
Editorial: Maintaining the equilibrium: the inextricable link between technological development and societal prosperity for all

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Throughout human history, technological and societal development have gone hand-in-hand. During the agricultural revolution, technological developments saw hunter-gatherers lay down permanent roots, cultivate crops and engage in animal husbandry rather than leading transient lives in pursuit of the resources they relied upon (Braidwood, 1960). Circa ten thousand years later, the industrial revolution saw people engaged in agricultural pursuits (i.e. the vestiges of the feudal system that had prevailed for centuries) migrate *en masse* to fledgling cities in pursuit of more prosperous lives within these emergent industrial centres. This unprecedented domestic migration required the development of residential housing provisions at a never-before-seen scale to accommodate the sheer number of people arriving in these fledgling cities (Timmins, 2014). After the industrial revolution, ever-increasing automation has reduced the deleterious health impacts associated with hard labour and facilitated the establishment of many of the workers' rights that society now takes for granted (Mishra, 2012). Indeed, irrespective of the discourse around the fortunes of differing generational groupings, people living today can consider themselves some of the "luckiest" people to have ever lived throughout human history. However, despite this unavoidable reality regarding the observable prosperity of modern society compared to historic norms, a future promising prosperity, security, as well as health and wellbeing for many people seems distant despite substantial societal and technological advances (Hickel, 2017; Blakeley, 2020). Arguably, the link between technological development and societal prosperity has been broken during the neoliberal era (cf. Harvey, 2005) with "big tech" companies securing enormous profits and subsequent dividends for shareholders, and the emergence of the world's very first trillionaire in 2026. Furthermore, while tech companies have thrived, global society has experienced simultaneous degradation of social cohesion realised via social media proliferating mis- and disinformation (Aïmeur *et al.*, 2023). Furthermore, as contemporary life has become demonstrably less laborious and life expectancies have increased as a tangible benefit of technological development (cf. Oeppen, 2019), the impact upon the natural environment has exponentially increased, coupled with the rise of consumerism (Koh and Lee, 2012; Roberts and Edwards, 2022). In a professional world dominated by the pursuit of progress and growth, it is easy to disregard factors such as biodiversity and to view the natural environment as merely a repository of resources just waiting to be exploited.

A report published by the United Nations (UN) World Commission on Environment and Development (WCED) entitled "Our Common Future" (1987) – more commonly referred to as the "Brundtland report" – established the definition of sustainability as the ability to: "*meet the needs and aspirations of the present without compromising the ability to meet those of the future.*" However, irrespective of the pressing requirement to ensure the needs of the "future" are protected, society must also question whether the "needs and aspirations of the present" are being met at a societal level, or whether this is happening for just a privileged few. More importantly, humanity must consider why the most prosperous global society in human history engenders such enormous levels of wealth inequality globally (Roberts and Edwards, 2026). To address this situation (both in terms of the present, the future, as well as environmental and social factors), the UN, itself an organisation born out of deep political and societal reflection subsequent to the horrors of the second world war, has developed a set of seventeen "sustainable development goals" (SDGs) (cf. United Nations, 2016) to avoid a dystopic future



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(Roberts and Edwards, 2022). Despite scholarly consensus regarding the current trajectory of human civilisation and the challenges it faces in terms of living in harmony with the natural environment upon which it relies (cf. Herrington, 2021), the pursuit of exponential economic growth continues to dominate political discourse, engendering further overconsumption and the subsequent relaxing of national-level sustainability targets established in response to the “Paris Agreement” (2016). The “Paris Agreement” is a legally binding international treaty adopted by 195 parties (194 parties still being bound by the agreement) at the UN Climate Change Conference (COP21) in Paris, which agreed to “*pursue efforts to limit [global] temperature increase to 1.5°C above pre-industrial levels*” (United Nations, 2015). However, it is widely considered that the overarching goal of the Paris Agreement is unlikely to be achieved, with the rate of global temperature rise having increased in pace rather than showing signs of slowing since the agreement came into force in November 2016 (Wiltshire et al., 2022). Against this context, technological development is often presented as a panacea to reducing the impact of anthropogenic climate change. Indeed, the construction sector is undergoing a process of rapid technological development and digitisation to improve both sustainability and economic performance (Roberts et al., 2018; Aghimien et al., 2021; Edwards et al., 2026a). However, the true impact of ever-increasing digitisation (as one of many avenues of technological development) is often not completely considered in terms of secondary and tertiary impacts or is simply overlooked in favour of augmenting national gross domestic product (GDP) metrics (Burton et al., 2021; Roberts et al., 2021).

