlinked ecosystem of stakeholders. Each plays a distinct yet mutually reinforcing role throughout a project's life cycle.

Artificial intelligence (AI) is rapidly becoming indispensable to Net Zero because it can analyse whole life carbon, simulate climate risk scenarios, optimise supply chains, and process the vast, multi scalar datasets that the built environment now depends on. But AI cannot replace human agency. Climate systems, urban systems, and social systems are deeply interdependent, and decisions about land, materials, energy, and community wellbeing involve ethical trade offs that no algorithm can resolve alone. Human involvement in the loop governance is essential to ensure that AI driven optimisation aligns with human values, equity, safety, and long term ecological stewardship. This is why the skills and roles listed in the following section remain so critical: they anchor AI within human judgement, professional accountability, and lived experience.

The following actors represent the **core human** infrastructure of the Net Zero transition The people whose decisions, skills, and accountability determine whether ambition becomes measurable progress. Their coordination is not optional but foundational, because Net Zero is ultimately a whole system challenge:

- **Funding Bodies and Investors** link capital to environmental performance, embedding ESG metrics and lifecycle value within financing terms.
- **Developers** set the ambition and embed sustainability within their commercial strategies, procurement briefs, balancing viability with environmental performance.
- **Project Managers** coordinate teams, manage timelines for carbon analysis, and ensure low-carbon decisions are locked in early.
- **Architects, Engineers, and Specialist Consultants** design for whole-life carbon reduction, integrating passive design, circularity, and data-driven performance.
- **Carbon Managers and Data Analysts** track measurable outcomes, verify emissions data, and inform continuous improvement.
- **Cost Consultants** align financial modelling with whole-life performance, ensuring budgets account for lifecycle carbon impacts and value retention.
- **Contractors and Subcontractors** build competence in low-carbon materials, modern methods of construction (MMC), and low-impact site operations.
- **Suppliers and Manufacturers** provide transparent environmental product declarations (EPDs) and material data from the outset to support informed design choices.
- **Insurers** play a pivotal role in de-risking innovation by underwriting emerging low-carbon technologies, materials, and systems. By proactively developing insurable pathways for proven Net Zero products, they can unlock investment in prototypes, demonstrator projects, and large-scale adoption.
- **Local Authorities and Planning Bodies** set clear regional frameworks, establish carbon benchmarks, and lead by example through public-sector procurement and policy enforcement.
- **Accessibility allyship and social infrastructure advocacy**: are emerging as critical actors in the Net Zero transition because retrofitting, renovation, and new design present a once-in-a-generation opportunity to correct long-standing inequities in how people access, use, and inhabit the built environment. As buildings undergo carbon upgrades, or new buildings are introduced because of the way we look at community-led living, there is a parallel responsibility to embed human-centred, inclusive design that reflects the full diversity of human life: mobility, sensory needs, neurodiversity, ageing, and social participation.
- **Facilities Managers and Asset Owners** ensure buildings operate to design intent, monitor post-occupancy data, and close the performance gap over time.
- **Customers and End Users** drive market demand by prioritising low-carbon products, materials, and places — influencing design through informed choice and consumer pressure.
- **Big and Small Tech Companies** provide the digital backbone for transition. From AI-driven design tools and predictive modelling to smart sensors, digital twins, and cloud-based carbon tracking platforms that enable transparent decision-making and optimisation across asset lifecycles.
- **Educational Institutions and Training Providers** cultivate the next generation of Net Zero professionals through cross-disciplinary curricula, technical training, and applied research.
- **Professional and Industry Bodies** (such as RICS, RIBA, IStructE, UKGBC, and LETI) align methodologies, publish standards, and facilitate shared learning to ensure consistency across sectors.

- **Community Groups, NGOs, and Third-Sector Organisations** advocate for sustainable, inclusive development, connecting social value with environmental outcomes and holding industry and government accountable.
- **Media and Knowledge Platforms** amplify success stories, disseminate evidence-based case studies, and normalise Net Zero as a societal expectation rather than a niche ambition.

Together, this network forms a system of shared accountability, where leadership at every level from design studio to policy desk, factory floor to boardroom determines how quickly and effectively the built environment can align with a 1.5°C future.

