



Deposited via The University of Sheffield.

White Rose Research Online URL for this paper:

<https://eprints.whiterose.ac.uk/id/eprint/241364/>

Version: Published Version

Article:

Barker, A. and Payne, S. (2026) The challenge of GI mainstreaming within market-led planning and development systems: assessing attitudes and experiences of regime level actors. *Journal of Environmental Planning and Management*. ISSN: 0964-0568

<https://doi.org/10.1080/09640568.2026.2680123>

© 2026 The Author(s). Published by Informa UK Limited, trading as Taylor & Francis Group. This is an Open Access article distributed under the terms of the Creative Commons Attribution License (<http://creativecommons.org/licenses/by/4.0/>), which permits unrestricted use, distribution, and reproduction in any medium, provided the original work is properly cited. The terms on which this article has been published allow the posting of the Accepted Manuscript in a repository by the author(s) or with their consent.

Reuse

This article is distributed under the terms of the Creative Commons Attribution (CC BY) licence. This licence allows you to distribute, remix, tweak, and build upon the work, even commercially, as long as you credit the authors for the original work. More information and the full terms of the licence here:

<https://creativecommons.org/licenses/>

Takedown

If you consider content in White Rose Research Online to be in breach of UK law, please notify us by emailing eprints@whiterose.ac.uk including the URL of the record and the reason for the withdrawal request.



The challenge of GI mainstreaming within market-led planning and development systems: assessing attitudes and experiences of regime level actors

Adam Barker & Sarah Payne

To cite this article: Adam Barker & Sarah Payne (24 Jun 2026): The challenge of GI mainstreaming within market-led planning and development systems: assessing attitudes and experiences of regime level actors, Journal of Environmental Planning and Management, DOI: [10.1080/09640568.2026.2680123](https://doi.org/10.1080/09640568.2026.2680123)

To link to this article: <https://doi.org/10.1080/09640568.2026.2680123>



© 2026 The Author(s). Published by Informa UK Limited, trading as Taylor & Francis Group.



Published online: 24 Jun 2026.



Submit your article to this journal [↗](#)



View related articles [↗](#)



View Crossmark data [↗](#)



The challenge of GI mainstreaming within market-led planning and development systems: assessing attitudes and experiences of regime level actors

Adam Barker^a  and Sarah Payne^{b*} 

^aDepartment of Planning, Property and Environmental Management, University of Manchester, Manchester, UK; ^bSchool of Geography and Planning, University of Sheffield, Sheffield, UK

(Received 15 May 2025; final version received 22 May 2026)

This article examines the challenges of green infrastructure (GI) mainstreaming within market-led planning and development systems, where the incorporation of GI depends on how developers, professional consultancies and public planning authorities interpret regulatory expectations, financial risk and development value within project decision-making. Drawing on elite interviews, the study explores how these market-facing actors negotiate the delivery of GI within development processes. The findings show that GI mainstreaming is shaped not simply by the presence of structural barriers but by relational dynamics between actors with different mandates, risk exposures and forms of authority. Developers, consultancies and public planning authorities interpret GI requirements in different ways, leading to negotiation, alignment and sometimes displacement of responsibility within development decision-making. By foregrounding actor interdependencies, the paper advances understanding of GI governance within market-led development systems and highlights the importance of analysing sustainability transitions through the institutional dynamics of development regimes.

Keywords: green infrastructure; planning; market-led development; institutional constraints; transition; governance

1. Introduction

Urban areas are increasingly being impacted by both a reduction in the quality of the urban fabric and an ability to adapt to changing environmental conditions. The promotion of densification and expansion, along with a historic faith in ‘grey’ modes of infrastructure development, has left many urban areas experiencing a reduction in available green space areas and the fragmentation of ecological networks (Bona *et al.* 2024; Van Oijstaeijen, Van Passel, and Cools 2020; Versini *et al.* 2023). This in turn has reduced the capacity of cities to address the negative consequences of climate change and develop effective management responses (Buijs *et al.* 2019; Van Cauwenbergh *et al.* 2022). The rise in urban temperatures and increases in environmental hazards, in particular, have led the United Nations (United Nations General

*Correspondence author. Email: s.payne@sheffield.ac.uk

Assembly 2015) to call for greater efforts in aligning urban growth trajectories with sustainable development goals (SDGs).

In response to these challenges, the concept of green infrastructure (GI) has emerged as a dominant paradigm for guiding urban planning and development. As a key component of the Nature-Based Solutions (NBS) agenda, GI is typically taken to refer to an interconnected network of blue and green spaces that consist of both natural and open areas (Benedict and McMahon 2012; Lyu *et al.* 2024). It maintains a varied evolutionary status which draws on planning and environmental management traditions such as greenways, urban parks, landscape ecology and garden cities (Mell *et al.* 2016; Payne and Barker 2015). According to Hansen and Pauleit (2014), this varied history enables GI to function as a melting pot for innovative green space planning. In most forms, GI asserts the role of multifunctionality (Korkou, Tarigan, and Hanslin 2023; Monteiro, Ferreira, and Antunes 2020) and therefore affords the potential to deliver a range of positive benefits within urban areas. These have been found to range from stormwater protection, urban cooling, enhanced biodiversity, carbon sequestration (Bačić *et al.* 2024; Harrington and Hsu 2018; Meerow 2020; Suleiman 2021; Zimmerman, Brenner, and Llopis Abella 2019) through to improved physical and mental health and enhanced investment opportunities (Anderson, Zgela, and Gough 2023; Benton-Short, Keeley, and Rowland 2021; Van Oijstaeijen, Van Passel, and Cools 2020; Wild, Henneberry, and Gill 2017).

Our focus in this paper is on the ways in which GI is negotiated, designed and delivered through site-level and neighbourhood-scale development projects. In market-led planning and development systems such as the UK, decisions about land use, layout, density and landscape integration are shaped through interactions between private developers, professional consultancies and public planning authorities. It is in these development-led discussions, where land value, viability, design standards and regulatory expectations intersect, that GI can be embedded or marginalised. By concentrating on this dimension of GI, the paper examines how these market-facing actors shape, constrain and enable environmental outcomes within a market-led planning and development system.

2. Towards the mainstreaming of GI

Although GI as a concept remains in a developmental state, a number of successful applications of GI planning and intervention exist worldwide, including within development-led urban contexts. Scholars frequently point to the use of GI in effective stormwater management in Maryland (Giese *et al.* 2019; Weber and Wolf 2000), in high-density urban management in Singapore (Liao 2019; Lim and Xenarios 2021), and in driving the regeneration of degraded areas in the Ruhr (Schwarze-Rodrian 2021). International practice has also highlighted the emergence of a wide range of decision support tools. To date, these have tended to focus on the use of GIS evaluation frameworks to identify GI needs and the use of economic valuation tools to assess likely investment gains or policy instruments (Van Oijstaeijen, Van Passel, and Cools 2020; Wang, Chang, and Fan 2021; Zabel and Häusler 2024).

Despite such advances, however, GI is far from mainstream practice and fraught with barriers to wider acceptance and delivery. The advancement of GI resists professional and knowledge-based boundaries (Felson, Oldfield, and Bradford 2013). As such, it requires multi-actor planning responses which can account for often highly variable urban agendas and priorities (Ibrahim, Bartsch, and Sharifi 2020). Several scholars have highlighted that current research fails to adequately account for the

drivers of decision-making (Buijs *et al.* 2019; Harrington and Hsu 2018; Meerow 2020). Of particular concern is the limited understanding of how actors operating within market-driven planning and development systems engage with GI.

Indeed, in contexts where housing and commercial real estate development are largely driven by private capital, the incorporation of GI depends on how market-facing actors interpret regulatory expectations, financial risk and development value within project decision-making (Crook, Henneberry, and Whitehead 2015; Payne and Barker 2015). However, much of the existing research has tended to focus on structural or governance barriers to GI implementation, including policy fragmentation, limited public resources and coordination challenges (see, for example, Dorst *et al.* 2022), providing less insight into how these considerations are negotiated within development-led, market-facing environments. As a result, the role of market-facing actors' decision-making and the interactions between developers, consultants and public planning bodies, in particular, in shaping the uptake of GI remains insufficiently understood.

Drawing on insights from transition management and new institutionalism, this paper examines how developers, consultancies and public planning bodies negotiate the incorporation of GI within development processes, recognising that actors operate under different institutional mandates and professional logics. Rather than identifying additional structural barriers to GI implementation, the analysis focuses on how these actors interpret regulatory expectations, financial risk and development value within market-led planning and development systems. By foregrounding the interactions between actors occupying different institutional positions, this paper offers a relational account of GI mainstreaming within market-led planning and development regimes.

The remainder of the paper proceeds as follows. Section 3 outlines the existing knowledge base and theoretical framing, drawing on transition management and new institutionalism. Section 4 describes the research design and interview methodology. Section 5 presents the empirical findings, and Section 6 discusses their implications for understanding the governance of GI within market-led planning and development systems.

3. GI and the complexity of market-led regimes

In this paper, 'market-led planning and development systems' refer to contexts in which the delivery of housing and commercial real estate development is primarily undertaken by private developers operating within a regulatory planning framework (Adams and Tiesdell 2012; Ball 2003). In such systems, land ownership, speculative investment, development finance and viability assessments play a decisive role in shaping environmental outcomes (Payne, Sharp, and Chapman 2026). Local planning authorities typically set policy and determine applications, but most projects are initiated and delivered by private actors. In the UK's discretionary planning system, environmental objectives such as green infrastructure may be secured either through public investment and state-led programmes (Austin 2014) or through negotiation within private development processes (Adams and Tiesdell 2012; Healey 1997; Mell *et al.* 2016; Payne and Barker 2015). This paper focuses on the latter, where GI provision is incorporated through negotiation, design revision and viability testing within development proposals. It is within this structured yet market-oriented regime that GI must compete

with other land-use claims and financial priorities for developable space (Payne, Sharp, and Chapman 2026).

Recent GI debates have increasingly framed GI mainstreaming as an institutional and organisational challenge, requiring a shift from purely technical innovation toward a stronger behavioural and governance-oriented interpretation (Gerlak *et al.* 2021; Suleiman 2021). This in part reflects the complexity of GI interventions and their associated decision-making contexts. Expectations associated with integration and multifunctionality need to be acknowledged here. Whilst an emphasis on the integration of different spatial areas within GI requires a multi-scaler response from actors working in different geographical jurisdictions (Lux 2024; Lyu *et al.* 2024), the multifunctional benefits arising from different types of socio-ecological interaction mean that multiple providers and beneficiaries are brought together who may have different thematic responsibilities or areas of interest. These challenges require shared prioritisation and agreement between a diverse group of GI providers and beneficiaries (Chatzimentor, Apostolopoulou, and Mazaris 2020; Wang, Chang, and Fan 2021) and also assume sufficient available knowledge, understanding and capacity for mobilisation (Mekala and Hatton MacDonald 2018).

