BUILDINGS & CITIES

Designing for pro-environmental behaviour change: the aspiration–reality gap

RESEARCH

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ABSTRACT

Built-environment designers (architects, landscape architects and urban designers) shape the spatial and material conditions that support or hinder pro-environmental behaviours (PEBs). This study examines the gap between designers' aspirations (the PEB outcomes they wish to enable) and their perceived reality (feasibility judgements under present institutional and project conditions) across five domains where designers exert material influence: recycling, energy conservation, sustainable transport, food growing and biodiversity-supportive gardening. Survey responses from UK-based design practitioners (n = 577) reveal a pervasive aspiration–reality gap, with aspirations exceeding perceived feasibility across all domains. The gap is smallest for lower dependency interventions and largest for higher dependency measures requiring organisational or political coordination. Around one-quarter of variance is attributable to between-person differences, with the remainder being intervention specific. Aspirations and perceived realities are strongly aligned across domains. Alignment is strongest in stewardship-dependent domains (food-growing; biodiversity-supportive gardening) and weakest in sustainable transport. This pattern suggests designers calibrate ambition to perceived delivery pathways, but coupling loosens where pathways are externally controlled or contested. These findings highlight the need to reduce institutional constraints shaping feasibility judgements and strengthen designers' behavioural-design capability and the professional sustainability baseline. Together, these measures can help to enable the facilitation of low-carbon, resource-efficient lifestyles.

PRACTICE RELEVANCE

Built-environment designers (architects, landscape architects and urban designers) reported aspirations that exceeded what they judged feasible under current delivery conditions. Narrowing this gap depends less on exhorting higher ambition than on making PEB-supportive design routinely deliverable in practice. Three near-term priorities are as follows. (1) Institutional reform (procurement, approvals, stewardship): embed behavioural criteria in briefs and approvals; move procurement beyond lowest

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capital cost; streamline pathways for high-dependency measures (notably sustainable transport); and resource long-term stewardship. (2) Professional empowerment (capability and confidence): strengthen behavioural-science literacy, evidence-based briefing, and user-centred stewardship guidance through continuing professional development and professional standards. (3) Strengthen the evidence base: normalise post-occupancy evaluation and operational feedback; use these data to test perceived feasibility against delivered interventions and realised behavioural/operational outcomes; codify learning into repeatable guidance and specifications.

1. INTRODUCTION

The escalating climate crisis demands rapid, systemic action across sectors (IPCC 2023). Central to this challenge is the need for widespread adoption of pro-environmental behaviours (PEBs), understood as actions undertaken, deliberately or habitually, to lessen environmental footprints (Steg 2023; Stern 2000). The spatial and material attributes of built environments can influence these behaviours, shaping whether sustainable living is enabled or constrained (Steg & Vlek 2009; UN-Habitat 2020). Accordingly, architects, landscape architects and urban designers are well-positioned to shape built environments that actively encourage PEBs.

Despite growing interest in behaviour-change approaches, limited empirical evidence examines how these designers understand and engage with PEB-supportive interventions, or how delivery conditions shape their perceived ability to act. This gap sits within a wider recognition of the disconnect between sustainability aspirations and what built-environment designers consider feasible in practice (Brogden *et al.* 2023; RIBA 2021). Understanding this aspiration–reality gap for PEB interventions is crucial for translating professional intent into effective design strategies.

This research examines the PEB outcomes designers wish to enable (*aspirations*) and what they judge feasible under current delivery conditions (*perceived reality*). Across five PEB-relevant domains, perceived reality is used diagnostically to indicate where delivery systems and institutions must change to make ambitious PEB-supportive design achievable. By identifying where aspirations diverge from feasibility judgements, the study provides evidence for more effective integration of PEB-oriented strategies into built-environment design practice.

2. BACKGROUND AND RESEARCH QUESTIONS

2.1 CONTEXTUAL FACTORS, DELIVERY DEPENDENCY AND PERSONAL SUSTAINABILITY ORIENTATION

Conceptually, the role of built-environment designers in accelerating PEBs is best understood as *bounded professional agency within a socio-technical delivery system*. Designers shape the spatial and material conditions through which everyday practices unfold (Maier *et al.* 2009; Janda 2011), but their design decisions do not directly determine end-user actions. Instead, they create environments that make PEBs easier or harder to enact. Research distinguishes behaviour-changing interventions ranging from micro-level 'nudges' (Thaler & Sunstein 2008) to material and infrastructural changes that reconfigure behavioural contexts (Abrahamse 2019; Steg & Vlek 2009; van Valkengoed *et al.* 2022). In practice, architects, landscape architects and urban designers most directly influence the latter: structurally embedded interventions delivered through spatial design, specification, infrastructure and operational arrangements (Janda 2011; Hürlimann *et al.* 2022). However, what designers can credibly propose, and deliver, is conditioned by commissioning and procurement logics, statutory powers, and long-term stewardship arrangements (Cole 2005; du Plessis 2007; Ansell & Gash 2008). In this framing, facilitation for PEB-supportive design depends on institutional alignment that makes interventions contractible and defensible (briefing and procurement), permissible (planning/approvals and governance) and durable (funded stewardship and operational responsibility). Accordingly, this study treats designers' feasibility judgements as

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an upstream indicator of where delivery systems must change to shift realised PEB enablement towards professional aspiration. Here, 'interventions' denotes design, specification, infrastructural and operational decisions that shape behaviours; questionnaire references to 'nudge' are interpreted as shorthand for these PEB-enabling design and delivery decisions rather than choice-architecture micro-interventions alone (Thaler & Sunstein 2008).

Despite this potential agency, designers operate within a web of *contextual factors* that shape what interventions can be proposed, defended and delivered. Evidence from UK practice and professional commentary points to recurring frictions, such as cost and programme pressure, value engineering, procurement and regulatory constraints, organisational routines, and limited client engagement, that narrow practitioners' scope to act (RIBA 2021; Bradley & Perisoglou 2025). Client control of briefs and procurement is particularly consequential: where measures are not specified as contractual or performance requirements, they are readily downgraded under time, cost and liability pressures (Cole 2005; RIBA 2021). Comparable patterns are reported internationally, with practitioners citing entrenched norms, limited budgets and weak implementation pathways that sustain the ambition–outcome gap (Ahn *et al.* 2013; Brogden *et al.* 2023). At a systems level, policy fragmentation and procurement logics can further dilute sustainability objectives by dispersing responsibility and privileging short-term cost minimisation over longer term performance outcomes (du Plessis 2007; Ohene *et al.* 2022). How such contextual factors specifically configure delivery of PEB-supportive interventions (rather than sustainability delivery in general) remains under-researched, and while the current study does not measure such barriers directly, it treats them as interacting factors that shape what is judged feasible and defensible.