The UK Net Zero Carbon Buildings Standard

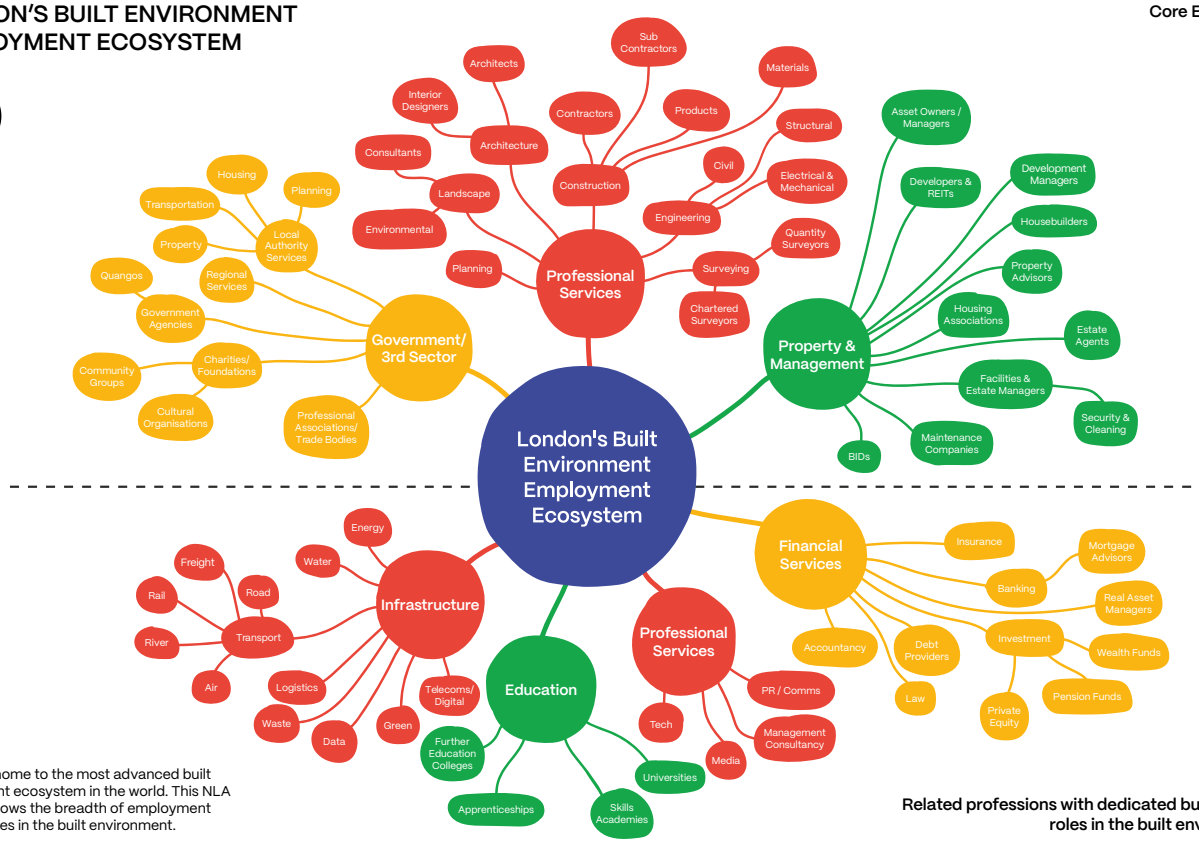
The UK Net Zero Carbon Buildings Standard (UK NZCBS) included the work of more than 350 voluntary experts from across the built environment industry in its technical development, and sought feedback from over 700 stakeholders beyond this, highlighting its collaborative foundation. Version 1 of the Standard was published in March 2026. (Image courtesy of the UK Net Zero Carbon Buildings Standard, 2025).

3. What (current and future) skills are needed to drive this transition and develop knowledgeable and adaptable leaders?

Delivering Net Zero is fundamentally a skills and leadership challenge. Achieving a resilient, low-carbon built environment will depend on developing people who can think systemically, work across disciplines, and translate climate ambition into measurable delivery.

It means fundamentally reevaluating the skills we have today and asking ourselves are we future-proofing current and new generations to be equipped with the knowledge, education, syllabus and inspiration to possess the rights skills and expertise to drive a low-carbon economy.

LONDON'S BUILT ENVIRONMENT EMPLOYMENT ECOSYSTEM



London is home to the most advanced built environment ecosystem in the world. This NLA diagram shows the breadth of employment opportunities in the built environment.

The above existing **NLA London Employment Ecosystem** (from the Built Environment Sector publication) identifies six interconnected stakeholder groups (non hierarchical):

1. Professional Services
2. Property & Management
3. Financial Services
4. Infrastructure
5. Government and Third Sector
6. Education

The Net Zero group considered the skills, upskilling pathways, and knowledge incubation required to build capability, capacity, and know-how to genuinely support a sustainable, low-carbon, nature-positive economy. Building on the roles above, the following skills and specialisms are essential to enable a resilient, adaptive, and evidence-based transition to Net Zero.

1. Professional Services

Professional services must evolve from siloed expertise to collaborative, circular, and data literate practice. Cross disciplinary upskilling is now fundamental. Early supplier engagement, collaboration between carbon and cost managers, and integrated project delivery models are some of the levers that turn ambition into measurable progress.

The skills needed to deliver include:

- **Data analytics specialists —** quantify operational and embodied carbon across project stages, enabling transparent reporting and performance tracking.
- **Parametric tool programmers and Digital Twin developers —** connect BIM with manufacturing, material databases, and in-use performance models to simulate carbon, energy, and maintenance outcomes, supporting better decisions and post occupancy optimisation.
- **Building scanners and demolition auditors —** identify materials suitable for reuse, enabling circular construction and accurate resource inventories during retrofit or deconstruction; foster a culture of open sharing of inventories to redefine value.
- **Climate resilience designers —** integrate adaptation, retrofit strategies, and long term resilience into asset design to mitigate physical climate risks.
- **AI informed clerks of works —** use intelligent monitoring to track quality on site, detect performance deviations in real time, and de risk delivery.
- **Material efficiency assessors (architects/engineers) —** apply embodied carbon intensity metrics (e.g., $kgCO_2e/m^2$) to eliminate excess and optimise performance.
- **Specification of innovative solutions (including off site manufacture) —** stay abreast of innovation in materials and components, with a particular focus on off site manufacturing and assured performance.

2. Property & Management

Operational performance is pivotal for asset owners, housing associations, and facilities managers. The skills required spans retrofit, PropTech, and resident education in energy use. Digital capability in operations is as essential as design stage expertise.