In response, proponents of GI have advocated that GI transitions need to be accompanied by new models of environmental governance (Malekpour, Tawfik, and Chesterfield 2021; Van Cauwenbergh *et al.* 2022). These approaches emphasise collaborative and adaptive governance, cross-sectoral coordination, and forms of co-production that bring together public authorities, private developers, community actors and environmental stakeholders. Such approaches emphasise the centrality of plural responsibility and multi-actor agency. This is likely to require trans-organisational expertise, adaptability, clarity of ambition, a commitment to exploring new forms of knowledge, and place-based awareness (Barker *et al.* 2024; Reimer and Rusche 2019). GI governance within this context, therefore, is not only part of the formal apparatus of government but also part of the day-to-day workings of the private sector, the third sector and the wider community.

This form of collaborative decision-making environment has particular implications for how the role of the state and the market can be understood within the context of GI delivery and the expectations that can be placed on those operating within market-driven development systems. The alignment of GI within a widening socio-economic agenda places GI governance actors with the difficult challenge of ensuring ecological integrity whilst also ensuring societal well-being and market-based return (King and Shackleton 2020). For the private sector, this often manifests as the need to conform to policy demands and explore innovative practices (Payne, Sharp, and Chapman 2026; Payne and Barker 2015). For the public sector, modes of policy formation and regulation are required that provide both market intervention and facilitation. Gaining an effective understanding of GI-based state and market dynamics requires the advancement of new knowledge linked to institutional responses. Several authors, however, have argued that currently there is limited understanding of the institutional drivers of GI change (Buijs *et al.* 2019; Meerow 2020; Reimer and Rusche 2019). Within market-led planning and development systems, this tension is particularly visible in negotiations over land value, density, design standards and development viability, where GI provision may alter both spatial form and financial return (Payne, Sharp, and Chapman 2026).

According to Mekala and Hatton MacDonald (2018) and Suleiman (2021), a lack of an effective cultural understanding of GI decision-making means that the beliefs,

values and perceptions of different governance actors are not fully understood. As such, this complicates our understanding of the degree to which GI is accepted as a development objective, how and why GI decisions are made and the relationship between institutional convergence and divergence (Buijs *et al.* 2019; Harrington and Hsu 2018; Koppenjan 2015; Mielke 2019). This, in turn, has implications for the understanding of 'GI readiness' within institutional structures and processes (Aalbers, Kamphorst, and Langers 2019; Gerlak *et al.* 2021). This relates to the extent to which institutions display sufficiently adaptive organisational characteristics to respond to entrepreneurial behaviour (O'Donnell, Lamond, and Thorne 2017).

The need for a stronger cultural appreciation of GI has also been linked to an improved understanding of institutional responses to external pressures. First, it is unclear whether governance actors feel that there is a definable GI market in place and how this might be responded to (Mell *et al.* 2016; Zimmerman, Brenner, and Llopis Abella 2019). Secondly, it is unclear whether new GI knowledge is perceived as legitimate within everyday planning and development activities and is driving changes in practice (Zabel and Häusler 2024; Zalejska-Jonsson, Wilkinson, and Wahlund 2020). Finally, it is arguable that the steering or supporting role of policy and regulation in driving forward GI change is assumed rather than explored (Harrington and Hsu 2018; Reimer and Rusche 2019).

In this article, we argue that despite the relative lack of institutionally orientated GI theorisation, a number of theoretical perspectives have emerged which offer a useful context from which to explore the potential for GI mainstreaming. Whilst not specifically focused on market-based actors in the development sector, they offer a combined reading within which to situate new research. Transition management theory, in particular, can aid an appreciation of how actor interactions and system dynamics might operate in advancing GI implementation. Through a focus on socio-economic, cultural and political dynamics, transition management seeks to explain how existing systems and associated forms of dominant behaviour can be challenged to allow for innovation (Dewulf *et al.* 2009; Jiang and Payne 2022; Loorbach *et al.* 2016; Payne and Barker 2018; Rauschmayer, Bauler, and Schöpke 2015; Schöpke *et al.* 2017; Wittmayer and Loorbach 2016). The most established of these theories takes the form of the multi-level perspective (MLP). Here, the process of change is understood as the byproduct of pressure placed upon the 'regime' (the level of dominant activity) by a combination of the 'landscape' (the exogenous level usually occupied by national government) and the 'niche' (the level which drives innovation and new knowledge) (Geels 2014; Jørgensen 2012). The MLP approach helps with an understanding of transition as one in which the different layers contain overlapping areas of interaction and influence and one in which change is likely to be both experimental and incremental. It also suggests that change emerges from regime destabilisation in the face of ingrained priorities, values and behaviours (Geels 2014; Killip 2013; Smith, Voß, and Grin 2010).

Whilst the MLP approach has historically focused on the manner in which technical innovation emerges within the niche rather than how social and economic constraints are understood within the regime (Geels 2019; Roberts and Geels 2019), a greater understanding of regime complexity has recently begun to emerge (Geddes and Schmidt 2020; Jiang and Payne 2022; Kanger 2021). These perspectives have helped develop an understanding of how pathways within the regime can be established to help mainstream actors meet varied and uncertain objectives. This emerging

behavioural context affords the opportunity to use an MLP interpretation of the regime to explore how market-facing actors can combine societal expectations with the search for new economic opportunities. It also potentially allows for a greater appreciation of the role the niche can play as a broker for the regime and how collaboration can help established development systems adapt to advance new business rationalities. In development-led contexts, the regime is constituted by interdependent actors: developers controlling land and capital; planning authorities controlling regulatory approval; and professional consultancies mediating between policy requirements and commercial delivery. Understanding how these actors interpret pressure from landscape (e.g. climate policy) and niche innovation (e.g. GI tools and exemplars) is therefore central to explaining uneven patterns of GI mainstreaming.

However, as a detailed understanding of regime characteristics within market-led planning and development systems has yet to fully emerge, we suggest that perspectives drawn from New Institutionalism can play an important supplementary role. This theory defines institutions as a “relatively stable collection of practices and rules defining appropriate behaviour for specific groups of actors in specific situations” (March and Olsen 1998, 948). The established institutional context is therefore likely to be a significant conditioning factor in GI acceptance and uptake (Mekala and Hatton MacDonald 2018; Munck af Rosenschöld, Rozema, and Frye-Levine 2014).

New Institutionalism sees the behaviour of institutions as being ‘embedded’ and ‘path dependent’ (Powell and DiMaggio 2012). Values, beliefs, relations and behaviours are usually clearly defined and normalised (Nee 1998), forming the institutional belief systems or *logics* through which actors interpret problems, risks and appropriate courses of action (Thornton, Ocasio, and Lounsbury 2012). This both directly and indirectly determines inter-actor relations, knowledge acquisition and prioritisation, resource allocation and institutional capacity (Carrigan and Coglianese 2011; Needham and Louw 2006; Smith and Lewis 2011). Unpacking these institutional attributes and how they condition reform is therefore helpful to a richer appreciation of regime potential. This, however, is likely to require a flexible view of institutional attitudes and behaviours within the regime.

Previous work by both Payne and Adams (Adams and Payne 2011; Payne 2009, 2013) has indicated that market-based actors tend to display highly differentiated responses to both social and state expectations. The acceptance of GI within the mainstream, therefore, is likely to be variable and conditional and state-market interactions multi-faceted. Examining how these institutional dynamics shape actor responses to GI, therefore, provides a means of understanding why mainstreaming may unfold unevenly within market-led planning and development systems.

Figure 1 provides a schematic representation of the analytical framework guiding this study. Drawing on the Multi-Level Perspective, it situates GI implementation within interactions between landscape pressures, niche-level knowledge development and a market-led planning and development regime. The regime is conceptualised as internally differentiated between developers, consultancies and public planning authorities, whose mandates, risk exposures, professional expertise and forms of authority shape how GI is negotiated in practice. Complementing the MLP framing, New Institutionalism informs our understanding of how embedded valuation norms, path dependency and organisational structures condition behaviour within the regime.

On this basis, this paper aims to assess the conditioning factors impacting upon GI mainstreaming within market-led planning and development systems. Through elite

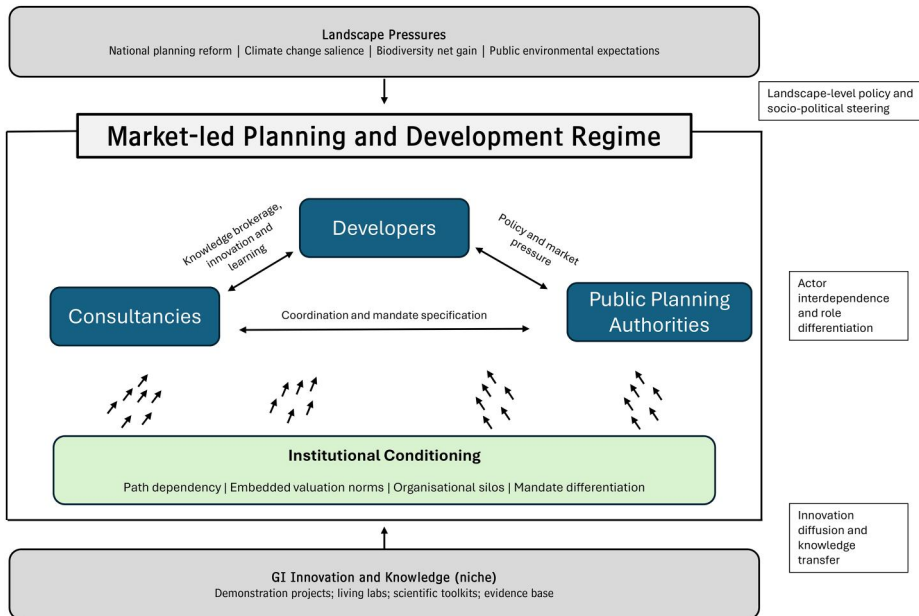


Figure 1. Analytical framing of GI mainstreaming within market-led planning and development systems.

interviews with professional actors operating within the planning and development regime, the study focuses on both attitudes and experiences of GI engagement and application. In order to achieve this, the research explores two key dimensions of the regime environment. First, the research considers those internal barriers and opportunities that condition institutional behaviour. We take this to refer to values, beliefs and actions that can be aligned with the ways in which a particular organisation operates. This enables the consideration of factors such as level and form of GI engagement and perceived barriers to increased mainstreaming. Second, we then consider the role of external driving forces upon regime actors. This looks at how institutions are conditioned by wider dynamics both within the regime and outside. These include the structure and trajectory of the market; the influence of GI scientific knowledge and the expectations actors have of one another.