Within this mix of contextual factors, *delivery dependency* (used here as an operational framing of *delivery-side complexity*) differentiates PEB-supportive domains. It is defined as the aggregate structural, financial, organisational and political effort required to realise a PEB-relevant measure, capturing professional delivery conditions rather than the behavioural effort required of end-users. High-dependency interventions typically require extensive coordination, statutory alignment or infrastructure change (*e.g.* active travel networks), whereas low-dependency interventions require more limited modification or permission (*e.g.* clear recycling provision). In this study, delivery dependency is used as a theory-led domain classification to interpret differences between intervention areas, rather than as a measured project-level variable.

Designers also bring a *personal sustainability orientation*, conceptualised as a relatively stable disposition grounded in biospheric values, environmental identity and professional commitments to sustainability (Clayton 2003; Stern 2000). While contextual factors vary between projects, this orientation is likely to shape how constraints are interpreted and how vigorously PEB-relevant strategies are pursued. Here it is treated as a conceptual baseline rather than operationalised using a validated multi-item scale; interpretation is therefore cautious where between-person consistency is observed.

Together, *contextual factors*, *delivery dependency* and *personal sustainability orientation* offer an interpretive framework for understanding how designers evaluate which PEB-supportive measures should be pursued and what is realistically deliverable. These evaluations are operationalised as aspiration and perceived reality scores. Importantly, perceived reality denotes professional judgement of feasibility under present delivery conditions rather than post-occupancy outcomes. While this does not measure realised PEB engagement, these judgements still matter because they shape what is proposed, advocated for and designed into projects. These judgements therefore form an upstream point of origin for later PEB-relevant outcomes.

2.2 PEB-RELEVANT PRACTICE DOMAINS AND THEIR DELIVERY DEPENDENCY

This research focuses on five PEB-intervention areas: (1) promoting sustainable transport use; (2) supporting waste recycling; (3) enabling food growing; (4) enhancing energy conservation; and (5) designing for biodiversity-supportive gardening. These domains were selected because they span household- and neighbourhood-scale practices, map onto concrete decision points within architectural, landscape and urban design work, and are associated with established behaviour-change potential. Consistent with Section 2.1, they also vary in delivery dependency, allowing the domains to be positioned along a low–high dependency spectrum that clarifies both where designers exert influence (through design, specification, procurement and stewardship decisions) and why feasibility judgements may differ under prevailing contextual factors.

At the lower dependency end of the spectrum sit recycling and energy conservation. These practices often align with comparatively lower cost, routine pro-environmental actions for end-users (Rau *et al.* 2024) and, from a delivery perspective, are commonly more standardisable within project teams and building–operator interfaces. Experimental evidence indicates that making residual-waste disposal less convenient than recycling can increase recycling, while tailored 'how-to' prompts can reduce contamination (Rosenthal & Linder 2021). Designers can translate these principles into materially embedded provision through the location, visibility and accessibility of bin stores, layouts that reduce contamination, and supportive signage and wayfinding (Bernstad 2014; Knickmeyer 2020). Energy conservation likewise depends not only on technical performance but also on the usability of building systems: control legibility, ventilation strategies, feedback through metering or displays, and the alignment of interfaces with users' routines can enable lower energy practices and reduce performance gaps (Janda 2011; Harputlugil & de Wilde 2021). Such measures are often incorporated through established spatial standards and routine specifications (*e.g.* BS 5906:2005 for waste-management arrangements in buildings; BSI 2005) and coordinated within relatively bounded delivery networks, potentially supporting comparatively higher feasibility judgements in professional appraisals.

By contrast, sustainable transport, biodiversity-supportive gardening and food growing can sit toward the higher dependency end of the spectrum, because delivery commonly hinges on wider governance structures, multi-actor coordination and the durability of operational responsibility over time (Ansell & Gash 2008; Marsden & Rye 2010; Dempsey & Burton 2012). Sustainable transport interventions frequently require street-space reallocation, network continuity and integration with broader mobility systems, and thus depend on governance capacity, cross-agency cooperation, funding alignment and political support (Banister 2008; Bertolini *et al.* 2005; Marsden & Rye 2010). Within projects, designers can shape uptake through street layouts and permeability, and by the quality, continuity, and usability of walking and cycling provision (including crossings and end-of-trip arrangements), features widely associated with active travel uptake and modal choice (Pucher & Buehler 2010; Hickman & Huaylla Sallo 2022). However, because these decisions are often politically and publicly contested and negotiated across multiple institutions, feasibility is frequently shaped by dependencies beyond the designer's immediate control (Banister 2008; Marsden & Rye 2010).

Biodiversity-supportive gardening and food-growing are also commonly higher dependency because they rely on stewardship and ongoing management, often mediated through maintenance practice and the conditions shaping demand for professional wildlife-friendly maintenance, alongside resourcing beyond one-off capital delivery (Dempsey & Burton 2012; Barthel *et al.* 2015; Kalauni *et al.* 2023; Naumann *et al.* 2011). Biodiversity-supportive design, through species selection, habitat structuring and domestic-garden guidance, can support wildlife-friendly gardening and contribute to urban biodiversity conservation (Goddard *et al.* 2010; Aronson *et al.* 2017). Because uptake depends on household participation and ongoing practice, designers' strategies often need to align with residents' motivations and capacities to garden (Chalmin-Pui *et al.* 2021). Food-growing is treated here as a PEB domain only where it is implemented as small-scale, soil-appropriate, low-input provision, with safeguards that avoid the risks associated with poorly managed urban agriculture (Barthel & Isendahl 2013; Langemeyer *et al.* 2021). Designers shape these outcomes through spatial allocation, water access, storage and composting provision, and governance or stewardship models that support long-term engagement. Across both domains, maintenance plans, management contracts and post-occupancy protocols are often decisive for sustaining uptake over time (Dempsey & Burton 2012). Where governance arrangements, incentives or long-term support are weak, implementation may stall or prove difficult to sustain (Ansell & Gash 2008; Kabisch *et al.* 2015).

Together, these five domains represent materially influenceable levers for built-environment designers, rather than purely aspirational areas of practice. Comparing aspiration and perceived reality across domains that differ in delivery dependency therefore provides a structured basis for identifying where institutional and delivery reforms are most needed to shift feasibility towards ambition.