The skills needed to deliver include:

- **BIM literacy across the building lifecycle —** supports robust asset data management, efficient maintenance, carbon tracking, and long term operational resilience.
- **Sensor monitoring and smart asset capability —** enables real time performance management to reduce operational risk, maintenance costs, and emissions.
- **Retrofit and future proofing strategies —** extend building life, cut emissions, and maintain compliance with tightening sustainability and regulatory standards.
- **Ongoing BMS training and monitoring —** optimise controls for low energy consumption and responsive building operations.
- **Adaptation over demolition —** prioritise circular economy outcomes, reduce embodied carbon, and protect asset value through reuse.
- **Energy efficiency solutions and performance monitoring —** implement measures that lower operating costs, reduce carbon, and help address fuel poverty for occupants and tenants.
- **Building scanners and demolition auditors —** catalogue reusable materials to enable circularity and reliable inventories during retrofit or deconstruction, supported by a culture of open sharing.

3. Financial Services

Finance and insurance play a central role in scaling Net Zero, aligning with green finance initiatives. Expertise is needed in ESG investment, risk management for innovation, and green product development. With more than £75 billion projected in infrastructure investment for Net Zero 2030, understanding carbon is now inseparable from value, risk, and return.

The skills needed to deliver include:

- **WLCA (Whole Life Carbon Assessment) literacy —** enables robust evaluation of operational and embodied carbon for ESG reporting and investment decisions.
- **Data analytics specialists —** quantify carbon impacts, track project performance, and provide insights that strengthen reporting, risk management, and asset liquidity.

- **Off site manufacturing literacy —** assess modern methods that reduce carbon, shorten delivery, and improve cost certainty and resilience.
- **ESG and green finance requirements —** align capital allocation with regulatory expectations and investor needs.
- **Linking climate risk to construction innovation —** identify where new methods and materials reduce exposure to climate related financial risks and enhance resilience.
- **Risk mitigation for innovative approaches —** evaluate, assure, and de-risk non traditional construction to meet compliance and insurer expectations.
- **In house capability on low-carbon construction —** inform decisions on materials, suppliers, and design to support net zero investment pathways.
- **Investment model literacy (incl. green finance mechanisms) —** advise on structures that influence asset value and funding opportunities.
- **ESG requirements expertise —** interpret evolving standards and integrate them into financing, due diligence, and asset management strategies.

4. Infrastructure

The sector is advancing Net Zero through integrated planning, digitalisation, and supply chain transformation. Major clients are embedding carbon reduction into design and procurement (e.g., PAS 2080, whole life carbon). Investment is flowing into Digital Twins, AI enabled asset management, and off site manufacture, aligned with nature based solutions, biodiversity net gain, and circular economy frameworks. Cross portfolio collaboration (energy, transport, water, communications) is accelerating innovation.

The skills needed to deliver include:

- **Systems engineers —** integrate decarbonisation into lifecycle design.
- **Carbon managers —** apply PAS 2080 and BS EN 15978 to manage and reduce whole life carbon.
- **Data and AI specialists —** build predictive maintenance and optimisation models.
- **Supply chain analysts —** optimise materials flow, logistics, and reuse.
- **Environmental economists —** quantify carbon value, co benefits, and wider social outcomes.

Collectively, these capabilities shift infrastructure from linear delivery to regenerative systems that deliver measurable carbon reduction, social value, and resilience.

5. Government, Local Authority, and Third Sector

Public bodies and community organisations enable the transition through policy, sustainable procurement, knowledge transfer, and integration of Net Zero principles into local planning and design guides. Public sector leadership and technical literacy are as critical as private sector innovation.

The skills needed to deliver include:

- **Technical and analytical specialists —** assess Net Zero proposals and ensure policy reflects best environmental practice.
- **Data analysts —** evaluate applications for circularity, reuse, and material efficiency within planning and procurement.
- **Testing and validation capacity (e.g., BRE, regional centres) —** validate innovative low-carbon products and methods, with open data to build market confidence.
- **Regional climate risk modellers and planning officers —** embed adaptation, biodiversity, and resilience into local frameworks that guide sustainable growth and investment.

6. Education

Education underpins the entire transition. We need a government, education, and employer led, digitally enabled, systems based model that continuously evolves with practice and technology. Embedding Net Zero principles across all primary and secondary school education and ensuring curriculums across architecture, engineering, construction and finance degrees (including relevant degree adjacencies) are aligned to driving low-carbon futures.

The priorities include:

- **Curriculum reform —** embed Net Zero across primary and secondary education; align architecture, engineering, construction, and finance degrees (including adjacent disciplines) to low carbon futures.

- **Vocational excellence —** expand colleges and skills academies focused on retrofit, off site manufacturing, logistics, robotics, and hybrid craft digital skills.
- **AI and data analytics capability —** train the workforce to use sustainability software for scenario modelling and performance monitoring.
- **Teacher development and resourcing —** address current shortages in educators able to deliver green transition subjects.
- **Awareness pathways —** increase visibility of green careers and apprenticeships to attract diverse new entrants.

These foundations must be agile and continually updated to reflect innovation in materials, data, and practice.