In recent years, the pace of technological development has increased substantially and is having a profound impact upon established industrial practices and workflows (Gedikli et al., 2024). The emergence of artificial intelligence (AI), particularly “generative AI” (GenAI), has revolutionised the way in which many organisations function whilst simultaneously disrupting the *status quo* in terms of the stability of employment and the application of human resources within organisations (Păvăloaia and Necula, 2023). The beneficial applications of AI are undeniable. The application of AI systems within the agricultural sector is facilitating vast reductions in preventative pesticide utilisation, augmenting sustainability while simultaneously opening new markets where more stringent regulatory frameworks prevail (Dong et al., 2025). In the construction industry, emergent digital technologies have engendered substantial advances in project monitoring (Rahimian et al., 2020) as well as providing a catalyst for embedding “circular economic” principles (Elghaish et al., 2022). Furthermore, the impact upon health and safety within the construction sector, which remains a persistent issue with far too many industrial accidents being recorded, is another avenue where the potential of emergent technologies, including AI, has the potential to be profound (Edwards et al., 2026b). The ability to predict health and safety events using leading indicators (Bayramova et al., 2023, 2024) or to utilise machine learning to identify the antecedents of a health and safety incident to prevent future occurrences (Bortey et al., 2024a, b) has the potential to drastically reduce the number of deaths and life-changing injuries within the sector. However, the application of AI to all industrial practices and workflows, particularly when focused upon profit and efficiency, without prior consideration of the human impact, has led to profound changes in employment, with AI now cited as the leading reason for “layoffs” (Edwards et al., 2026c; Roeloffs and Folk, 2026). The impact upon education and training has also been substantial (Sozon et al., 2026). While debates regarding GenAI abound within higher education (HE) in terms of the ability for academics to reliably certify the next generation of emergent professionals, a far more pressing issue regards the observed decline in graduate employment opportunities (Jung et al., 2024) which in turn is contributing to a “perfect storm” of contributory factors currently impacting upon the HE sector (Roberts and Edwards, 2025). This is despite prevailing research espousing the industrial need for soft skills, including communication, teamwork and leadership, being required within the next generation of graduates (Posillico et al., 2023).

Against the aforementioned context, the built environment represents a foundational pillar underpinning the prosperity of national economies while simultaneously representing the “front line” in terms of the tension between economic performance and societal benefit (OHCHR,

2014). The provision of housing within global north economies – many of which are facing entrenched housing crises despite ever-increasing sophistication in terms of the technological innovations available to the sector – is a prominent example (Roberts and Edwards, 2026). Over the course of the last half-century, the influence of adopting the neoliberal economic ideology has shifted the underpinning rationale of housing provision from providing protection from the elements and a catalyst for human activity (Clark, 2002; Roberts and Edwards, 2026) to a financial opportunity for personal wealth generation (Blakeley, 2020). When considered against the contextual backdrop of the 2008 financial crisis (cf. Stuckler *et al.*, 2017) and subsequent austerity measures implemented, which saw drastic cuts in public sector funding (Roberts and Edwards, 2026), this degradation of public services has engendered a confluence of factors that are diminishing the health and prosperity of working people (Evans *et al.*, 2003). In turn, this has engendered increasing political instability, polarisation and even civil disorder (coupled with the impact of online mis- and disinformation) as rampant wealth inequality becomes increasingly entrenched (Blakeley, 2019; Squires and Webber, 2019). Subsequently, it is the duty of built environment academics to provide solutions to entrenched problems, reestablishing the built environment sector as the foundation of societal prosperity. Such ambitions can be achieved via the provision of sustainable underpinning infrastructure as a catalyst for societal prosperity rather than facilitating the profit motivations of “big business” and augmenting the political desire for ever-increasing GDP metrics.