4. Methodology

The empirical research presented here focused on regime-level actors shaping GI uptake. It draws on the experiences of planning and development stakeholders operating across Northern England, a region where environmental ambitions associated with green infrastructure must often be reconciled with viability constraints typical of post-industrial urban development contexts. Rather than focusing on specific sites or individual cities, the study examines how actors interpret and negotiate the incorporation of GI within their professional practice. Many organisations represented in the study – including development firms, consultancies and planning authorities – operate across regional development markets rather than within a single local authority area, with planning authorities also engaging through regional governance structures and inter-

authority collaboration. This regional perspective provides insight into how GI is interpreted and operationalised within market-led development practice. While geographically bounded, the institutional configuration examined here – private development operating within a discretionary planning system – is characteristic of the wider UK planning regime and comparable development contexts internationally.

Consistent with the conceptualisation of the regime as internally differentiated, the study targeted developers, consultancies and government bodies whose mandates, risk exposures, professional expertise and regulatory roles shape how GI is negotiated within development processes:

- *Government:* Regional government bodies, local planning authorities and agencies involved in and/or responsible for policy formulation, development management and the approval processes.
- *Developers:* Companies engaged in residential and commercial development projects. They are the key drivers of growth and investment, influencing the type of projects that are pursued and the overall direction of development.
- *Consultancies:* Private sector businesses that provide specialist professional and technical expertise to clients involved in the planning and development process. They bring valuable expertise and experience and play an important role in influencing the design and feasibility of development projects.

Respondents were selected using purposive sampling to capture actors directly involved in land development, planning, design or housing delivery where GI considerations arise. The sample included private developers (volume and SME), construction firms, urban design and planning consultancies, engineering and environmental consultancies, housing providers, local authority officers and government housing bodies. Snowball sampling was also used by asking initial interviewees to suggest other potential participants holding relevant expertise or influence. Interviewees were grouped according to their primary functional role within the development regime: those responsible for regulatory oversight (public planning authorities), those controlling land, capital and project delivery (developers), and those providing professional and technical services mediating between policy requirements and development implementation (consultancies). Consultancy interviewees were grouped under a single category because their role in the development regime is to provide specialist expertise informing project feasibility, design and regulatory compliance. Further details of the interview participants are provided in [Table 1](#).

A total of 35 participants were recruited for interview. The Research Ethics Committee at the University of Manchester approved our interviews (approval: 16299) on 01 September 2016. Participants provided written informed consent prior to interview. Participants have been anonymised and quotations are not attributable.

Elite semi-structured interviews were conducted with the selected participants between 2018 and 2021. The timeframe reflects both the elite nature of the sample and delays associated with the Covid-19 pandemic, which affected interview scheduling and access to senior professionals. This period also encompassed evolving biodiversity net gain requirements and broader political and economic uncertainty in England. While these contextual dynamics are acknowledged, no systematic shifts in actor narratives were observed across the interview period. The consistency of responses suggests that the findings reflect features of the development regime rather than short-term policy volatility.

Table 1. Planning and development actor interviewees.

Public planning authorities	Developers	Consultancies
Local Authority (5)	Regional Infrastructure Provider (1)	Built Environment Consultancy (4)
Combined Authority (6)	Volume Housebuilder (2)	Urban Design Consultancy (7)
Local Authority (21)	Volume Housebuilder (3)	Real Estate Consultancy (8)
Government	Developer (9)	Sustainable Housing Consultancy (10)
Combined Authority (22)	Social Housing Provider (15)	Landscape Architect (11)
Environment Body (23)	Construction Company (16)	Built Environment Consultancy (12)
Combined Authority (24)	Small Housebuilder (17)	Urban Design Consultancy (13)
Government Housing Body (26)	Volume Housebuilder (18)	Urban Design Consultancy (14)
Local Authority (28)	Social Housing Provider (25)	Built Environment Consultancy (19)
Local Authority (35)	Small Housebuilder (29)	Engineering and Environmental Consultancy (20)
	Construction Company (30)	Engineering Consultancy (27)
	Social Housing Provider (31)	Biodiversity Consultancy (32)
		Planning and Design Consultancy (33)
		Property Consultancy (34)

The interviews explored the ‘internal’ and ‘external’ dimensions of the regime environment identified in the analytical framework. Questions were organised around four core themes (Table 2): (1) current levels of GI engagement; (2) perceived internal barriers and organisational constraints; (3) external drivers including market signals, policy and knowledge; and (4) expectations regarding the roles of other actors within the development system. While wording varied slightly across actor groups to reflect professional context, all respondents were asked comparable questions aligned to these thematic areas. This approach enabled in-depth exploration of actor perspectives and the interactions shaping green infrastructure mainstreaming within the market-led development regime.

Interviews were audio-recorded and transcribed verbatim. Data analysis combined deductive and inductive coding. Initial categories were informed by transition management and new institutionalist concepts including regime stability, institutional lock-in and actor interdependency. Themes were subsequently refined through iterative reading of transcripts to identify patterns emerging from the data. Table 2 summarises the analytical themes used to organise the empirical analysis, drawing on the theoretical dimensions represented in Figure 1, while also reflecting patterns emerging from the interview data. These themes structure the presentation of the empirical findings in the following section. This analytical approach enables examination of how actors occupying different institutional positions interpret, negotiate and shape the incorporation of GI within market-led development processes.

Table 2. Mainstreaming GI within the regime: research themes and sub-themes.

MLP/NI elements	Main GI theme	GI sub-theme
<i>Internal Environment</i>		
Institutional values Institutional embeddedness	Level and form of GI engagement	• Extent of GI mainstreaming • Motivational drivers for GI uptake • Typical form of GI provision
Institutional risk aversion Institutional path dependency Institutional lock-in	Barriers to GI mainstreaming	• Role of GI planning, development and management life cycles • Organisational structures and processes • Viability of business cases
<i>External Environment</i>		
Responses to landscape pressure	Role of the market in advancing GI	• Extent of identifiable GI marketplace • Role of monetisation of GI benefits
Responses to niche innovation	Role of new scientific knowledge	• Awareness and adoption of new scientific knowledge • Role of GI assessment toolkits • Role of GI demonstration projects
Regime dynamics and interrelationships	Role of ‘other actors’	• Experiences and expectations of Government

This study should be interpreted in light of a number of limitations. First, the empirical analysis focuses on three groups of key regime actors – developers, professional consultancies and public planning authorities – whose roles position them directly within development decision-making processes. While this configuration provides insight into how GI is interpreted and negotiated within market-led development systems, it does not capture the perspectives of other stakeholders involved in GI delivery, such as community organisations, infrastructure providers or environmental groups. Second, the research examines GI primarily within development-led urban projects, where environmental interventions are incorporated through planning negotiation, design processes and development viability considerations. The findings therefore reflect institutional dynamics associated with development processes rather than more specialised or technically defined forms of GI provision, such as catchment-scale water management. Third, the empirical material is drawn from actors operating within the UK’s discretionary planning system and focuses on development contexts in Northern England. As such, the findings reflect institutional dynamics characteristic of this planning regime and should be interpreted in that context. Notwithstanding these limitations, the study provides analytical insight into how differentiated actors within market-led development systems interpret, negotiate and allocate responsibility for the incorporation of GI within urban development.

5. Results part 1: internal institutional issues

5.1. Level and form of GI engagement

Respondents were asked to comment on their levels of engagement with green infrastructure delivery, including the extent of GI mainstreaming, motivations for uptake and the form that engagement took in practice. Across the regime, GI was rarely described as a core organisational activity. This was particularly evident among developers, construction companies and certain built environment consultancies, where GI was positioned as a peripheral rather than dominant element of business strategy:

It's not a hugely important factor in the running of my business. Construction Company (30)

I wouldn't say we have a day-to-day commitment to it. Small Housebuilder (29)

It's quite a small part of what the organisation does...well because it does a lot of things. Engineering and Environmental Consultancy (20)

For these actors, limited mainstream activity was commonly attributed to GI occupying a relatively 'low agenda' position within corporate frameworks and being perceived as extending beyond established standards rather than constituting routine practice. However, differentiation between actor groups was evident. Respondents within the urban design consultancy grouping more frequently described GI as embedded within master planning processes and positioned themselves as active proponents of GI integration in client proposals. In these cases, GI was framed less as an add-on and more as a structuring principle for spatial design.

Motivations for engagement further exposed variation across the regime. Developers and construction actors frequently framed GI in terms of reputational positioning and competitive advantage:

There's the recognition that it's beneficial to the business to be seen as a responsible, ethical constructor and taking environmental impacts into account. Volume Housebuilder (18)

...if we can deliver for a customer at the same price but deliver them more or deliver in an innovative way or deliver an added benefit that they hadn't even thought of, then of course they're going to love that. Construction Company (16)

For these actors, GI was often instrumentalised as part of marketing-led lifestyle offer or branding strategy, particularly where its physical visibility afforded differentiation in competitive housing markets. At the same time, regulatory compliance-based motivations were also prominent, particularly where planning approval was contingent upon GI provision:

...if we don't put anything in, the Council will say no, we're not accepting this, you're not having planning permission, there's no Green Infrastructure. Engineering and Environmental Consultancy (20)

The next motivation is to make sure that I'm selling a lifestyle to people and therefore I've got to design the landscaping aspect to make it part of the lifestyle sell. Small Housebuilder (17)

In this sense, reputational and regulatory motivations were frequently intertwined. Developers sought to secure planning permission and maintain competitive positioning, while consultancies emphasised their role in navigating local authority expectations and translating policy requirements into commercially viable design responses. Reputational advantage therefore operated both as a market-facing strategy and as a form of professional credibility.