Cross-cutting competencies

Across all roles, a common set of core capabilities underpins effective Net Zero delivery:

- **Digital literacy and AI engineering —** using data, modelling, and smart technologies (including BIM and Digital Twins) for evidence based decisions and AI driven analytics and processing.
- **Systems thinking —** understanding how design, supply chains, materials, and policy interact in a circular, low carbon economy.
- **Inter professional collaboration —** aligning disciplines, sectors, and incentives to balance environmental, social, and economic performance.
- **Lifecycle awareness —** embedding carbon, cost, and operational analysis from inception to end of life.
- **Carbon literacy —** understanding emissions sources, metrics, and reduction pathways.
- **Mentoring and coaching —** enabling the cultural shift required to change how we plan, design, deliver, and operate the built environment.
- **Change leadership and communication —** leading transformation across teams and sectors with clarity and accountability.

From skills gaps to skills ecosystems

The NLA Panel's analysis frames the agenda as an interconnected skills ecosystem, not a linear pipeline. Bridging the gap requires:

- **AI powered integrated carbon models** to generate faster, more accurate whole life assessments operated by human engineers and data distributed through the skills ecosystem.
- **Aligning education, policy, and finance** to reward long term carbon performance.
- **Pairing carbon managers with cost managers early** in project development.
- **Sharing open data** across public and private sectors to accelerate learning.
- **Treating upskilling as continuous**, not a one off, in a permanently decarbonising economy.
- **Forecasting resource needs intelligently —** define the roles, team structures, and investment required for a low carbon economy as AI reshapes traditional roles.
- **Keeping a 'human in the loop' for AI —** clarify how new roles and skills will guide AI to meet environmental goals and how they translate into new sectors, industries, investment vehicles, and returns.

Sustainability is no longer a specialist add-on: it is a core leadership competency. The future of the built environment depends on how effectively we embed these skills across professions, institutions, and generations to deliver a Net Zero, regenerative, and resilient society.

Practical example: 'old world' jobs needed as much as AI engineers. 'Hands on' tools are still as relevant as keyboard prompts.

Retrofitting for Net Zero is not only a technological challenge, but a revival of skills that have long underpinned the resilience of the built environment. The 2024 report Heritage and Carbon: Unlocking the Environmental and Economic Potential of Historic Buildings shows the scale of this opportunity: the UK's pre 1919 building stock (nearly a quarter of all buildings) could sustain a range of **205,000 to 290,000 jobs every year to 2050**, contributing around **£35 billion** annually to the economy.

These are not hypothetical roles; they are practical, skilled jobs in conservation, traditional crafts, building pathology, project management, and policy. As demand for retrofit and upcycling accelerates, heritage skills become central to Net Zero delivery, proving that climate action is as much about reviving human expertise as deploying new technologies.

While **AI** will optimise data, modelling, and decision making, it cannot replace the craft knowledge required to repair, adapt, and extend the life of existing buildings. This is why the skills and actors listed in this paper must remain relevant and continually updated. The Net Zero transition depends on a workforce that blends advanced digital capability with the 'hands on', place based skills that make low-carbon transformation possible in practice.

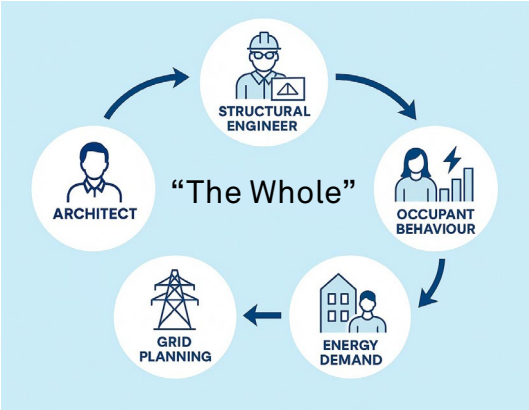
The ethical questions that will undeniably face us in the next 10 years is who will be (best) placed to perform the physical works pertaining to skilled work: human, humanoid or robotics? Whilst this paper has not addressed the future role of robotics within the built environment, we note that the introduction of any form of robotics into this sector poses the same challenges that faces the current system led thinking. Robotics intensively 1) rely on lithium, nickel, cobalt and copper; 2) place vast pressures on the electricity grid and 3) drive larger and larger real estate massing through the operation of data centres. Those three factors alone have a huge impact on emissions behaviour let alone the broader social equation of why a humanoid or robot should replace a human employed role.

4. Why is systems thinking important to achieving Net Zero in the built environment, real estate and construction industries?