In view of both the opportunities and challenges facing a technologically enabled construction sector and its subsequent impact upon wider society, this issue of *Smart and Sustainable Built Environment* (SASBE) presents tangible contributions to these interconnected factors. Pertinent insights are presented on topics including innovations in construction technology; augmenting the delivery of affordable housing; reducing the environmental footprint of the construction sector through reduction of wastage; and diminishing established employability barriers for emergent built environment professionals. The academic work presented in these vital areas of investigation provides a road map to achieving the noble objective of a built environment sector that exists in equilibrium with the society that it serves. It is highly encouraging that scholars working within the built environment academic sphere continue to prioritise augmenting the vibrancy of human civilisation and its ability to overcome even the most entrenched societal challenges, as evidenced in this latest issue of SASBE.

Smart cities, urban environments and sustainable communities

The first cluster addresses the planning, design and social dynamics of smart and sustainable urban environments. Alkhalifa (2024) surveys 400 residents across global megacities to assess readiness for smart sustainable city transformation, finding that sustainability is consistently prioritised over technological intelligence, with persistent gaps in education, political will and funding constraining progress. Ibrahim *et al.* (2025) extend this urban lens to the Arab region, examining how cultural heritage and social cohesion shape smart city development in Sharjah, Lusail and SEKEM Egypt, concluding that cultural dimensions must be integral to SDG-aligned urban frameworks rather than treated as secondary considerations. Kavishe *et al.* (2025) address the acute challenge of informal settlements in Tanzania, using exploratory factor analysis to classify nineteen infrastructure challenges into four categories – economic, housing and health, social and cost and quality – providing a taxonomy to guide inclusive urban policy. Khotbehsara *et al.* (2025) review a decade of Space Syntax research through a PRISMA-guided systematic review, identifying a significant gap in studies of moderate- and low-density city centres and calling for greater integration of emerging technology-based tools in walkability analysis. Abdul Aziz *et al.* (2025) examine female safety perceptions in urban alleys in Kuala Lumpur, identifying open sightlines, adequate lighting and community presence as the features most strongly associated with perceived safety among female users, with direct implications for urban design policy.

Digital and immersive technologies in construction and the built environment

The second cluster examines the role of digital and immersive technologies in transforming construction processes and building performance assessment. [Anwar and Azhar \(2025\)](#) provide a comprehensive PRISMA review of reality capture technologies – including laser scanning, photogrammetry and video capture – across five years of literature, cataloguing applications in progress monitoring, quality control and BIM integration and identifying data complexity and cost as persistent barriers to wider adoption. [Macchiaroli et al. \(2025\)](#) conduct the first systematic review focused exclusively on extended reality impacts on residential real estate valuation and economic project management, finding that XR technologies reduce construction costs and enhance decision-making transparency, though mixed reality remains substantially underexplored. [Azmi et al. \(2025\)](#) apply the stimulus-organism-response framework to a systematic review of virtual reality in indoor daylight visual comfort assessment, identifying four factor clusters – window, light, natural and spatial properties – and proposing a conceptual model for VR-based comfort evaluation in residential settings. [Almhafdy and Al-Shargabi \(2025\)](#) develop deep learning models to predict heating and cooling loads and solar panel output in arid climate residential buildings, achieving high predictive accuracy and demonstrating a pathway to near-zero-energy building design. [Purushothaman et al. \(2025\)](#) undertake a double systematic literature review of SMART technologies in construction health and safety, mapping BIM, VR/AR, wearables and drones to the “Fatal Five” risk factors and identifying further hazard categories – including fire, vibration and weather – where technology adoption remains underdeveloped.