For other actors, particularly housing providers and certain developers, GI functioned less as an opportunity advantage and more as a mechanism of conflict avoidance. Here, GI inclusion was framed pragmatically as a means of ensuring compliance with external planning demands and reducing negotiation friction. By contrast, urban design consultancies were more likely to articulate GI engagement in normative terms, linked to landscape advocacy, spatial quality and holistic place-making. These differing framings illustrate how GI is embedded within differing organisational ‘logics’ – commercial, regulatory and design-oriented – that coexist within the same development regime.

Variation was also visible in practice-based approaches to GI delivery. For some actors, particularly within built environment and design consultancies, GI provision was conceptualised as a spectrum beginning with the retention and enhancement of existing landscape assets:

...the ideal is you retain what’s there, you enhance it and you compliment it with new provision, and that’s a starting point. Built Environment Consultancy (19)

This approach implies early-stage integration and alignment between development design and landscape planning. In contrast, some construction actors described GI as occupying residual space within development schemes:

...quite often we’re putting something in new just simply because there wasn’t anything there before or ...so I mean you know, let’s not overstate it. Quite often we’re talking about verges and odd spaces that you know, are left when you build something. Construction Company (16)

Here, GI appears as a by-product of development rather than a structuring element. These contrasting interpretations reflect not only differing professional orientations but also the structured interdependencies within development processes: where GI is considered early, design-led actors exert greater influence; where it is deferred, commercial and construction ‘logics’ dominate. The level and form of engagement with GI is therefore shaped less by abstract commitment and more by positionality within the development regime, highlighting that GI is not simply adopted or rejected by individual actors, but emerges through the interaction of commercial, regulatory and design ‘logics’ within the development regime.

5.2. Barriers to GI mainstreaming

In order to explore impediments to greater GI mainstreaming, interview respondents were asked to identify those internal constraints which currently worked against wider engagement. Although uncertainty was raised across all actor groups, its meaning and

implications varied significantly depending on organisational position within the development regime.

For developers and construction actors, uncertainty was most strongly framed in terms of corporate exposure and long-term performance risk. Concerns centred on the difficulty of guaranteeing ecological outcomes within speculative development cycles and the mismatch between short-term delivery horizons and longer-term environmental functionality:

I suppose there's always risk if you're doing something innovative. ... I think the nature of construction for instance is we don't tend to look 10 or 20 years ahead, we tend to look three to five years ahead. Are the solutions that are right now going to be right in 2040? Construction Company (16)

Similarly, engineering consultancies highlighted performance uncertainty, but framed this in technical and liability-oriented terms:

... when you design something how does it perform? You know, the business risk is if you get underperformance as per design. With green infrastructure it's very difficult to show poor performance because things might change. Engineering Consultancy (27)

While both perspectives invoked 'risk', developers tended to emphasise financial exposure and reputational consequences, whereas consultancies foregrounded performance accountability and professional liability. In both cases, uncertainty was linked to a perceived lack of institutional alignment between development timeframes and ecological life cycles. Developers also noted that, in practice, this often resulted in seeking a 'balance' between satisfying minimum planning requirements and reverting to more established, risk-averse design and development approaches.

Maintenance concerns revealed a further layer of interdependency between actors. Across actor groupings, responsibility for long-term stewardship emerged as a recurring tension. For developers, maintenance was frequently framed as a downstream liability transferred to homeowners or management companies, creating reluctance to over-specify GI provision. Local authority respondents, by contrast, framed maintenance in terms of departmental fragmentation and adoption thresholds, highlighting internal tensions over decision-making and who was responsible:

... We've got a new development coming through with a road and we're saying we want a grass verge down each side with trees planting. And our highways guys are saying well we don't want to adopt that because then we've got the maintenance liability of cutting the grass and looking after those trees. Local Authority (21)

Organisational structure further conditioned how different actor groups interpreted and responded to GI requirements. Both public and private sector interviewees expressed concerns about the ability to challenge established views and the role played by thematic division:

... It's a strong driver on senior management; it's quite a strong driver on people coming into the business. But that middle management, middle ranking, 20 years' experience type inertia, they're always hard to engage with. Built Environment Consultancy (19)

I think...everywhere is basically silos you know, working in silos...but green infrastructure is a multidisciplinary thing, it cuts across a number of disciplines, it cuts across a number of services. Built Environment Consultancy (12)

Several respondents asserted that the main obstacle to a lack of GI primacy within organisations was not the reluctance of senior staff to engage but rather the degree of 'lock in' found amongst the middle organisational tier which formed the dominant staff grouping. This was seen to take the form of an 'apathy to innovation' and a faith in embedded practices developed through years of narrowly defined professional routines. This, in turn, was seen as creating organisational inertia that made it more difficult to respond to new opportunities. To overcome this, there was evidence of some developers utilising internal training programmes and 'roadshows' to challenge embedded practices and bring GI thinking into an earlier stage of project planning. The difficulties of 'lock-in' were, however, further problematised by organisation specialisation. Whilst a number of actors commented on the importance of maintaining a portfolio of elite level expertise, it was recognised that this led to the creation of divisional units which were ill-equipped to deal with the cross-sectoral working demanded of GI. It was thought, in some cases, that this would be difficult to change in an environment where most business cases were linked to 'specific' rather than 'generalised' expertise.

Financial viability concerns further exposed asymmetries within the regime. Developers and housing providers most explicitly linked GI provision to trade-offs over developable space and land value. GI was frequently framed as an 'either/or' decision in which green space reduced the number of saleable units and therefore affected land price assumptions:

Landowners need the price; you've got to construct the houses. You can have less houses and more green, you can't meet the land price, so it's still driven by those financial factors. Social Housing Provider (31)

This framing positioned GI as a direct challenge to established financial viability calculations embedded within development practice. For urban design consultancies, however, the difficulty lay in articulating tangible economic benefits in ways that aligned with client expectations. In other words, rather than opposing GI in principle, design consultancies described the challenge of translating environmental value into commercially legible and ultimately, financially viable arguments:

... Whenever you mention landscape or GI to a client, the first thing they think of is cost... what's that tree outside going to do... is it going to give me any more revenue or is it going to increase the value of my property? And I think... it does, that's the thing, GI does do that but it's explaining those tangible benefits. Urban Design Consultancy (13)

Here, the regime dynamic becomes visible. Developers sought to prioritise land value and margin, consultancies attempted to translate environmental value into commercially legible arguments, and public sector actors assumed that market 'logics' could be reshaped through policy leverage. Rather than simple resistance, these dynamics reflect structured negotiation across actors with differentiated mandates. Interviewees also recognised that perceptions of value were partly shaped by internal

knowledge and awareness, suggesting that improved understanding and evidence of GI benefits could strengthen the case for its inclusion in development proposals. Taken together, these responses show that barriers to GI are not located within any single organisation but arise through the distribution of risk, responsibility and valuation practices across actors within the development regime.

6. Results part 2: external institutional issues

6.1. Role of the market in advancing GI

Arguments suggesting that GI can deliver direct economic rewards are well established. One of the dominant areas of focus for our consideration of external influences on regime actors was the extent to which a clear financial market was in existence within the built environment sector. Most interviewees tended to perceive the market for GI as hypothetical rather than demonstrable:

No, you can't guarantee that...because the market we operate in is that there is not enough houses being built...There's not enough choice to be able to say well these are with and these are without...it's just a tree, it's just a raingarden, and why would you bother with that if it's not an asset? Built Environment Consultancy (12)

I suppose if you turn it around and look at the financial impacts of environmental damage rather than the economic benefits of the environmental goods, then there's possibly some value in there. Volume Housebuilder (18)

Sometimes it is GI for GI's sake but a lot of the time it is talking about...it's sort of reinforcing their reputation as good developers and establishing a relationship with the community. Urban Design Consultancy (14)

This was particularly true amongst developers and consultants who, as the above quotes show, were sceptical of the ability to isolate direct returns in a market constrained by supply issues. In a context where housing demand was high, GI was not thought to provide a sufficient point of difference amongst competing variables such as plot size, number of bedrooms or off-road parking. As a result, there was a concern amongst housebuilders that GI would be seen by consumers as a positive addition rather than a baseline necessity.

Nevertheless, a number of respondents held the view that GI was potentially providing an indirect market function. Although there was often seen to be a mismatch between benefit viewed at point of provision and benefit viewed at point of functional delivery (as is often the case with SUDS-based interventions where the benefit is felt downstream) it was understood that financial rewards could potentially be materialised through reduced environmental damage and subsequently reduced expenditure on remediation. In this sense, GI was seen as part of the process of internalising market externalities. Developers also observed anecdotal evidence that GI additions on a housing site were improving the speed of sale but that it was not yet possible to isolate their contribution from the range of wider site-based parameters. Another common theme amongst developers was the indirect benefit associated with the reputational advantage accrued from using GI as a sales tool.

These responses show that developers framed the absence of a demonstrable market premium for GI in terms of limited consumer differentiation exacerbated by constrained housing supply, while consultancies tended to emphasise reputational value and longer-term positioning. Public sector respondents, by contrast, often assumed that developers would respond to clearer regulatory signals or to the reframing of environmental ‘damage’ as a financial liability. These differing interpretations of ‘the market for GI’ reveal weak signalling within the regime: developers seek clearer evidence of return; consultancies attempt to translate environmental value into commercial language; and local authorities expect market responsiveness to regulatory signals.