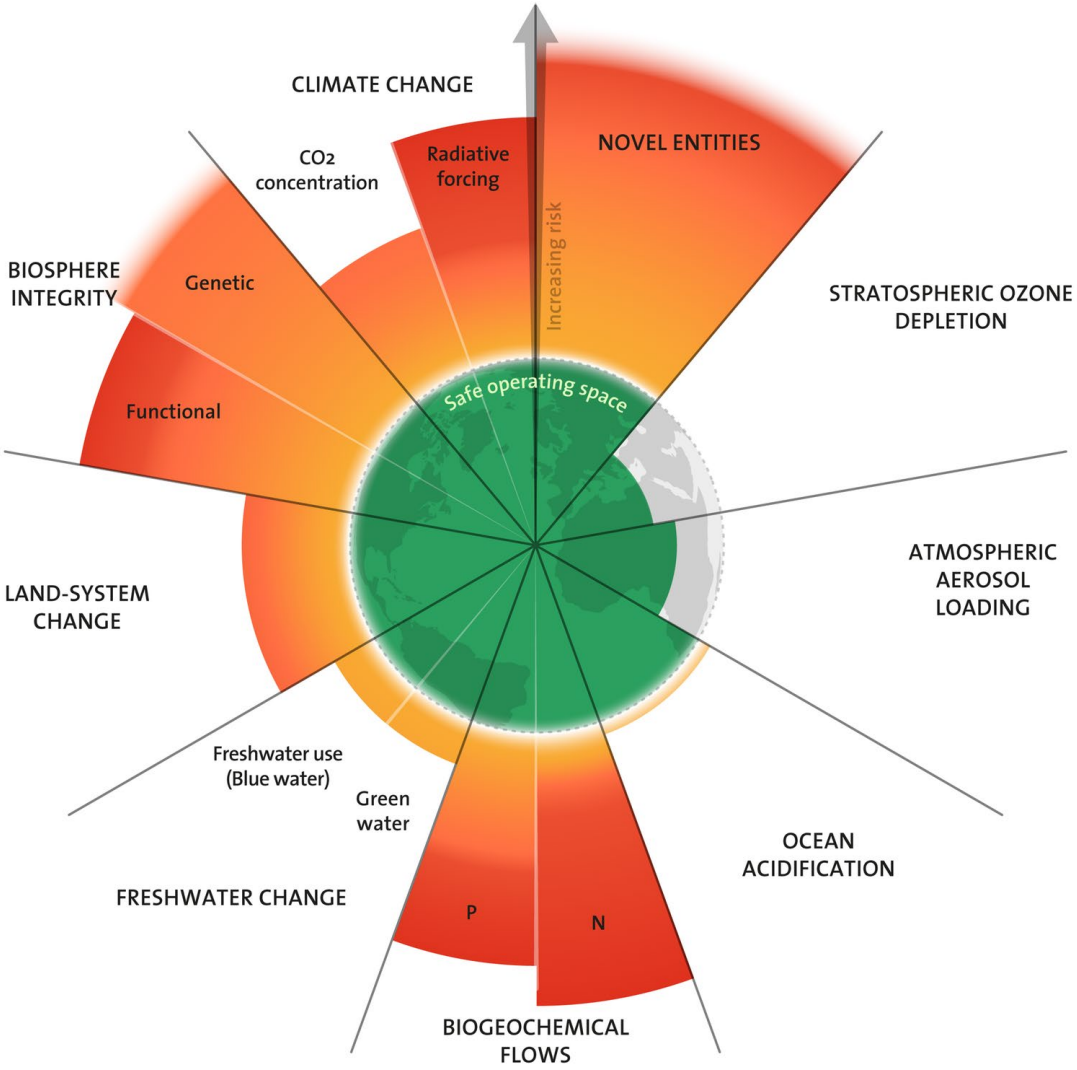
Systems thinking is fundamentally about stepping back to see the bigger picture – understanding how different parts of a complex whole interact, influence each other, and create outcomes that no single component could achieve alone.

In the built environment, this means recognising that decisions made by one stakeholder will impact others through an interconnected web of cause and effect.

At its core, systems thinking asks us to shift from asking 'How do I optimise my part of the project?' to 'How does my decision advance our collective goal?' For the built environment sector, that goal has crystallised: creating buildings and places that operate within planetary boundaries whilst delivering enhanced human wellbeing. This concept, developed by Kate Raworth and the Doughnut Economics Action Lab[1], defines the environmental limits within which humanity can safely operate while meeting social needs for housing, energy, water, and community infrastructure.



An architect's decisions affect the work of structural engineers, which influences contractor choices, which impact occupant behaviour, which shapes energy demand, which affects grid planning.



The "Planetary Health Check 2025" shows that seven of nine planetary boundaries have now been exceeded, with severe consequences for both ecosystems and societies. Azote for Stockholm Resilience Centre, based on analysis in Sakschewski and Caesar et al. 2025

1 https://doughnuteconomics.org/about-doughnut-economics

Systems thinking requires what we term 'climate literacy', i.e. understanding not just the technical mechanics of Net Zero, but recognising the deeper connections between building decisions and planetary health. When we consider that wildlife populations have declined by 73% since 1970[2], and that major urban development has caused grassland loss equivalent to the area the size of Dorset, and arable farmland loss equivalent to the size of Bedfordshire since 1990 [3], the inadequacy of our current approach becomes undeniable. We need fundamental change in how we conceptualise development, construction, and building operation.

Several pioneering initiatives demonstrate how systems thinking is already transforming practice across the built environment sector, offering practical models that others can adapt and scale.

A compelling example is the work of the UK Green Building Council (UKGBC), whose Roadmap to Net Zero Whole Life Carbon[4] represented a critical first step in applying systems thinking to the sector. The Roadmap united diverse industries and stakeholders — from developers, designers, and product manufacturers to financiers, policymakers, and building users — to build a shared vision for decarbonising the built environment. By mapping interdependencies, identifying leverage points, and aligning sectoral pathways, it created a unifying framework for collective action.

This collaborative foundation directly informed the creation of the UK Net Zero Carbon Buildings Standard (UKNZCBS), which exemplifies systems thinking in practice. Rather than treating operational and embodied carbon separately, or focusing exclusively on new construction, the NZCBS provides a comprehensive, science-based framework that aligns metrics, benchmarks, and pathways across building lifecycles. It enables consistent measurement, shared accountability, and coherent policy development — a genuinely systemic approach to Net Zero delivery.

Panel Insights

Our panel discussions revealed both the potential and complexities of implementing systems thinking across London's built environment sector. A fundamental tension emerged: the need to shift from profit-driven models that inhibit reuse and circularity toward value-driven approaches that recognise multiple forms of wealth creation.