2.3 RESEARCH QUESTIONS AND HYPOTHESES

The study examines how designers evaluate their capacity to support PEBs across five domains of practice via four research questions:

- RQ1: Is there a gap between designers' aspirations and their perceived reality of being able to encourage PEBs across different intervention types?
- RQ2: Do aspirations, perceived realities and the gap between them differ across intervention types?
- RQ3: To what extent are aspirations and perceived realities correlated across intervention types?
- RQ4: Is the variance in aspirations and perceived realities driven more by individual professional disposition or by intervention-specific characteristics?

In other words, the study tests whether practitioners want to do more to support PEBs than they judge deliverable at present; whether this varies by domain as delivery dependency changes; if ambition tracks feasibility; and the extent to which responses reflect stable between-person tendencies versus domain-specific delivery conditions. Accordingly, four hypotheses are proposed.

> *Hypothesis 1: Designers will report higher aspirations for delivering PEB-supportive interventions than they judge feasible under current delivery conditions across all intervention types.*

This hypothesis proposes that built-environment designers are motivated to encourage environmentally friendly behaviours, but frequently perceive limitations in translating this intent into practice. Individual-level psychological factors, including pro-environmental concern, personal values and social norms, interact with institutional and project constraints to produce well-documented 'value–action' or 'attitude–behaviour' gaps (Gifford 2011; Kollmuss & Agyeman 2002; Dioba *et al.* 2024). Ajzen (1991) clarifies these dynamics by emphasising the role of *perceived behavioural control* in shaping whether intentions become action. As such, even highly motivated designers may struggle to implement PEB-supportive measures when faced with inadequate infrastructure, conflicting norms or limited financial resources (Bamberg & Moser 2007; van Valkengoed *et al.* 2022). Such constraints align with the contextual factors introduced in Section 2.1 and with broader evidence that procurement and governance arrangements, budgetary pressures and conservative delivery norms can systematically weaken the translation of sustainability intent into deliverable design outcomes (Cole 2005; du Plessis 2007; RIBA 2021). In this study, the 'reality' term is treated as perceived feasibility under prevailing delivery conditions, rather than realised post-occupancy outcomes.

> *Hypothesis 2: Interventions with lower delivery dependency will be associated with (1) higher aspiration and (2) higher perceived-reality scores and (3) a smaller aspiration–reality gap than interventions with higher delivery dependency.*

This hypothesis anticipates systematic variation in aspirations and perceived reality across domains as delivery dependency increases. Behavioural research consistently indicates that more routine, lower cost and lower disruption actions tend to be adopted more readily than higher cost, higher disruption alternatives (Rau *et al.* 2024; Diekmann & Preisendörfer 2003). Relatedly, the gap between pro-environmental intentions/aspirations and action tends to be smaller in low-cost situations than in high-cost ones (Diekmann & Preisendörfer 1998; Gifford 2011). Population studies further illustrate that 'everyday' PEBs are reported at substantially higher rates than more demanding practices (*e.g.* Teixeira *et al.* 2023).

The relevant 'friction' is translated here from end-user effort to professional delivery conditions. Lower dependency interventions are expected to be judged more feasible because they are more readily standardised and typically entail fewer approvals and fewer cross-actor dependencies, whereas higher dependency interventions are more exposed to delivery frictions, as introduced in Section 2.1 (Ansell & Gash 2008; Dempsey & Burton 2012; Marsden & Rye 2010). Consistent with Ajzen's (1991) account of perceived behavioural control, higher delivery dependency is therefore expected to depress perceived reality and widen aspiration–reality divergence. Applying the domain classification in Section 2.2, aspiration and perceived-reality scores are expected to be higher, and the aspiration–reality gap smaller, for lower dependency domains (*e.g.* recycling, energy conservation) than for higher dependency domains (*e.g.* sustainable transport, food growing, biodiversity-friendly gardening).

> *Hypothesis 3: Aspirations and perceived realities will be positively correlated across all intervention types. However, the strength of this correlation will vary by delivery dependency, with weaker aspiration–reality alignment expected as delivery dependency increases.*

This hypothesis anticipates that designers who report higher aspirations for delivering PEB-supportive interventions will also judge delivery to be more feasible, but that alignment will weaken as delivery dependency increases. Whereas Hypothesis 2 concerns how delivery dependency shifts average aspiration, perceived reality and their gap across domains, Hypothesis 3 tests whether delivery dependency also conditions how tightly individual designers' aspirations track their feasibility judgements within each domain. Higher dependency interventions typically entail additional potential points of disruption, most directly those embedded in the contextual factors outlined in Section 2.1 (*e.g.* approvals, procurement constraints, multi-actor coordination and long-term operational responsibility), which may reduce how consistently aspiration tracks perceived feasibility across domains. Empirical work suggests that intention–behaviour consistency is context-contingent and tends to be stronger where costs and disruptions are lower and where routines and convenience support follow-through (Diekmann & Preisendörfer 1998, 2003). Translating this to professional delivery conditions, accumulated contextual frictions are expected to interrupt the translation of aspiration into feasibility judgements, consistent with perceived behavioural control as a key mediator between intention and action (Ajzen 1991; Bamberg & Moser 2007; Gifford 2011). Accordingly, while positive aspiration–reality correlations are expected across domains, the strongest coupling is predicted for lower dependency domains (recycling; energy conservation), with weaker coupling expected in higher dependency domains (sustainable transport; food growing; biodiversity-supportive gardening).

> *Hypothesis 4: Designers will display between-person differences in their overall levels of aspiration and perceived reality (consistent with stable person-level tendencies), while within-person scores will vary across intervention types (consistent with intervention-specific delivery conditions).*

This hypothesis examines sources of variance in professional responses, drawing on constructs introduced in Section 2.1. It anticipates that individual professional disposition acts as a stable baseline (personal sustainability orientation), while intervention-specific characteristics drive fluctuations in feasibility (delivery dependency). Environmental identity is widely regarded as a stable self-concept (Clayton 2003; Whitmarsh & O'Neill 2010), and biospheric values systematically influence pro-environmental intentions and preferences (Stern 2000). These factors imply that designers differ in their general level of aspiration and perceived capacity. Because this study does not administer a validated multi-item dispositional scale, personal sustainability orientation is treated as a conceptual account of stable between-person tendencies rather than a directly measured construct. At the same time, the structural, financial, organisational and political effort required for specific interventions, together with contextual factors introduced in Section 2.1, such as client expectations, regulatory constraints, procurement routes and funding conditions, necessitates case-by-case recalibration of feasibility judgements (Ajzen 1991; Bamberg & Moser 2007; Gifford 2011). Designers' evaluations are therefore expected to exhibit a dual pattern: a stable personal orientation towards PEB-supportive design coexisting with systematic within-person variation shaped by the distinct delivery dependencies of each intervention type. This logic integrates the mechanisms outlined in Hypothesis 2 (dependency-driven differences) and Hypothesis 3 (context-sensitive coupling between aspiration and feasibility).