The question of whether the benefits of GI needed to be monetised to aid marketisation generated responses which revealed a tension between pragmatism, practicality and ethical integrity. Arguments centred on pragmatism tended to focus on three main areas. First, there was the view, especially within local authority and consultancy respondents working with developer groupings that the ‘rules of the game’ were already established and that business operated with a hard-nosed focus on monetary investment and profit margins. This meant that the ‘language of business’ was pre-determined and that ‘language’ needed to be acknowledged:

Regrettably, yes, I think they do. I think it would be great if we didn’t have to but I think that most of the world operates on money, certainly developers operate on money and profit margins. Local Authority (28)

Second, it was noted that adherence to established ways of valuing investments was necessary for making a case for doing more with GI; whilst finally, monetisation was thought by urban design consultants to be a requirement to ensure a broader understanding of built environment quality:

Definitely, yeah. Because there is quite a hard-nosed approach to development a lot of the time. And if you want to create change on a really wide scale across the board, you’re going to have to get the attention of people. Urban Design Consultancy (14)

Despite part-acceptance of the need for monetisation, those of a practical mindset questioned the degree to which some GI benefits resisted valuation. Again, this was a concern upheld within the local authority grouping along with government housing respondents. A fundamental issue was whether it was actually possible to value some of the more abstract social benefits of GI linked to attitudinal issues like sense-of place, attachment, and well-being:

...those social values you cannot sometimes put them into pounds and pence can you? ...it’s difficult to put an absolute monetary or economic value on those. So that’s a challenge for us because we’ve got to be looking at this without getting too sort of dreamy and idealistic. Government Housing Body (26)

Whilst the availability of approaches was acknowledged, their persuasiveness against other variables was a concern. Arguments which explored the ethical dimension of monetisation, perhaps surprisingly, emerged from the volume housebuilders where GI monetisation was considered as a form of environmental subordination to the economy. One particular volume housebuilder argued that despite the aforementioned ‘language’ of business, the environment should hold primacy over the economy

and should be free of the process of monetisation. To do otherwise it was suggested, would create a portfolio of environmental attributes with different monetary values. This in turn, could generate a scenario in which the cheapest environmental option would prevail and both diversity and multifunctionality would be lost:

...from an ecological point of view, I think economic valuation could also kind of create these perverse incentives you know...It is really dangerous because suddenly SuDS ponds are not as valuable as something else, for whatever reason. Or you might end up with a certain habitat that can be delivered cheaply, that delivers some benefits. So you just get developers doing that type of habitat everywhere...I also have a bit of a fundamental issue with trying to monetise environmental things, in that to my mind ...The economy is a subset of the environment not the other way around (laughs).
Volume Housebuilder (18)

These responses illustrate that monetisation is not simply a technical issue but a site of normative and strategic tension within the regime. While local authorities and consultancies often framed valuation as a pragmatic necessity for influencing developer behaviour, some developers expressed reservations about subordinating environmental value to financial metrics. The question of whether GI should be monetised therefore, exposes deeper divergences in how actors conceptualise the relationship between economy and environment.

6.2. Role of new scientific knowledge

A common driver for regime level change is linked to acceptance of new forms of knowledge. Our findings show mixed attitudes towards the legitimacy of new scientific knowledge related to GI. Those actors who were least responsive to new external knowledge tended to assert one of two perspectives. The first was this was the responsibility of others (typically academics) and that the language of engagement needed to be re-framed towards practice. The second was that there was already sufficient knowledge within the company based on acquired experience to justify decisions. This was based on a belief in 'tried and tested' approaches and longevity of practice and tended to prioritise what had happened in the past rather than what was emerging:

I would say that the responsibility of academics is to reach out...convert it into my speak... And make it entertaining. Social Housing Provider (25)

...we've been going for 40 years and we have a lot of experience, we tend to just say like oh well this is what we've done previously and this is what's worked. Urban Design Consultancy (14)

Other actors interviewed did show more interest in the utility of new GI knowledge but approaches to acquisition were quite distinct. At one end of the spectrum, it was recognised that although scientific knowledge wasn't embedded in day-to-day practice within an organisation as a whole, there was often a 'go to' person within an organisation who maintained an outward looking view to gather expertise. More common, however, was the practice of 'outsourcing' expertise where it was felt needed. This was often a role provided by the different consultancy groupings who were associated with higher levels of knowledge advocacy. Local authority bodies interviewed

demonstrated a more ‘hybrid’ level of engagement. Whilst partnership with Universities on EU funded research projects was found to be enhancing scientific awareness within specific teams (particularly spatial planning units), there was also evidence of informal knowledge-based partnerships across local authorities and a desire to benchmark practice against scientific guidance.

A division of knowledge roles was thus visible across the regime. Developers and construction actors frequently externalised responsibility for scientific interpretation, relying on consultancies to translate emerging evidence into practice-ready solutions:

...it would normally be in collaboration with expert consultants who have environmental expertise. We do have an engineering solutions element to our business but it's a bit more technically resolved. So we would normally outsource and bring that expertise into the team. Construction Company (30)

Consultancies were thus positioned as knowledge brokers, mediating between academic research, regulatory expectations and commercial constraints. Local authorities occupied a hybrid position, combining selective engagement with research partnerships and informal knowledge-based networks. Knowledge acquisition and mobilisation therefore reflected structured interdependencies rather than a uniform receptiveness to innovation.

Despite the variation amongst respondents in relation to knowledge legitimacy, there was a degree of commonality in outlining the main areas of focus that new knowledge needed to focus on. The most dominant of these was an improved understanding of scale-based interactions. Respondents felt that much of the knowledge linked to GI functions and benefits was not necessarily at the right scale for the planning and development community. Information was felt to be prioritised to site-based ‘micro’ components (street trees, green roofs) or the wider, ‘macro’ landscape scale where hydrological science was dominant. Instead, respondents called for a stronger appreciation of GI functions and benefits at the ‘development’ scale. Most actors viewed this as the neighbourhood or meso scale. It was also felt that a better understanding of how different scales interacted was required when trying to build an investment which highlighted where financial returns were being either delivered or lost:

What we need to be talking about is the really low, not micro but whatever the bit in between is. So, it's that development scale, that local scale. Construction Company (16)

Most respondents also felt that many of the GI decision making toolkits that had emerged from the scientific community were not sufficiently persuasive for day-to-day usage. This was especially true of toolkits which tried to quantify performance benefits. In many cases, these were felt to be overly complex and detailed to be readily adaptable to local needs. The level of market saturation identified was also a contributing factor towards a sense of toolkits being ‘scientifically remote’. In contrast, most respondents supported the increased use and accessibility of GI demonstration projects. Exemplar GI schemes which had been developed as a form of urban experimentation, often involving partnership working and external funding, were seen as more persuasive and relevant. These were thought to provide a ‘seeing is believing’ function which could be showcased to key actors within an organisation and provide exposure beyond normal practice. The focus on practical realisation of science rather than explanatory

theory or models, also meant that many respondents found demonstration projects allowed for knowledge transfer to inspire internal project planning. Examples were also thought to be more relatable where they were situated within similar economic settings and where a portfolio of cases had been developed within a particular city region for reference:

... the word I would use is translatable, I think that's the one that comes to my mind is that if you've seen that and you think yeah, that's a really good idea or that's a great scheme, how can we use that in other schemes without watering down the impact of the original? Government Housing Body (26)

6.3. *The role of 'other' actors*

The final area explored under the theme of external opportunities and constraints was the role that planning and development actors expected each other to play. The results indicted a number of clear expectations and desires associated with certain groupings. By far the most common response from developers and consultancies was that there needed to be a stronger steer on GI delivery from local government:

... something around consistent local authority requirements across the board, it just makes life easier if you know. Volume Housebuilder (18)

I think it needs to be policy-driven I think, there needs to be more kind of rules and joined-up thinking between various landowners and local authorities ... when you get to the scale that we work at, you don't have those structures in place to put pressure on the ... or even advise the clients to say that you need to be tying in with the city-scale ... Urban Design Consultancy (13)

Rather than being opposed to increased policy-based requirements for GI provision within local plans and associated strategies, many respondents called upon local authorities to establish clear and consistent requirements. This was primarily due to concerns over the existence of an uneven playing field across different geographical areas governed by different sets of rules. This was thought to generate uneven market constraints. As part of this, respondents argued that with a common benchmark developers would be more likely to accept less profitable or more indirect market solutions, signalling enhanced risk tolerance. Increased policy provision was also thought to be necessary by the urban design consultancy grouping as part of advocacy enhancement. Here, it was thought that a clear consistent policy baseline coupled with evidence-based argumentation would enable them to put pressure on clients and ultimately, change internal mindsets.

The expectation of stronger policy leadership from local authorities reflects a recurring pattern of responsibility displacement within the regime. Developers and consultancies expressed willingness to comply with clearer GI requirements but were reluctant to alter established development practices in the absence of clear and consistent regulation. Local authorities, meanwhile, faced internal fragmentation and capacity constraints, arguably limiting their ability to provide the certainty requested. GI mainstreaming therefore appears contingent upon coordinated shifts across actor groups rather than decisive leadership by any single institution.

7. Discussion

Interpreted through the analytical framework presented in Figure 1, this study shows that the mainstreaming of green infrastructure within market-led planning and development systems cannot be reduced to a problem of technical feasibility or institutional inertia. While some of the barriers identified in this study, including uncertainty, fragmented responsibility and perceived viability constraints, are established within the GI and nature-based solutions literature, our analysis demonstrates that these barriers are experienced and interpreted differently across actor groups within market-led regimes.

Developers, consultancies and public planning bodies operate with differentiated mandates, risk exposures, professional expertise and forms of authority, and GI outcomes emerge from their structured interdependencies rather than from the actions of any single group. Indeed, developers control land and capital but operate within speculative markets and viability constraints; public planning authorities exercise regulatory authority but face policy fragmentation and resource constraints; and, consultancies frequently act as professional intermediaries, translating environmental ambition into commercially legible design and technical proposals. In this sense, GI provision is therefore negotiated within a relational regime in which risk and responsibility can be distributed, deferred or displaced between actors. GI mainstreaming, in this context, thus reflects the capacity of these actors to align myriad expectations around land value and viability, design standards, policy clarity and long-term stewardship.

The results, therefore, extend existing transition accounts by demonstrating that regime stability in market-led planning and development systems is not uniform but structured through differentiated mandates and negotiated exposure to risk. While multi-level perspective approaches can emphasise socio-technical lock-in, the findings show that openness to GI varies across actor groups and is conditioned by embedded valuation norms, path-dependent decision rules and organisational structure. In this respect, GI mainstreaming is shaped less by resistance *per se* than by relational interdependence and uneven risk allocation within the regime. Table 3 synthesises the relationship between the theoretical expectations derived from new institutionalism and the multi-level perspective, and the empirical patterns observed across the interviews.

Across the interviews, five recurring dynamics were identified which structure how GI is interpreted and operationalised within market-led planning and development systems. As shown in Table 3, these themes link theoretical expectations from new institutionalism and the multi-level perspective with the empirical patterns observed across the interviews. Each theme is now discussed in turn.

7.1. Theme 1: rethinking GI embeddedness: emerging values and practice-based responses

Achieving sustainability transitions within the institutional mainstream requires a shift in regime values and behaviours (Geels 2014; Lockwood *et al.* 2017). Typically, institutions operating within the regime are seen as displaying ‘embedded’ characteristics which make them resistant to external pressure. Resistance levels, however, are noted to be partially dependent upon socio-economic context (March and Olsen 1998). Our research on actors operating within the UK planning and development regime revealed a degree of ‘embedded behaviour’ regarding GI engagement. In most cases, interviewees asserted that GI was not yet a mainstream consideration and was not centrally situated within organisational ambitions. Yet, despite this, we found evidence of a degree

Table 3. Linking theoretical expectations and empirical insights in market-led planning and development regimes.