I. Beyond Financial Returns: Quantifying Broader Value Creation

Conventional financial models prioritise short-term returns and fail to capture the comprehensive value created by sustainable building practices. Several frameworks are emerging to bridge this gap:

- Social Return on Investment (SROI): Quantifies social, environmental, and economic outcomes in monetary terms, providing a comprehensive value assessment beyond traditional financial metrics.
- Natural Capital Accounting: Values the environmental services provided by buildings and landscapes — carbon sequestration, air purification, stormwater management, biodiversity habitat, and urban cooling effects.
- Carbon Offset Payments / internal carbon pricing: This approach acts as a penalty, whereby payments are made in lieu of carbon reduction to offset the net impact to zero. This creates funds, at a local authority level, and within organisations, which can be used to fund carbon reduction initiatives.

II. Building Climate Literacy Through Stakeholder Engagement

Systems thinking requires broad understanding of both the technical aspects of Net Zero and the deeper connections between building decisions and planetary health. The panel emphasised the importance of storytelling and advocacy in building this literacy. Rather than overwhelming stakeholders with technical details, effective communication starts with the 'big why' – why do we want to build climate resilience, reduce water use, reduce carbon emissions, or preserve biodiversity? – and builds understanding from shared values toward technical solutions.

This approach has proven effective in mobilising cross-sector collaboration. When developers, contractors, suppliers, and communities understand their shared stake in planetary health, technical discussions about embodied carbon or operational energy become conversations about how to achieve shared goals rather than compliance exercises.

III. Navigating Fragmented System Structures

We identified critical challenges in applying systems thinking across fragmented industry structures. Structural steel reuse provides an instructive example: whilst reusing steel in high-value applications can reduce demand for new production, poorly planned reuse that fails to utilise steel's full structural potential

2https://livingplanet.panda.org/en-GB/
3 https://www.wcl.org.uk/docs/Habitat%20loss%20from%20major%20infrastructure%20projects%20-%20The%20case%20for%20action%20April%202021.pdf
4 https://www.nzcbuildings.co.uk/

may simply displace scrap recycling without reducing the global environmental impact of steel production.

Similarly, sustainability requirements that render social housing financially unviable highlight how isolated interventions can create unintended consequences within a complex system. When environmental goals are pursued without considering social and economic interdependencies, they risk undermining broader societal outcomes.

The commercial sector has a pivotal role in this system. With its capacity for innovation, investment, and scale, it can serve as a testing ground for new approaches — prototyping, refining, and normalising solutions that are both environmentally ambitious and socially equitable. Through systems thinking, commercial projects can drive coordinated progress that enhances the resilience and inclusivity of the entire built environment.

IV. Policy as a Systems Lever

We identified the critical need for coherent, aligned national policy frameworks to lever systemic change across the built environment. Fragmented regulations and inconsistent local interpretations dilute impact and create uncertainty, slowing Net Zero transition. A unified approach would provide the clarity, consistency, and confidence needed to drive investment, innovation, and coordinated action. However, local authorities retain a vital role in responding to the unique social, economic, and environmental priorities of their regions.

The challenge lies in developing nationally aligned yet locally adaptable policy frameworks. Setting clear, science-based targets and pathways whilst allowing flexibility for local authorities to tailor implementation to their specific contexts and community needs.

V. Transforming Creative Process Through AI Integration

For design professionals, systems thinking fundamentally transforms the creative process. This approach demands new collaborative methodologies where design teams continuously ask: 'Does this decision advance our collective goal?' Rather than constraining creativity, this redirects it toward innovations that optimise across multiple performance criteria simultaneously. Early adopters report that constraint-driven creativity often generates more innovative and satisfying design solutions than unconstrained approaches.

AI offers powerful capabilities for managing systems complexity, analysing vast datasets on building performance, occupant behaviour, supply chains, and environmental impacts to reveal patterns, trade-offs, and optimisation opportunities that might otherwise remain hidden. We emphasised that AI should augment, not replace, human judgement — providing data-driven insights that support decision-making whilst relying on people to validate, fact-check, and refine algorithmic recommendations. The greatest value lies in using AI to process complex information and generate evidence-based options that human teams can interpret and apply with contextual understanding.

'System thinking is inherently about communication and respect of different perspectives and priorities in the built environment, and there is, I think, widespread support of this sort of approach in the industry, however the challenge is how to achieve this in a time- and cost-effective way. A benefit of systems thinking might allow individual projects to prioritise certain targets, which achieves holistic positive outcomes.' - NLA Expert Panel Member

VI. Cross-sector Learning and Innovation

We strongly advocate learning from systems thinking approaches in other sectors. The packaging industry's circular economy innovations, for example, offer valuable insights for construction material flows. Cross-industry think tanks and knowledge exchanges could accelerate learning and prevent sectors from solving similar systemic challenges in isolation.

Direction of Travel

The evidence is clear: systems thinking is not optional for achieving Net Zero in the built environment. The interconnected nature of building systems, supply chains, policy frameworks, and stakeholder networks means that fragmented approaches will consistently fall short of the transformation required.