3. METHOD

3.1 STUDY DESIGN

A self-administered questionnaire (for the full questionnaire, see the supplemental data online) was constructed in Google Forms to capture built-environment designers' (architects, landscape architects and urban designers) evaluative judgements concerning their capacity to support PEBs. In line with the conceptual framework outlined in Sections 2.1 and 2.2, two dimensions of professional judgement were assessed: aspiration and perceived reality, operationalising what designers seek to pursue and what they judge feasible under prevailing delivery conditions.

Five intervention types were included: (1) sustainable transport; (2) recycling of rubbish/waste; (3) food growing; (4) energy conservation; and (5) biodiversity-friendly gardening. For each intervention, participants responded to two 10-point Likert-type items (1 = 'Never', 10 = 'Always'):

- Aspiration: 'How often do you aspire to deliver interventions that nudge people to [intervention]?'
- Perceived Reality: 'How often are you able to deliver interventions that nudge people to [intervention]?'

Although the questionnaire employed the term 'nudge', reflecting common behavioural terminology and professional vernacular, analysis and interpretation follow Section 2.1 in treating responses as judgements about structurally embedded PEB enablement, rather than micro-level-choice architecture alone. Original item wording is retained for transparency.

Before beginning the questionnaire, participants viewed a participant information sheet outlining the study's purpose, what participation involved, the voluntary nature of participation, the right to withdraw (by exiting before submission), confidentiality arrangements and data-handling. Participants could proceed only after providing informed consent via a mandatory tick-box statement indicating they understood the information provided and consented to take part by completing the questionnaire. Responses were transmitted to the research team only upon completion and submission; partially completed questionnaires were not recorded.

3.2 SAMPLING AND DATA COLLECTION

Email addresses were obtained from open-access, non-selective UK professional directories: The Royal Institute of British Architects (RIBA) (n = 12,013); the Landscape Institute practice listings (n = 424) plus individual practitioner webpages (n = 1624); and the Urban Design Group directory (n = 197). A personalised email invitation containing the survey link was distributed in February 2024; a reminder followed three weeks later. The survey remained open for six weeks.

In total, 577 completed responses were received: 420 architects (72.7%), 130 landscape architects (22.5%) and 27 urban designers (4.7%). The sample represented a broad span of experience (from 0–5 to > 20 years) and included a diverse gender distribution.

3.3 DATA ANALYSIS

Analyses were performed in R 4.4.0 (R Core Team 2024). Table 1 summarises the analytical strategy.

Effect sizes are reported as Cohen's d (paired) for RQ1; partial η^2 and partial ω^2 for the LMMs in RQ2; Pearson's r for RQ3; and intraclass correlation coefficient ICC(1) for RQ4, each with 95% confidence intervals (CI). The aspiration–reality gap was computed per participant and per intervention as the simple difference between that participant's aspiration score and the corresponding perceived-

RESEARCH QUESTION	PRIMARY ANALYTIC MODEL	POST-HOC/EFFECT SIZE	RATIONALE
RQ1: Is there a gap between designers' aspirations and their perceived reality of being able to encourage pro-environmental behaviours across different intervention types?	Paired *t*-test (aspiration versus reality) for each of the five interventions; Wilcoxon signed-rank used if Shapiro–Wilk $p < 0.05$	Cohen's *d* (paired) + 95% confidence interval (CI)	Tests the within-person aspiration–reality discrepancy
RQ2: Do aspirations, perceived realities and the gap between them differ across intervention types?	Three separate linear mixed-effects models (LMMs) with a random intercept for the participant: • Aspiration ~ intervention • Perceived reality ~ intervention • Gap ~ intervention	Kenward–Roger *F*-tests; Tukey-adjusted pairwise contrasts; partial η^2 and partial ω^2 (95% CI)	Retains all five repeated measures per person, accounts for within-subject correlation and quantifies the variance explained by delivery dependency
RQ3: To what extent are aspirations and perceived realities correlated across intervention types?	Pearson's *r* for each intervention; Fisher's *r*-to-*z* to compare coefficients	95% CI for each *r*	Examines the strength of alignment within each intervention
RQ4: Is the variance in aspirations and perceived realities driven more by individual professional disposition or by intervention-specific characteristics?	Two-level random-intercept LMM (scores nested in persons)	Intraclass correlation coefficient ICC(1) + 95% CI	Partitions the score variance into between-person (dispositional) versus within-person (intervention-specific) components

Table 1 Statistical approaches adopted for each research question.

reality score. These individual gap values (not aggregated means) served as the dependent variable in the RQ2 mixed-effects gap model.

Although demographic and professional background data were collected, covariates were not modelled. This scope decision preserves the repeated-measures focus on domain differences and avoids over-interpretation given the brief dispositional measurement. Individual heterogeneity is captured via participant random intercepts; demographic, gender and career-stage predictors are reserved for subsequent analyses. Between-person variance identified through the ICC is interpreted as consistent with stable person-level differences (including, plausibly, personal sustainability orientation), though this remains an inference from the response structure rather than a direct dispositional measure.

4. RESULTS

4.1 RQ1: IS THERE A GAP BETWEEN DESIGNERS' ASPIRATIONS AND THEIR PERCEIVED REALITY OF BEING ABLE TO ENCOURAGE PEBS ACROSS DIFFERENT INTERVENTION TYPES?

Across all five intervention types, designers' aspirations consistently and significantly exceeded their perceived reality of deliverability. Paired-samples *t*-tests confirmed a highly reliable aspiration–reality gap for every domain (Energy: $t(576) = 19.70$, $p < 0.001$, $d = 0.82$; Recycle: $t(576) = 17.88$, $p < 0.001$, $d = 0.74$; Transport: $t(576) = 26.82$, $p < 0.001$, $d = 1.12$; Garden: $t(576) = 18.02$, $p < 0.001$, $d = 0.75$; Grow: $t(576) = 19.35$, $p < 0.001$, $d = 0.81$) (Figure 1). These results support Hypothesis 1: built-environment designers articulate strong ambitions to embed PEB-supportive interventions but judge themselves constrained in what is feasible under present delivery conditions.

4.2 RQ2: DO ASPIRATIONS, PERCEIVED REALITIES AND THE GAP BETWEEN THEM DIFFER ACROSS INTERVENTION TYPES?

Aspirations varied significantly by intervention type ($F(4, 2304) = 138.54$, $p < 0.001$, partial $\eta^2 = 0.19$) (Figure 1). Energy attracted the highest aspirations, significantly above all other interventions, while Recycle exceeded Grow and Garden, but did not differ from Transport. Grow recorded the lowest aspiration mean. Perceived reality showed an analogous pattern ($F(4, 2304) = 154.83$, $p < 0.001$, partial $\eta^2 = 0.21$) (Figure 1). Energy and Recycle were judged most feasible; Transport and Garden were statistically indistinguishable, and Grow again sat lowest.