MLP/NI elements	Theoretical expectation	Empirical finding	Discussion theme
Institutional embeddedness	Actors reproduce established behaviour	Organisational silos and middle-tier inertia limit institutional permeability (Section 5.1)	Theme 1
Path dependency	Established rules constrain change	Embedded valuation norms and lifecycle logics reinforce path-dependent decision-making (Section 5.2)	Theme 2
Landscape pressure	External climate policy destabilises regime	Absence of a reliable GI market signal; uneven policy clarity limits destabilisation (Section 5.3)	Theme 3
Regime destabilisation	Niche innovation contributes to innovation breakthrough	Regime internally differentiated with variable institutional permeability across actor groups (Section 5.4)	Theme 4
Institutional complexity and regime dynamics	Organisational mandates shape dynamics	Developers, Consultancies and Public Authorities display differentiated mandates and exposure to risk (Section 5.5)	Theme 5

of institutional permeability where the benefits of GI were being acknowledged and practice was being advanced. This is suggestive of the ability of institutions to engage in value exploration and adjustment in advance of more widespread regime modification.

However, caution should be expressed against perceiving institutions and their relationship with GI as being homogenous. In line with previous studies on institutional behaviour within the regime (Payne and Barker 2018), we found attitudes towards GI within the UK planning and development system to display significant levels of variation. Whilst, in some cases there was a genuine level of ‘issue salience’ with GI needs and the recognition of a link with reputational advantage, for others it was recognised as a means of ‘conflict avoidance’ in securing planning approval. This level or variation was noted to have an influence on the degree of ambition associated with practice. The differing nature of emerging GI values and behaviours means that GI-based transition within the regime is likely to take different routes and require an

awareness of regime complexity (Jiang and Payne 2022) amongst those seeking to enhance mainstreaming. These findings therefore reinforce that regime stability is internally differentiated rather than uniformly resistant, with institutional permeability varying across actor groups.

7.2. Theme 2: institutional alignment: the tension between expectation and reformation

In addition to the identification of ‘institutional permeability’, our research also highlighted an awareness amongst most respondents that shifts in values and behaviours would need to be accompanied by changes to processes, structures and established rules. A recognised area of concern amongst institutional theorists is that institutions can display forms of ‘path dependency’ associated with an allegiance to long accepted ways of working (Carrigan and Coglianese 2011; Smith and Lewis 2011). Our findings indicate that actors within the planning and development regime struggled to align the standard procedural model of planning and development with the expectations brought by GI. Whereas developers and consultancies were used to operating within an agreed ‘project life cycle’ with a predetermined endpoint, working with GI as a ‘living asset’ meant such processes were often mis-aligned. The problem was found to be twofold. First, these market-facing actors feared that GI could bring increased corporate risk if interventions did not perform as intended in the medium to long-term. This was thought to be a possibility in an uncertain climatic future. Second, the need for ongoing GI maintenance served as a cost disincentive to adopters/consumers taking over an asset or to those providers who felt they would be pressured to enter into maintenance agreements.

Addressing the role played by competing ‘life cycles’ and changing environmental stewardship is a particularly complex issue and is likely to require ongoing dialogue amongst institutional actors within the regime. These tensions illustrate how GI ambition is shaped through relational risk allocation within the regime: developers seek to minimise long-term ecological and maintenance exposure; local authorities attempt to avoid unfunded adoption burdens; and consultancies manage liability associated with performance claims. In this sense, GI outcomes are conditioned less by outright resistance than by how risk is distributed and negotiated between actors.

Alignment issues linked to organisational structure and path-based rules suggest that debates centred on GI uptake amongst planning and development actors accords with experiences in other institutional settings. Our research highlighted that respondents found both issues to be a constraint on meeting GI expectations and were seen as enhancing ‘lock in’ by limiting innovation. Similarly, we also found evidence of the use of established rules in decision making, as noted by others such as Powell and DiMaggio (2012) and Munck af Rosenschöld, Rozema, and Frye-Levine (2014). An internal emphasis on profit-driven business decision making meant that GI often lost out to more established and readily acceptable built environment solutions. Although these issues suggest that dominant actors within the planning and development regime face difficulties in overcoming established frameworks, the recognition amongst interviewees of the need for improved GI awareness coupled with the gradual use of training and knowledge dissemination activities points to the presence of ‘levers’ for change. As other scholars have noted, however, this is likely to be gradual and incremental. This dynamic illustrates how embedded institutional rules and lifecycle logics shape the scope for GI adaptation within the regime.

7.3. Theme 3: GI and the market: signals, nascent norms and value complexity

By focusing on a wider range of regime dynamics, our research enabled actors within the development regime to explore those drivers of change that sat beyond the immediate organisational context. The first area of this ‘external’ environment explored related to the role of the market in GI mainstreaming. In accordance with the behavioural shift in GI research, persuasive arguments have emerged to suggest the GI can yield direct economic benefits and support to nature-centred business argumentation (Mell *et al.* 2016; Van Oijstaeijen, Van Passel, and Cools 2020; Wild, Henneberry, and Gill 2017; Zimmerman, Brenner, and Llopis Abella 2019). For UK planning and development actors, this offers the potential for GI to share the same investment space as established grey solutions. In this context, however, GI does not compete directly with publicly delivered grey infrastructure systems such as wastewater networks. Rather, it competes with developable space within privately delivered schemes, where plot yield, land value assumptions and viability calculations structure development decisions (Payne, Sharp, and Chapman 2026). The core tension is therefore not between green and grey infrastructure *per se*, but between environmental multifunctionality and land value maximisation at the site scale.

This has implications for how institutions are understood within the regime, however, as it means that market acceptance is likely to be as important to transition as the role of innovation emerging from the niche or niche/regime boundary. Our findings indicated that a reliable market for GI within the built environment sector had yet to emerge and that this was not a persuasive influence on regime behaviour. Interview respondents within the housebuilding industry, in particular, noted that while there was a hypothetical market, this had yet to translate into a feedback loop showing clear cost signals linked to GI. As a result, established and more risk-averse provisions tended to be preferred. There was evidence of nascent norms emerging however which, although they highlighted the absence of a faith in direct GI market signals, accepted that indirect economic benefits could be yielded through quicker sales or expenditure saved on environmental remediation.

Work on market-centred transitions by Barker *et al.* (2024), Jiang and Payne (2022), and Payne and Barker (2018) has shown that the development of an established market for environmental improvements goes beyond an emphasis on consumer acceptance, to also include increased market trust amongst lenders, insurers and valuers. This points to the need for a greater level of shared engagement amongst actors within the planning and development regime. It is also suggestive of the complexity of market adjustment and raises questions as to how a GI market can be supported. When asked to consider whether GI benefits should be monetised, most respondents were clear that they had to be, as the ‘rules of the game’ were already established. In many ways this could be seen as evidence of regime ‘push back’ and the need for market ‘accommodation’. Whether such ‘accommodation’ is supportive of the principles of GI is another matter. Alternative perspectives on monetisation stemming from the research cautioned on those aspects of the environment that resisted valuation and that monetisation could create a distorted sense of value through low-level standardised provision. In this sense, where landscape pressures interact with embedded valuation norms, the absence of a reliable GI market signal could reinforce regime stability rather than destabilising it.

7.4. Theme 4: knowledge breakthrough: towards the acceptance and demystification of science

Another dominant theme related to external dynamics was the role played by new scientific knowledge. Established MLP interpretations of regime transition tend to see new knowledge as emerging from the niche or regime boundary and challenging established beliefs and norms in such a way that capacity improvements result (Geels 2014; Jørgensen 2012; Roberts and Geels 2019). Often this pressure for regime breakthrough is associated with universities, third sector organisations, or innovation led- small enterprises. Whilst an extensive body of scientific innovation has emerged in support of GI, scholars have questioned whether such knowledge is deemed persuasive amongst GI decision-makers (Van Oijstaeijen, Van Passel, and Cools 2020; Wang, Chang, and Fan 2021). Our research on institutional attitudes towards new knowledge raises questions about the perceived legitimacy of new knowledge and highlights both barriers and future knowledge needs. Those who were most resistant to emerging knowledge asserted either the need for academics to operate in a more practice-focused language or a reliance on the 'tried and tested'. This shows the manner in which institutions may seek to reassert existing beliefs and norms when under pressure. Where there was evidence of a stronger appreciation of the value of new knowledge, this was seen to be the preserve of the 'expert' and, in many cases, was seen to reside outside the organisation.

This focus on new GI knowledge as either 'privileged' or 'elite' rather than 'everyday' serves as a potential impediment to innovation. Yet, our research also indicates that those who were trusted as the custodians of emerging knowledge (consultancies and public authorities) were using this position to advocate on behalf of the niche. This, in turn, highlights the role that brokerage within the regime might play in providing pathways to enhanced transition by increasing institutional permeability between niche-level innovation and established development practice. It also emphasises the role of consultancies and public authorities as intermediaries mediating niche knowledge into regime practice.

Further pathways to potential knowledge acceptance were also found to be associated with rethinking the type of knowledge being prioritised and the form in which it was being communicated. Here, we found that the growing pressure to appreciate how GI operated as an integrated system led to frustrations with the lack of useable development scale information and that the dominance of complex GI support toolkits had led to confusion and apathy. As noted by several respondents, a greater emphasis on demonstration projects linked to similar market environments could serve as a form of GI knowledge demystification.

7.5. Theme 5: shared rules: policy clarity and standardisation

Previous studies on sustainability transitions in market-led regimes (Payne and Barker 2018, 2015) have drawn attention to the importance of developing an institutional appreciation of state-market interactions. Each institutional environment is context specific and the relationship between the formal regulatory apparatus of government and the market will always be variable. Our research on market-led planning and development systems has highlighted the importance of enhanced policy intervention to condition GI responses. Developers and consultancies argued that the lack of clear and consistent expectations between different local authorities and government agencies

created hesitancy and risk averse responses. Without a set of common rules, there was a fear that GI standards were geographically variable and that some markets were less constrained than others. These findings therefore point to the importance of policy provision in supporting immature GI markets which have yet to provide clear price signals.