Immediate Actions Required:

1. Adopt integrated value frameworks
2. Implement collaborative decision processes
3. Invest in climate literacy
4. Engage in cross-sector learning
5. Advocate for systemic policy frameworks
6. Create innovation opportunities and incentives

We must drive toward a built environment sector that operates as a conscious, coordinated system working within planetary boundaries while delivering enhanced human wellbeing. This requires fundamental shifts in business models, professional practices, policy frameworks, and stakeholder relationships. While the transformation is complex, the tools, technologies, and collaborative models needed are increasingly available.

The question is not whether systems thinking will become essential to built environment practice – it already is. The question is how quickly we can make the transition from fragmented, profit-driven approaches toward integrated, value-driven systems that serve both human needs and planetary health.

The built environment community has the opportunity to lead this transformation, demonstrating how systems thinking can deliver enhanced outcomes for people, planet, and prosperity simultaneously.

5. In the current industry, what do we call success and is it really success?

The Panel's discussion reveals that the industry's traditional success model - cost, speed, unintentional or intentional constrained design outputs, emphasis on financial return versus social and environmental income and shorter range durability - is fundamentally different to how we need and ought to approach Net Zero goals.

True success now requires a **new value framework** that for simplicity's sake can be built on five principles:

1. Lifecycle Value: evaluating projects through carbon, durability, adaptability, and social benefit, not just capital cost.

2. Cultural Leadership: clients, financiers, and regulators modelling Net Zero ambition and incentivising long-term outcomes.

3. Open Knowledge Ecosystem: success measured through transparency, shared learning, and open-source data.

4. Regenerative Metrics: defining success through measurable positive impact (carbon reduction, biodiversity gain, human wellbeing).

5. Collaborative Systems Thinking: seeing each project as part of a larger network of environmental, economic, and social systems.

Until these principles become embedded, 'success' will remain performative, achieved on paper but **not aligned with planetary limits.**

The opportunity is clear: redefine success not as 'compliance' but as contribution to a living, regenerative built environment.

Here we explore how we can shift the conversation to creating a new value framework to evaluate success.

I. The Financial System Undervalues Climate Impact

- The current financing model measures success through profitability and deliverability, not environmental or social outcomes.
- Climate impact is invisible in valuations, meaning that projects achieving carbon reductions often lack in-vestor recognition.
- Developers and contractors perceive low-carbon construction as riskier or more expensive, limiting up-take of innovation.
- Risk aversion among insurers, funders, and procurement teams slows change — innovation is penalised ra-ther than rewarded.

II. Innovation and Risk Perception

- 'Perceived risk' around new methods (e.g., MMC, CLT, low-carbon materials) is a barrier to scaling.
- Projects succeed only when ambitious clients champion innovation and when schemes are cost-comparable to conventional builds.
- The sector needs procurement reform and informed leadership to derisk innovation through evidence and data.

III. Leadership, Policy, and Knowledge Exchange

- Success depends on systemic coordination across government, clients, consultants, insurers, and end users.
- Policymakers must embed Net Zero across departments through demonstrator projects, upskilling, and regulation.
- Knowledge is locked in silos; there's a strong call for open-source data sharing and cross-sector knowledge hubs.
- The MRA's 20% Timber Covenant is cited as an example of how voluntary sector-wide targets can stimulate collaboration, training, and culture change.

IV. Defining 'Success' Beyond Delivery

- 'On time and on budget' is still the default definition of success, but it ignores embodied carbon, resource efficiency, and social impact.
- Success should be measured through whole-life carbon intensity ($kgCO_2e/m^2$), operational energy, and health and wellbeing outcomes.

- Identifying what success physically means looks like: the **Black and White Building** (329 $kgCO_2e/m^2$, 44 kWh/m^2 energy in use) is referenced as true success. Low carbon, cost-effective, demountable, and profitable.
- More retrofit projects are needed to replicate this success model at scale.

V. Systemic and Cultural Change

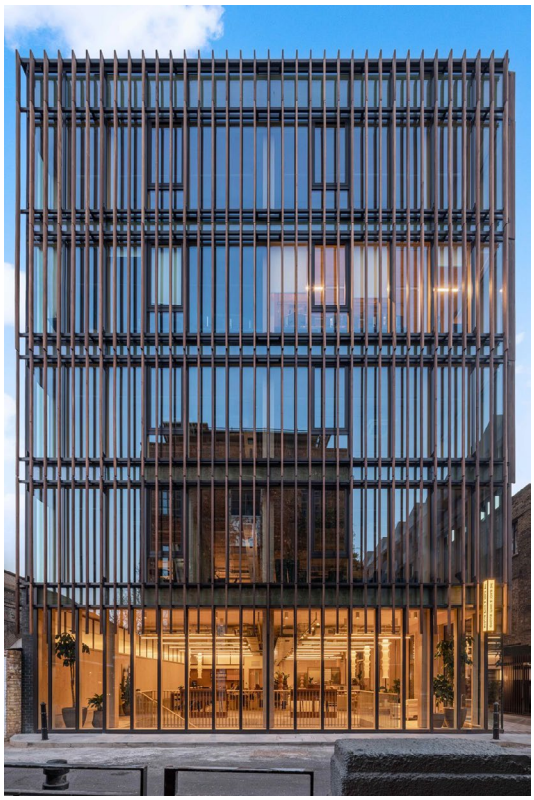
- Systems thinking is essential: success should reflect connected performance across design, construction, and end-of-life.
- There's a need for emotional intelligence and behavioural leadership, not just technical skill.
- True success lies in collaboration, transparency, and shared accountability, not isolated wins.