Industrialised construction, waste reduction and sustainable materials

The third cluster addresses the industrialisation of construction and the drive to reduce waste and material impact across the project lifecycle. [Kauppinen et al. \(2024\)](#) conduct a systematic review of 121 articles to clarify the contested definition of industrialised construction, identifying four main themes and proposing a unified definition: the adoption of practices that minimise project-specific work from design to end of life. [Kujala et al. \(2025\)](#) complement this definitional work with a qualitative case study of industrialised wooden multi-storey construction in Finland, finding that concept inflexibility, design fidelity gaps, inconsistent regulatory interpretation and cash flow management constrain the sector’s industrialisation trajectory. [Hamzeh and Noueihed \(2024\)](#) present a novel holistic framework combining value stream mapping, simulation and fuzzy logic to assess production system state in an offsite construction facility, demonstrating that lean interventions that produce local improvements can simultaneously damage overall system performance. [Tong et al. \(2024\)](#) address construction and demolition waste from the design stage, reviewing fifty articles under PRISMA to develop a conceptual decision support framework for selecting designing-out-waste solutions. [Shooshtarian et al. \(2025\)](#) examine public opposition to construction and demolition waste recovery facilities, identifying five opposition categories and proposing eight strategies and a six-step management framework for policymakers. [Singh et al. \(2025\)](#) evaluate the feasibility of substituting freshwater with harvested rainwater, stormwater and borewell water in concrete production, finding only minor differences of 2–3 per cent in mechanical properties and identifying stormwater as the most cost-effective and environmentally beneficial alternative, with seawater unsuitable due to its chloride content.

Governance, policy and regulatory frameworks

The fourth cluster examines governance, policy and regulatory dimensions of sustainable built environment delivery. [Tutak and Brodny \(2024\)](#) develop a European Green Deal Index using eighteen indicators and a multi-criteria evaluation approach to assess implementation progress across all twenty-seven EU member states between 2019 and 2021, finding significant disparities between established and newer member states, with Sweden, Denmark and the

Netherlands leading and Bulgaria and Cyprus recording the weakest results. [Al-Mhdawi et al. \(2024\)](#) contribute a position paper examining publicly funded infrastructure projects as instruments of public policy through a legal framework lens, arguing that policy ambiguity is more likely to hinder than facilitate effective project delivery and calling for greater attention to the legal complexities inherent in such projects. [Francis et al. \(2024\)](#) investigate environmental sustainability in stadiums through twenty expert interviews spanning five continents, proposing an Environmentally Sustainable Stadium Process Model and identifying legislation, competitive advantage and stakeholder pressure as the key drivers of sustainable feature adoption. [Isang et al. \(2025\)](#) explore stakeholder engagement as a mechanism for advancing SDG attainment in the Nigerian construction industry, finding through qualitative interviews with twenty-two practitioners and policymakers that industry norms, governance failures and socio-cultural factors are the primary inhibitors, with policy implementation, training and professional practice identified as enablers.

Workforce, social equity and human-centred environments

The fifth cluster addresses workforce development, social equity and the human dimensions of the built environment. [Wong et al. \(2024\)](#) apply the Fuzzy Delphi and DEMATEL methods to identify and rank fifty-four sustainable housing attributes across six dimensions in rural Malaysia, demonstrating that economic benefits are the strongest driver of social implications and that government participation and lifecycle cost reduction are the top-priority criteria. [Alkilani and Loosemore \(2024\)](#) examine the barriers faced by skilled female migrants seeking employment in the Australian construction industry through sixteen semi-structured interviews, finding that intersecting factors of gender and migration status produce profound negative impacts on confidence, health and well-being and recommending mentorship programmes, inclusive recruitment practices and social procurement policies. [Yam et al. \(2025\)](#) employ co-design workshops with a uniquely broad stakeholder cohort – including property leaders, academics, students and university executives – to develop four strategies for future-proofing property workforces in the age of Property Industry 4.0, centred on AI-focused curriculum reform, professional body regulation, industry certification and soft skills development. [Nieberler-Walker et al. \(2025\)](#) draw on interviews with twelve global healthcare designers to establish five systematic steps for integrating therapeutic hospital gardens into clinical care, offering the first practitioner-facing guidelines for this underserved area of sustainable healthcare design.

Taken together, the twenty-four papers in this issue constitute a substantial contribution to built environment scholarship. They span quantitative and qualitative methodologies, draw on evidence from six continents and address the built environment at scales ranging from the material composition of concrete to the policy architecture of the European Green Deal. What unites them is a commitment to understanding and improving the environments in which people live, work and move – environments that are simultaneously the product and the precondition of sustainable development. The editors express their sincere gratitude to all contributing authors and to the reviewers whose expertise and diligence have ensured the quality of this collection. Future contributions that advance these interconnected themes are warmly welcomed.

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