In summary, although the findings highlight shared recognition of GI's potential value, they also reveal asymmetrical forms of influence within the regime. Developers exercise structural power through land ownership and capital allocation, enabling them to determine what is financially viable within specific development schemes. Public planning authorities possess regulatory authority, yet their influence is mediated through policy clarity, resource capacity and internal fragmentation. Consultancies occupy an intermediary position, operating as brokers seeking to translate environmental objectives into commercially legible and technically actionable forms. Power within this configuration is therefore relational rather than hierarchical. That is to say, GI outcomes are shaped not by unilateral dominance, but by negotiations across actors with differentiated mandates, professional expertise and exposure to risk. The scope for GI mainstreaming therefore depends less on the preferences of individual actors than on the extent to which expectations around risk, value, knowledge and stewardship can be aligned within the regime.

8. Conclusion

This article has examined the challenges of GI mainstreaming within market-led planning and development systems. Drawing on elite interviews with professional actors operating within the planning and development regime, the study has assessed the attitudes and experiences of GI engagement and application. In drawing on theory derived from transition management and new institutionalism, the research has explored both internal barriers and opportunities that condition institutional behaviour and the role of external driving forces upon regime actors. The findings show that GI mainstreaming is shaped not simply by the presence of structural barriers but by the relational dynamics between actors with different mandates, risk exposures and forms of authority. Developers, consultancies and public planning authorities interpret GI requirements in different ways, leading to negotiation, alignment and sometimes displacement of responsibility within development decision-making. These dynamics can be understood as reflecting the operation of different institutional logics within the development regime, shaping how actors evaluate environmental requirements, financial risk and professional responsibility. By foregrounding these actor interdependencies, the paper advances understanding of GI governance within market-led planning and development systems and addresses gaps in knowledge concerning both the barriers to wider GI acceptance and delivery (Dorst *et al.* 2022) and the drivers shaping decision making (Buijs *et al.* 2019; Harrington and Hsu 2018; Meerow 2020) within development regimes. In doing so, it enhances awareness and understanding of how actors that sit within market-driven development systems engage in GI, strengthening our understanding of the factors that condition GI governance. More broadly, the research emphasises the importance of analysing sustainability transitions not only through technological innovation or policy change, but through the institutional dynamics of development regimes where market-facing actors interact.

Our findings highlight the need for policy makers to acknowledge the complexity of GI transition within market-led planning and development systems. A greater appreciation of regime characteristics can help in the formulation of more effective policy interventions and the development of transition pathways. The findings highlight the importance of addressing both internal and external barriers to GI mainstreaming. Internal barriers relate to the need to foster institutional conditions which are more receptive to GI. This can be achieved by embedding GI within corporate policy, adjusting established working practices to better align with GI delivery, and enhancing internal knowledge and awareness of GI benefits. External barriers highlight the need for policy makers to consider how market conditions can be shaped to provide more support for GI. This can be achieved through a clearer articulation of GI within local planning policy and the use of policy to help generate market signals.

The research also points to the important role that knowledge generation and knowledge transfer can play in enhancing GI mainstreaming. In particular, a greater emphasis on the development of GI knowledge at the ‘development scale’ and the use of GI demonstration projects can help to create a greater sense of legitimacy and persuasiveness amongst actors within the planning and development regime. Though our research highlights the need for regime actors to be willing to accept alternative ways of working, it also highlights the important role played by enabling mechanisms to facilitate market adjustment.

Acknowledgements

We gratefully acknowledge the support of the Natural Environment Research Council [grant number #NE/N017498/1] and extend our sincere thanks to all interviewees for their invaluable contributions to the research.

Disclosure statement

No potential conflict of interest was reported by the authors.

Funding

The support for this study was obtained by Natural Environment Research Council [grant number #NE/N017498/1].

ORCID

Adam Barker  <http://orcid.org/0000-0001-8835-7837>

Sarah Payne  <http://orcid.org/0000-0001-5289-5844>

References

- Aalbers, C. B. E. M., D. A. Kamphorst, and F. Langers. 2019. “Fourteen Local Governance Initiatives in Greenspace in Urban Areas in The Netherlands. Discourses, Success and Failure Factors, and the Perspectives of Local Authorities.” *Urban Forestry & Urban Greening* 42 (June 2019): 82–99. doi:10.1016/j.ufug.2019.04.019.
- Adams, David, and Sarah Payne. 2011. ““Business as Usual?” – Exploring the Design Response of UK Speculative Housebuilders to the Brownfield Development Challenge.” In: *Urban*

- Design in the Real Estate Development Process*, edited by Steve Tiesdell and David Adams, 199–218. Chichester: Wiley-Blackwell.
- Adams, David, and Steve Tiesdell. 2012. *Shaping Places: Urban Planning, Design and Development*. London: Routledge.
- Anderson, Vidya, Matej Zgela, and William A. Gough. 2023. “Building Urban Resilience with Nature-Based Solutions: A Multi-Scale Case Study of the Atmospheric Cleansing Potential of Green Infrastructure in Southern Ontario, Canada.” *Sustainability* 15 (19): 19. doi:[10.3390/su151914146](https://doi.org/10.3390/su151914146).
- Austin, Gary. 2014. *Green Infrastructure for Landscape Planning: Integrating Human and Natural Systems*. London: Routledge.
- Bačić, Samanta, Hrvoje Tomić, Katarina Rogulj, and Goran Andlar. 2024. “Fuzzy Decision-Making Valuation Model for Urban Green Infrastructure Implementation.” *Energies* 17 (20): 20. doi:[10.3390/en17205162](https://doi.org/10.3390/en17205162).
- Ball, Michael. 2003. “Markets and the Structure of the Housebuilding Industry: An International Perspective.” *Urban Studies* 40 (5–6): 897–916. doi:[10.1080/0042098032000074236](https://doi.org/10.1080/0042098032000074236).
- Barker, Adam, Gemma Garcia-Blanco, Igone Garcia, and Adriana Aguirre-Such. 2024. “The Role of Strategic Planning in Nature-Based Solutions (NBS) Transformation: An Evaluation of the Green Cities Framework in Mainstreaming NBS in 6 European Countries.” *Nature-Based Solutions* 6(December 2024): 100157. doi:[10.1016/j.nbsj.2024.100157](https://doi.org/10.1016/j.nbsj.2024.100157).
- Benedict, Mark A., and Edward T. McMahon. 2012. *Green Infrastructure: Linking Landscapes and Communities*. Washington, DC: Island Press.
- Benton-Short, Lisa, Melissa Keeley, and Jennifer Rowland. 2021. “Green Infrastructure, Green Space, and Sustainable Urbanism: Geography’s Important Role.” In: *Geographic Perspectives on Urban Sustainability*, edited by V. Kelly Turner and David H. Kaplan, 1–22. London: Routledge.
- Bona, Sara, Fernanda Rodrigues, Ricardo Gomes, and Armando Silva-Afonso. 2024. “Nature-Based Solutions for Water Resilience in Thriving European Urban Areas.” *Urban Water Journal* 21 (7): 813–826. doi:[10.1080/1573062X.2024.235966](https://doi.org/10.1080/1573062X.2024.235966).
- Buijs, Arjen, Rieke Hansen, Sander Van der Jagt, Bianca Ambrose-Oji, Birgit Elands, Emily Lorange Rall, Thomas Mattijssen, *et al.* 2019. “Mosaic Governance for Urban Green Infrastructure: Upscaling Active Citizenship from a Local Government Perspective.” *Urban Forestry and Urban Greening* 40 (April 2019): 53–62. doi:[10.1016/j.ufug.2018.06.011](https://doi.org/10.1016/j.ufug.2018.06.011).
- Carrigan, Christopher, and Cary Coglianese. 2011. “The Politics of Regulation: From New Institutionalism to New Governance.” *Annual Review of Political Science* 14 (1): 107–129. doi:[10.1146/annurev.polisci.032408.171344](https://doi.org/10.1146/annurev.polisci.032408.171344).
- Chatzimontor, Anastasia, Evangelia Apostolopoulou, and Antonios D. Mazaris. 2020. “A Review of Green Infrastructure Research in Europe: Challenges and Opportunities.” *Landscape and Urban Planning* 198 (June 2020): 103775. doi:[10.1016/j.landurbplan.2020.103775](https://doi.org/10.1016/j.landurbplan.2020.103775).
- Crook, Tony, John Henneberry, and Christine Whitehead. 2015. *Planning Gain: Providing Infrastructure and Affordable Housing*. Chichester: Wiley-Blackwell.
- Dewulf, Art E., J. A. M. Termeer Catherine, Renate A. Werkman, R. P. J. Breeman Gerard, and Krijn J. Poppe. 2009. “Transition Management for Sustainability: Towards a Multiple Theory Approach.” In: *Transitions towards Sustainable Agriculture and Food Chains in Peri-Urban Areas*, edited by Krijn J. Poppe, Katrien Termeer, and Maja Slingerland, 25–50. Wageningen: Wageningen Academic Publishers.
- Dorst, Hade, Alexander Van Der Jagt, Helen Toxopeus, Laura Tozer, Rob Raven, and Hens Runhaar. 2022. “What’s behind the Barriers? Uncovering Structural Conditions Working against Urban Nature-Based Solutions.” *Landscape and Urban Planning* 220 (April 2022): 104335. doi:[10.1016/j.landurbplan.2021.104335](https://doi.org/10.1016/j.landurbplan.2021.104335).
- Felson, Alexander J., Emily E. Oldfield, and Mark A. Bradford. 2013. “Involving Ecologists in Shaping Large-Scale Green Infrastructure Projects.” *BioScience* 63 (11): 882–890. doi:[10.1525/bio.2013.63.11.7](https://doi.org/10.1525/bio.2013.63.11.7).
- Geddes, Anna, and Tobias S. Schmidt. 2020. “Integrating Finance into the Multi-Level Perspective: Technology Niche-Finance Regime Interactions and Financial Policy Interventions.” *Research Policy* 49 (6): 103985. doi:[10.1016/j.respol.2020.103985](https://doi.org/10.1016/j.respol.2020.103985).