VI. Public Demand and Communication

- Stronger public lobbying and client education are needed to shift demand toward low-carbon solutions.
- The industry must improve communication of success stories — evidence that Net Zero design delivers commercial and wellbeing benefits.
- 'Less talk, more action' and a clear national roadmap are recurring pleas.

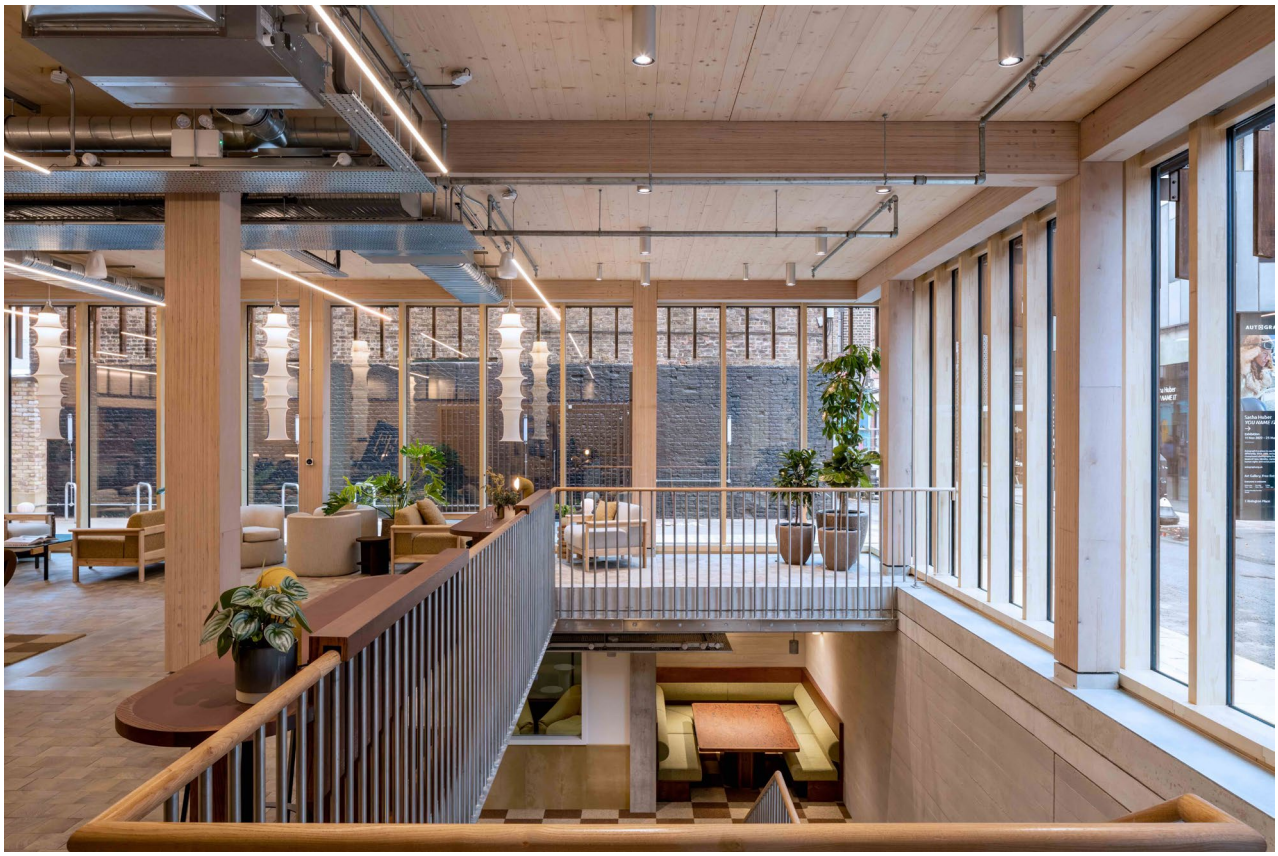
VII. Measurement and Benchmarking

- Calls for universal metrics to quantify Net Zero ROI and value creation.
- Success must be verifiable and transparent, using post-occupancy evaluation (POE) and anonymised data sharing.
- Local authorities (GLA, City of London, Westminster) are seen as leaders in whole-life carbon policy, while national consistency lags behind.



Through the optimisation of material use, the Black and White Building is the tallest engineered timber office building in central London.

Ed Reeve for Waugh Thistleton



Conclusion — Signs of Real Progress

While the conversation around 'what success looks like' rightly exposes deep structural barriers, there is also clear evidence that the industry understands what we can do to **turn the corner.** Across design studios, construction sites, policy teams and client boards, the language of Net Zero has shifted from ambition to **action.**

But we can't pretend that there doesn't remain resistance to maintain a unified Net Zero trajectory aligned to the Paris Agreement. We can't let the good work that is being achieved in reducing and removing emissions be lost to loud voices or erratic behavior.

We must not be a bystander. We must each take part in our own Net Zero leadership journey.

The built environment is no longer confined to cost and speed, but increasingly measured through carbon literacy, creativity and care for people and place. The task ahead is to build on this foundation, scale the pockets of excellence already visible, and make today's best practice tomorrow's business as usual.

The research and analysis presented here draws from extensive industry experience, academic research, and the collective insights of the NLA Net Zero Expert Panel, representing diverse perspectives across London's built environment community.

Appendix

Members of the NLA Expert Panel on Net Zero during one of their meetings at the Aldermen's Court Room, part of the 1970s extension of the London Guildhall.