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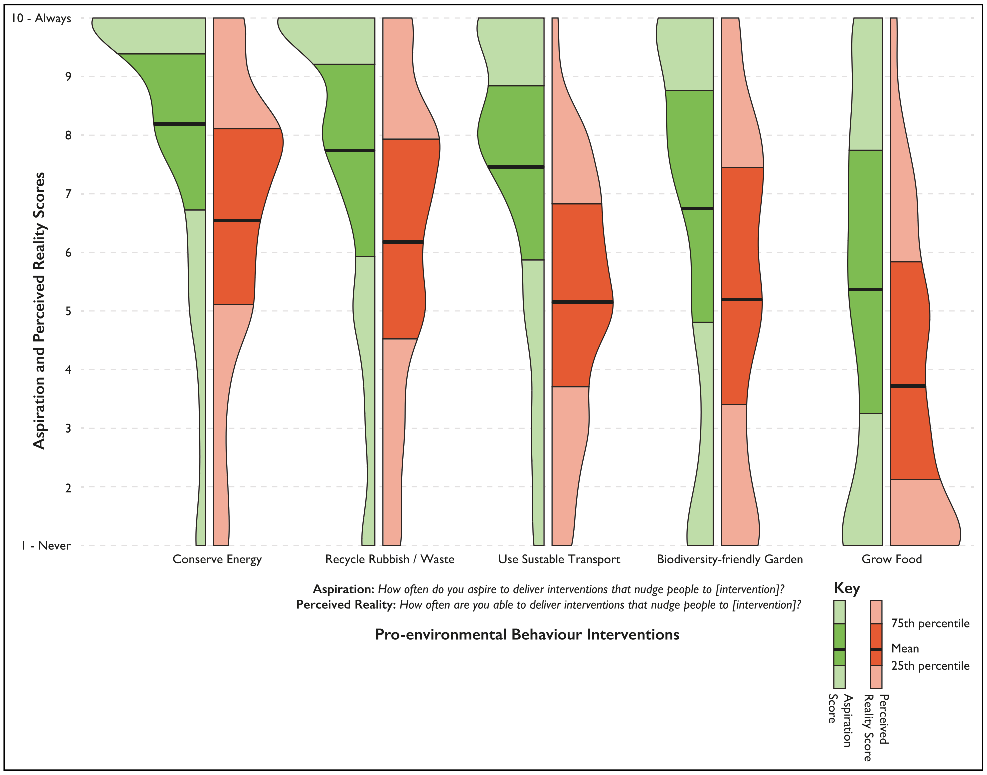

Figure 1 Violin plots of aspiration and perceived reality scores across intervention types.

Note: The horizontal width of each violin represents the probability density of responses; wider sections indicate a greater response frequency. Horizontal lines show the mean (thick) and 25th/75th percentiles (thin).

The aspiration–reality gap also differed by intervention ($F(4, 2304) = 20.58$, $p < 0.001$, partial $\eta^2 = 0.03$). However, post-hoc tests showed that only Transport exhibited a significantly wider shortfall ($\Delta = 2.31$) than every other intervention type ($\Delta \approx 1.55–1.65$). Thus, the expected amplification of the gap in higher dependency domains was most evident for sustainable transport, providing partial support for Hypothesis 2.

4.3 RQ3: TO WHAT EXTENT ARE ASPIRATIONS AND PERCEIVED REALITIES CORRELATED ACROSS INTERVENTION TYPES?

For every intervention, aspirations, and perceived realities were strongly and positively related (Energy: $r = 0.65$, 95% CI = [0.61, 0.70]; Recycle: $r = 0.67$, 95% CI = [0.62, 0.71]; Transport: $r = 0.62$, 95% CI = [0.57, 0.67]; Garden: $r = 0.76$, 95% CI = [0.73, 0.80]; Grow: $r = 0.76$, 95% CI = [0.72, 0.79]; all $p < 0.001$), confirming that designers who aspire more also feel more able to deliver in reality (Figure 2). However, contrary to Hypothesis 3's expectation that alignment would weaken with higher delivery dependency, the strongest aspiration–reality coupling occurred in the higher dependency domains of gardening and food growing ($r = 0.76$ in each). Sustainable transport showed the weakest alignment ($r = 0.62$), consistent with Hypothesis 3's direction of effect for at least one high-dependency domain, while the low-dependency domains remained strongly correlated (Energy $r = 0.65$; Recycle $r = 0.67$). Overall, the results support Hypothesis 3's positive correlation component, but provide mixed support for the dependency-gradient prediction.

4.4 RQ4: IS THE VARIANCE IN ASPIRATIONS AND PERCEIVED REALITIES DRIVEN MORE BY INDIVIDUAL PROFESSIONAL DISPOSITION OR BY INTERVENTION-SPECIFIC CHARACTERISTICS?

Designers' ratings reflected both stable between-person differences and intervention-specific judgements. The majority of variance was attributable to intervention-specific factors (72% for aspirations; 79% for perceived realities), indicating sensitivity to domain-specific delivery conditions. ICCs nonetheless confirmed meaningful between-person consistency (ICC = 0.28 for aspirations; 0.21 for perceived realities), consistent with stable person-level tendencies. When aggregated (average-measure ICC), these between-person differences showed strong reliability (aspirations: 0.66–0.72; perceived realities: 0.57–0.66). Notably, aspirations were more consistent

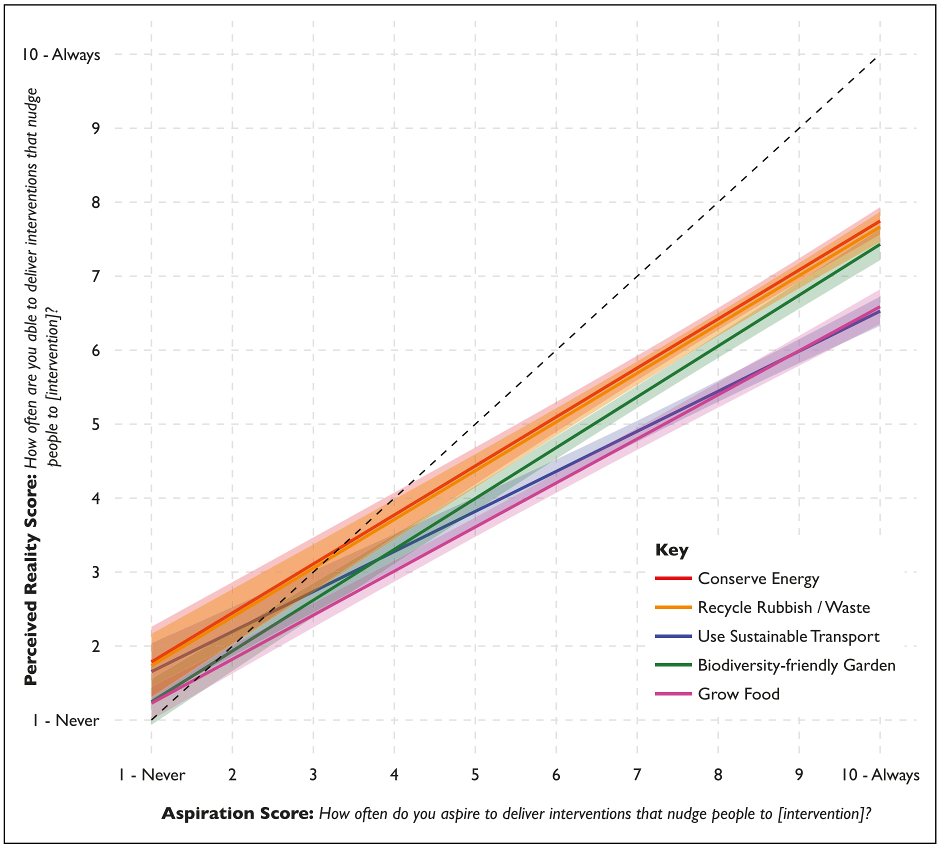

Figure 2 Correlations between aspiration and perceived reality by intervention type, showing a strong positive alignment across all domains, but a mixed dependency pattern.

across interventions than perceived realities, suggesting that general ambition is more stable than feasibility judgements across domains. These results support Hypothesis 4.

5. DISCUSSION

This study provides an empirical account of how built-environment designers evaluate their capacity to promote PEBs across multiple intervention domains. It does this by comparing the PEB outcomes designers wish to enable (*aspirations*) with those they judge feasible under present delivery conditions (*perceived reality*). The subsections below interpret the findings, drawing on behavioural and institutional theory to explain the mechanisms underpinning designers' evaluations and their implications for strengthening PEB-supportive practice.

The results support an explanatory structure in which personal *sustainability orientation*, *contextual factors* and *delivery dependency* operate as interdependent influences on professional judgement. Although personal sustainability orientation is inferred rather than directly measured, the between-person variance in aspirations and perceived realities is consistent with a motivational baseline that shapes engagement with PEB-oriented interventions. This baseline is conditioned by contextual frictions, spanning procurement, regulation, client priorities and organisational norms, visible indirectly in systematic differences in perceived reality across intervention types. Delivery dependency is used as the operational framing of delivery-side complexity: it captures the degree of institutional alignment, coordination and political commitment required for implementation. Overall, the results position behavioural and structural determinants as mutually reinforcing components of professional agency. Accordingly, the aspiration–reality gap is interpreted not simply as a matter of individual motivation or skill, but as a diagnostic signal of the delivery-system conditions that constrain, or enable, PEB-supportive design.

5.1 PEB DESIGN ASPIRATIONS OUTWEIGH PERCEIVED REALITIES

As predicted (Hypothesis 1), designers' aspirations exceeded their perceived reality across all PEB-intervention types. This consistent shortfall suggests that the aspiration–reality gap is not confined to highly delivery-dependent domains. It reflects a broader condition within contemporary practice, echoing long-standing concerns about sustainability ambition being diluted in delivery (RIBA 2021; Brogden *et al.* 2023; Ahn *et al.* 2013).

Although this study did not measure barriers directly, the pattern is consistent with evidence that procurement logics, regulatory rigidity, budget constraints and commissioning power can erode design intent (Cole 2005; du Plessis 2007; Bradley & Perisoglou 2025). Interpreted through the behavioural–structural lens established above, such contextual frictions likely function (indirectly, as reflected in perceived-feasibility judgements) as cues that certain PEB-supportive interventions will encounter resistance or lack institutional support. Designers may internalise these cues, reducing perceived behavioural control even where aspiration remains high, consistent with accounts emphasising the role of contextual constraints in shaping self-efficacy and perceived capacity to act (Ajzen 1991; Bamberg & Moser 2007). These gaps should therefore be read diagnostically as signals about delivery conditions rather than as a rationale for lowering ambition.

On this reading, the aspiration–reality gap reflects not a deficit of intent but a structurally conditioned feasibility ceiling. Reducing systemic frictions, rather than exhorting professionals to 'aim higher', is foundational to enabling PEB-supportive design.

5.2 VARIATION IN ASPIRATIONS AND PERCEIVED REALITIES IN LINE WITH DELIVERY DEPENDENCY

The magnitude and patterning of the aspiration–reality gap tracked delivery dependency, conceptualised as the aggregate structural, financial, organisational and political effort required to realise a PEB-relevant measure (Section 2.1). Lower dependency measures, most notably recycling support and energy conservation, were judged more feasible and attracted higher aspirations, consistent with evidence that lower cost, lower disruption behaviours tend to be endorsed and enacted more readily than higher cost alternatives (Diekmann & Preisendörfer 1998; Stern 2000). Contrary to a uniform widening of the gap across all higher dependency domains (Hypothesis 2), aspirations and perceived realities generally moved in parallel, with sustainable transport the clear exception. This exception is theoretically informative: transport interventions are often politically negotiated rather than technically resolved within a project boundary, so designers potentially recognise their climate relevance while simultaneously judging their delivery leverage to be low where statutory authority, network continuity and multi-agency agreement are decisive (Banister 2008; Marsden & Rye 2010).

The findings also suggest that delivery dependency is layered rather than singular. For example, sustainable transport concentrates organisational and political dependencies (Banister 2008; Pucher & Buehler 2010), whereas biodiversity-supportive gardening and food-growing are more stewardship-dependent, shifting risk and responsibility into long-term maintenance and governance arrangements (Dempsey & Burton 2012; Chalmin-Pui *et al.* 2021). Although the survey does not decompose these dependencies empirically, the domain profile is consistent with the proposition that perceived deliverability depends on which dependencies dominate, because these activate different contextual constraints and shape designers' scope to act. This distinction becomes important in Section 5.3 when interpreting why some higher dependency domains show stronger aspiration–reality coupling than predicted.

Practically, different intervention families require different facilitation. For lower dependency domains, narrowing the gap is primarily an implementation and protection task. Strengthen performance feedback and operational learning (including POE where feasible) and protect routine behavioural provisions from dilution through value engineering via clearer briefing, specification, and resourcing (Frederiks *et al.* 2015; RIBA 2021). For higher dependency domains, aspiration and feasibility are more likely to rise together when delivery pathways are strengthened. Clarify statutory routes, align budgets and responsibilities across agencies, and secure stewardship capacity so that design intent remains durable beyond handover (Dempsey & Burton 2012; Marsden & Rye 2010). In such settings, collaborative governance and outcome-based procurement can redistribute risk and align incentives (Ansell & Gash 2008; Cole 2005), while phased pilots and site-based

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demonstrators can build delivery confidence and political feasibility over time (Carlet *et al.* 2017; Rérat *et al.* 2022).

5.3 ALIGNMENT OF HEIGHTENED ASPIRATIONS WITH HEIGHTENED PERCEIVED REALITY

Aspirations and perceived realities were strongly correlated across all PEB domains (Hypothesis 3), indicating that designers who aspire more also judge delivery to be more feasible. However, the pattern did not follow the predicted delivery-dependency gradient: alignment was strongest in the higher dependency, stewardship-oriented domains (gardening; food growing), while sustainable transport, which was positioned as high-dependency, showed the weakest alignment. This divergence suggests that delivery dependency is not a single mechanism. Some high-dependency domains appear to support tight calibration between ambition and feasibility, whereas others introduce external contingencies that loosen that coupling (Ajzen 1991; Gifford 2011; Marsden & Rye 2010).

One interpretation is that stewardship-dependent domains present designers with comparatively legible delivery pathways within, or closely adjacent to, the project scope (*e.g.* specification, handover protocols, maintenance planning), making feasibility judgements feel more actionable and therefore more tightly coupled to aspiration. By contrast, sustainable transport interventions frequently depend on approvals, network continuity, statutory powers, and multi-actor agreement beyond the project boundary, meaning feasibility is more readily experienced as externally contingent and politically sensitive (Banister 2008; Marsden & Rye 2010). In Ajzen's (1991) terms, these differences map onto perceived behavioural control: where designers can identify credible pathways to implementation, aspiration and feasibility judgements move together; where delivery hinges on external authorisation and coordination, aspiration can remain high while feasibility is discounted.

Two mechanisms may underpin this coupling. First, *sensitivity to structural signals*: ambition rises when governance capacity, political backing, ring-fenced resources, or delivery partnerships make feasibility credible, consistent with perceived behavioural control and facilitation (Ajzen 1991; Bamberg & Moser 2007; Ansell & Gash 2008). Second, *domain expertise and self-efficacy:* practitioners may concentrate ambition in domains where they feel able to navigate constraints, tightening aspiration–reality alignment (Janda 2011). In both cases, institutional conditions are translated into behavioural judgements about controllability and risk, shaping what is worth proposing and defending.

Practically, this refines the facilitation logic set out in Section 5.2. Where coupling is loose (especially transport), the priority is governance/coordination: make delivery pathways credible through clearer approval and funding routes and cross-actor alignment, supported by outcome-oriented procurement and phased pilots that reduce coordination and contestation risk (Banister 2008; Marsden & Rye 2010; Ansell & Gash 2008; Rérat *et al.* 2022). Where coupling is tight (stewardship-dependent domains), the priority is implementation/protection: stabilise delivery through explicit stewardship and handover requirements and operational learning, including POE where feasible (Frederiks *et al.* 2015; Janda 2011).

5.4 BALANCED INFLUENCE OF PERSONAL SUSTAINABILITY ORIENTATION AND DELIVERY DEPENDENCY

The multilevel variance analyses indicate that designers' evaluations reflect both stable between-person tendencies and intervention-specific delivery conditions (Hypothesis 4). Around one-quarter of the variance in aspirations and perceived realities lay between individuals, consistent with stable person-level tendencies often theorised in terms of biospheric values and environmental identity (Clayton 2003; Stern 2000; Whitmarsh & O'Neill 2010). This person-level component should be interpreted cautiously, as orientation is not directly measured here.

Most variance occurred within individuals across intervention types, indicating that feasibility judgements are highly sensitive to contextual factors and delivery dependency, such as

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governance arrangements, procurement constraints, stewardship requirements and political acceptability, consistent with perceived behavioural control and bounded agency (Ajzen 1991; Bamberg & Moser 2007; Gifford 2011). The greater within-person variability in perceived reality than aspiration further suggests that ambition is comparatively stable, whereas feasibility is recalibrated to domain-specific delivery conditions.

Taken together, these variance patterns align with the interpretive framework in Section 2.1: *personal sustainability orientation* provides a motivational baseline, while *delivery dependency* and *contextual factors* recalibrate feasibility judgements and therefore the size of aspiration–reality gaps across domains.

Practically, narrowing the aspiration–reality gap requires both capability-building and delivery reform: strengthening designers' sustainability literacies and 'middle-actor' capacity through education and continuing professional development can improve their ability to specify, justify and steward PEB-supportive measures through delivery (Grant 2020; Simpson *et al.* 2020). In parallel, reforms that reduce contextual friction can expand perceived behavioural control and shift perceived feasibility towards ambition. These include streamlined approvals for active travel (Banister 2008), embedding biodiversity stewardship in standard specifications (Aronson *et al.* 2017; Chalmin-Pui *et al.* 2021) and procurement models that reward behavioural outcomes rather than lowest capital cost (Cole 2005).

5.5 INTEGRATING BEHAVIOURAL AND STRUCTURAL MECHANISMS

Overall, the findings indicate that designers' evaluations of PEB-supportive interventions reflect the interaction of structurally embedded delivery conditions and person-level orientations. Through the lens of perceived behavioural control, constraints in briefing, procurement, approvals and governance are likely to be internalised as feasibility judgements that shape what is worth proposing and defending under time, cost and risk pressures, rather than reflecting a lack of aspiration (Ajzen 1991; Cole 2005; RIBA 2021). In this survey, these dynamics are visible indirectly in strong between-intervention variation in perceived reality and in the larger aspiration–reality shortfall for domains with high organisational and political dependency, most notably sustainable transport (Bamberg & Moser 2007; Gifford 2011). At the professional level, feasibility judgements may be further depressed by psychological frictions such as anticipated contestation with clients/approvers, reputational or liability risk sensitivity, and reliance on routinised specifications under programme pressure. These frictions can reduce perceived control even when pro-environmental intent remains high.

Personal sustainability orientation, treated here as a conceptual baseline rather than a directly measured disposition, may shape how strongly such structural cues influence judgement. Designers with stronger biospheric values and environmental identity may sustain higher aspirations even where feasibility appears low, whereas others may calibrate ambition downwards more readily (Clayton 2003; Stern 2000; Whitmarsh & O'Neill 2010). Building on the person-in-context pattern identified in Section 5.4 (and introduced in Section 2.1), perceived reality can be read as an upstream feasibility signal co-produced by professional orientations and delivery-system conditions. This helps to explain why ambition can remain high while feasibility is discounted under constrained delivery pathways.

5.6 STUDY LIMITATIONS

This study draws on self-reported perceptions: perceived reality captures feasibility judgements under current delivery conditions rather than verified project delivery or post-occupancy outcomes. Accordingly, the study cannot assess whether interventions were implemented, nor if the implemented interventions produced measurable changes in PEBs; it reports professional judgements that may shape upstream proposal and specification decisions. Perceived feasibility may therefore diverge from realised impacts, particularly where outcomes depend on occupant practices or operational management beyond designers' control (Janda 2011; Harputlugil & de

Wilde 2021). Future work should validate these judgements against project-linked and post-occupancy indicators.

The cross-sectional design limits causal inference: the direction of influence between aspiration and perceived feasibility cannot be established, and both may be shaped by unmeasured contextual conditions. Measurement was intentionally brief (single-item aspiration and feasibility ratings), and the instrument did not capture key explanatory variables (*e.g.* organisational setting, project type, procurement route, perceived barriers or prior delivery experience), constraining explanatory resolution. Delivery dependency was used as a theory-led domain classification rather than an empirical measure of project complexity, and personal sustainability orientation was inferred from variance structure rather than assessed using validated scales. Although the sample is large and diverse enough for UK-sector inference, self-selection bias remains possible if sustainability-oriented practitioners were more likely to respond. Demographic and career-stage effects were not modelled directly; where relevant, these were treated as part of unobserved between-person heterogeneity via random intercepts (Zelezny *et al.* 2000; Hürlimann *et al.* 2022). These limitations motivate the future research agenda outlined below in the Conclusions.

Despite these limitations, the study provides a systematic baseline account of how built-environment designers appraise their capacity to support PEBs across intervention domains, and motivates validation against project-linked and post-occupancy indicators.

6. CONCLUSIONS

This study demonstrates a persistent aspiration–reality gap in designing for pro-environmental behaviours (PEBs). Across five intervention domains, built-environment designers (architects, landscape architects and urban designers) reported aspirations that exceeded what they judged feasible under current delivery conditions. Domain variation was consistent with delivery dependency (delivery-side complexity): lower dependency measures such as recycling and energy conservation were seen as comparatively deliverable, whereas feasibility was most constrained for higher dependency domains, most notably sustainable transport. Alignment between aspiration and perceived feasibility was strongest in stewardship-dependent higher dependency domains (food-growing; biodiversity-supportive gardening), while sustainable transport combined high aspiration with markedly lower feasibility, indicating that ambition can remain high even where delivery is contested or controlled beyond the project boundary.

The findings support a person-in-context account of professional agency. As bounded actors within socio-technical delivery systems, designers' feasibility judgements reflect an individualised motivational baseline (consistent with, though not a direct measure of, *personal sustainability orientation*) and *contextual factors* (governance, procurement, stewardship) that vary by domain and *delivery dependency* (delivery-side complexity). Although post-occupancy PEB outcomes are not measured, these upstream judgements matter because they shape what is proposed, specified and defended within projects.

Because perceived feasibility is produced within multilevel delivery systems, narrowing the aspiration–reality gap requires coordinated action across governance scales. Local authorities shape feasibility through planning frameworks, approvals processes and capital investment; clients, funders, and consultancies shape briefs, procurement choices and risk appetite; and national policy sets the regulatory and funding conditions that determine whether behavioural outcomes are incentivised or marginalised. Professional bodies influence deliverability through standards and continuing professional development, while asset managers and operators shape longer term outcomes through stewardship and post-occupancy evaluation (POE). Closing the aspiration–reality gap therefore depends less on raising ambition than on making PEB-supportive design contractible, permissible and durable in practice. Three near-term priorities follow:

- *Institutional reform (procurement, approvals, stewardship)*
  Embed behavioural criteria in planning and approvals where appropriate; extend outcome-based procurement beyond lowest capital cost; streamline pathways for high-dependency

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infrastructure (especially active travel); and specify funded, long-term stewardship responsibilities for biodiversity and food-growing elements.

- *Professional empowerment (capability and confidence)*
  Strengthen behavioural-science literacy, evidence-based briefing, and user-centred stewardship through continuing professional development and professional standards, enabling practitioners to articulate delivery pathways and advocate effectively within complex project environments.
- *Strengthening the evidence base (POE and future research)*
  Normalise POE and operational feedback to test the perceived feasibility against delivered interventions and realised behavioural/operational outcomes, build institutional confidence, and translate learning into guidance and specifications. Future research should triangulate survey judgements with project-linked evidence, incorporate validated dispositional measures, and test how procurement route, organisational setting, project type and prior delivery experience condition aspiration–reality profiles using longitudinal and/or mixed-method designs.

Collectively, these actions outline a pathway from constrained ambition to more effective and scalable delivery of PEB-supportive interventions, strengthening the contribution of built-environment design to climate-change mitigation.

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AI DECLARATION

During the preparation of this manuscript, the authors used Google's Gemini (2.5 Pro) to help refine language and improve the clarity of expression. The tool was also used to assist with manuscript formatting, reference list correction and adherence to APA 7th edition stylistic guidelines. The authors carefully reviewed and revised all AI-generated suggestions to ensure the final text accurately reflects their original ideas and analysis. All intellectual content, arguments and conclusions are the sole work of the authors, who bear full responsibility for the final manuscript.

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COMPETING INTERESTS

The authors have no competing interests to declare.

DATA ACCESSIBILITY

The data that support the findings of this study are not publicly available due to privacy restrictions related to the professional participants, but are available from the corresponding author upon reasonable request.

ETHICAL APPROVAL

The study was conducted in accordance with the Declaration of Helsinki and approved by the University of Sheffield's Research Ethics Committee (reference number 057152). Informed consent was obtained from all subjects involved in the study. Before accessing the questionnaire, all participants were presented with a digital participant information sheet. This document outlined the research aims (examining the extent to which designers encourage pro-environmental behaviours), the voluntary nature of participation and the right to withdraw at any time before submission. It further detailed data-protection measures, confirming that responses would be anonymous, confidential and stored securely in accordance with the university's data policies. Informed consent was obtained digitally; participants were required to click a box confirming they had read the information and agreed to participate before they could proceed to the survey questions.

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