- Geels, Frank W. 2014. "Regime Resistance against Low-Carbon Transitions: Introducing Politics and Power into the Multi-Level Perspective." *Theory, Culture & Society* 31 (5): 21–40. doi:[10.1177/0263276414531627](https://doi.org/10.1177/0263276414531627).
- Geels, Frank. 2019. "Socio-Technical Transitions to Sustainability: A Review of Criticisms and Elaborations of the Multi-Level Perspective." *Current Opinion in Environmental Sustainability* 39 (2019): 187–201. doi:[10.1016/j.cosust.2019.06.009](https://doi.org/10.1016/j.cosust.2019.06.009).
- Gerlak, Andrea K., Alison Elder, Mitch Pavao-Zuckerman, Adriana Zuniga-Teran, and Andrew R. Sanderford. 2021. "Agency and Governance in Green Infrastructure Policy Adoption and Change." *Journal of Environmental Policy & Planning* 23 (5): 599–615. doi:[10.1080/1523908X.2021.1910018](https://doi.org/10.1080/1523908X.2021.1910018).
- Giese, Emma, Amanda Rockler, Adel Shirmohammadi, and Mitchell A. Pavao-Zuckerman. 2019. "Assessing Watershed-Scale Stormwater Green Infrastructure Response to Climate Change in Clarksburg, Maryland." *Journal of Water Resources Planning and Management* 145 (10): 05019015. doi:[10.1061/\(ASCE\)WR.1943-5452.0001099](https://doi.org/10.1061/(ASCE)WR.1943-5452.0001099).
- Hansen, Rieke, and Stephan Pauleit. 2014. "From Multifunctionality to Multiple Ecosystem Services? A Conceptual Framework for Multifunctionality in Green Infrastructure Planning for Urban Areas." *Ambio* 43 (4): 516–529. doi:[10.1007/s13280-014-0510-2](https://doi.org/10.1007/s13280-014-0510-2).
- Harrington, Elise, and David Hsu. 2018. "Roles for Government and Other Sectors in the Governance of Green Infrastructure in the U.S." *Environmental Science & Policy* 88 (October 2018): 104–115. doi:[10.1016/j.envsci.2018.06.003](https://doi.org/10.1016/j.envsci.2018.06.003).
- Healey, Patsy. 1997. *Collaborative Planning: Shaping Places in Fragmented Societies*. London: Red Globe Press.
- Ibrahim, Alhassan, Katharine Bartsch, and Ehsan Sharifi. 2020. "Green Infrastructure Needs Green Governance: Lessons from Australia's Largest Integrated Stormwater Management Project, the River Torrens Linear Park." *Journal of Cleaner Production* 261 (2020): 121202. doi:[10.1016/j.jclepro.2020.121202](https://doi.org/10.1016/j.jclepro.2020.121202).
- Jiang, Han, and Sarah Payne. 2022. "Examining Regime Complexity in China's Green Housing Transition: A Housing Developers' Perspective." *Building Research & Information* 50 (3): 291–307. doi:[10.1080/09613218.2021.1943644](https://doi.org/10.1080/09613218.2021.1943644).
- Jørgensen, Ulrik. 2012. "Mapping and Navigating Transitions—The Multi-Level Perspective Compared with Arenas of Development." *Research Policy* 41 (6): 996–1010. doi:[10.1016/j.respol.2012.03.001](https://doi.org/10.1016/j.respol.2012.03.001).
- Kanger, Laur. 2021. "Rethinking the Multi-Level Perspective for Energy Transitions: From Regime Life-Cycle to Explanatory Typology of Transition Pathways." *Energy Research & Social Science* 71 (2021): 101829. doi:[10.1016/j.erss.2020.101829](https://doi.org/10.1016/j.erss.2020.101829).
- Killip, Gavin. 2013. "Transition Management Using a Market Transformation Approach: Lessons for Theory, Research, and Practice from the Case of Low-Carbon Housing Refurbishment in the UK." *Environment and Planning C: Government and Policy* 31 (5): 876–892. doi:[10.1068/c11336](https://doi.org/10.1068/c11336).
- King, A., and C. M. Shackleton. 2020. "Maintenance of Public and Private Urban Green Infrastructure Provides Significant Employment in Eastern Cape Towns, South Africa." *Urban Forestry & Urban Greening* 54 (2020): 126740. doi:[10.1016/j.ufug.2020.126740](https://doi.org/10.1016/j.ufug.2020.126740).
- Koppenjan, Joop F. M. 2015. "Public–Private Partnerships for Green Infrastructures. Tensions and Challenges." *Sustainability Governance and Transformation* 12 (February 2015): 30–34. doi:[10.1016/j.cosust.2014.08.010](https://doi.org/10.1016/j.cosust.2014.08.010).
- Korkou, Maria, Ari K. M. Tarigan, and Hans Martin Hanslin. 2023. "The Multifunctionality Concept in Urban Green Infrastructure Planning: A Systematic Literature Review." *Urban Forestry & Urban Greening* 85 (July 2023): 127975. doi:[10.1016/j.ufug.2023.127975](https://doi.org/10.1016/j.ufug.2023.127975).
- Liao, Kuei-Hsien. 2019. "The Socio-Ecological Practice of Building Blue-Green Infrastructure in High-Density Cities: What Does the ABC Waters Program in Singapore Tell Us?" *Socio-Ecological Practice Research* 1 (1): 67–81. doi:[10.1007/s42532-019-00009-3](https://doi.org/10.1007/s42532-019-00009-3).
- Lim, Mabel, and Stefanos Xenarios. 2021. "Economic Assessment of Urban Space and Blue-Green Infrastructure in Singapore." *Journal of Urban Ecology* 7 (1): juab020. doi:[10.1093/jue/juab020](https://doi.org/10.1093/jue/juab020).
- Lockwood, Matthew, Caroline Kuzemko, Catherine Mitchell, and Richard Hoggett. 2017. "Historical Institutionalism and the Politics of Sustainable Energy Transitions: A Research Agenda." *Environment and Planning C: Politics and Space* 35 (2): 312–333. doi:[10.1177/0263774X16660561](https://doi.org/10.1177/0263774X16660561).

- Loorbach, Derk, Jan Rotmans, and René Kemp, Gert de Roo. 2016. "Complexity and Transition Management." In: *Complexity and Planning Systems, Assemblages and Simulations*, edited by Jean Hillier, and Joris van Wezemael, 177–198. Farnham: Ashgate.
- Lux, Maria S. 2024. "Networks and Fragments: An Integrative Approach for Planning Urban Green Infrastructures in Dense Urban Areas." *Land* 13 (11): 1859. doi:10.3390/land13111859.
- Lyu, Liang, Kojiro Sho, Han Zhao, Youngkeun Song, Yuta Uchiyama, Jihwan Kim, and Takeru Sakai. 2024. "Construction, Assessment, and Protection of Green Infrastructure Networks from a Dynamic Perspective: A Case Study of Dalian City, Liaoning Province, China." *Urban Forestry & Urban Greening* 101 (November 2024): 128545. doi:10.1016/j.ufug.2024.128545.
- Malekpour, Shirin, Sylvia Tawfik, and Chris Chesterfield. 2021. "Designing Collaborative Governance for Nature-Based Solutions." *Urban Forestry & Urban Greening* 62 (2021): 127177. doi:10.1016/j.ufug.2021.127177.
- March, James G., and Johan P. Olsen. 1998. "The Institutional Dynamics of International Political Orders." *International Organization* 52 (4): 943–969. <http://www.jstor.org/stable/2601363>. doi:10.1162/002081898550699.
- Meerow, Sara. 2020. "The Politics of Multifunctional Green Infrastructure Planning in New York City." *Cities* 100 (May 2020): 102621. doi:10.1016/j.cities.2020.102621.
- Mekala, Gayathri Devi, and Darla Hatton MacDonald. 2018. "Lost in Transactions: Analysing the Institutional Arrangements Underpinning Urban Green Infrastructure." *Ecological Economics* 147 (May 2018): 399–409. doi:10.1016/j.ecolecon.2018.01.028.
- Mell, Ian C., John Henneberry, Sigrid Hehl-Lange, and Berna Keskin. 2016. "To Green or Not to Green: Establishing the Economic Value of Green Infrastructure Investments in The Wicker, Sheffield." *Urban Forestry & Urban Greening* 18 (2016): 257–267. doi:10.1016/j.ufug.2016.06.015.
- Mielke, Jahel. 2019. "Signals for 2°C: The Influence of Policies, Market Factors and Civil Society Actions on Investment Decisions for Green Infrastructure." *Journal of Sustainable Finance & Investment* 9 (2): 87–115. doi:10.1080/20430795.2018.1528809.
- Monteiro, Renato, José C. Ferreira, and Paula Antunes. 2020. "Green Infrastructure Planning Principles: An Integrated Literature Review." *Land* 9 (12): 12. doi:10.3390/land9120525.
- Munck af Rosenschöld, Johan, Jaap G. Rozema, and Laura Alex Frye-Levine. 2014. "Institutional Inertia and Climate Change: A Review of the New Institutional Literature." *WIREs Climate Change* 5 (5): 639–648. doi:10.1002/wcc.292.
- Nee, Victor. 1998. "Sources of the New Institutionalism." In: *The New Institutionalism in Sociology*, edited by Mary C. Brinton and Victor Nee, 1–16. New York: Russell Sage Foundation.
- Needham, Barrie, and Erik Louw. 2006. "Institutional Economics and Policies for Changing Land Markets: The Case of Industrial Estates in The Netherlands." *Journal of Property Research* 23 (1): 75–90. doi:10.1080/09599910600748675.
- O'Donnell, E. C., J. E. Lamond, and C. R. Thorne. 2017. "Recognising Barriers to Implementation of Blue-Green Infrastructure: A Newcastle Case Study." *Urban Water Journal* 14 (9): 964–971. doi:10.1080/1573062X.2017.1279190.
- Payne, Sarah L. 2009. "The Institutional Capacity of the UK Speculative Housebuilding Industry—Responding to the Brownfield Development Policy Agenda." PhD diss, University of Glasgow. <https://theses.gla.ac.uk/853/>
- Payne, Sarah, and Adam Barker. 2015. "Implementing Green Infrastructure through Residential Development in the UK." In: *Handbook on Green Infrastructure: Planning, Design and Implementation*, edited by Danielle Sinnett, Nick Smith and Sarah Burgess, 375–394. London: Edward Elgar.
- Payne, Sarah, and Adam Barker. 2018. "Carbon Regulation and Pathways for Institutional Transition in Market-Led Housing Systems: A Case Study of English Housebuilders and Zero Carbon Housing Policy." *Environment and Planning E: Nature and Space* 1 (4): 470–493. doi:10.1177/2514848618784282.
- Payne, Sarah, Liz Sharp, and Kiera Chapman. 2026. "Enhancing the Uptake and Quality of SuDS within New Housing Developments." *Journal of Environmental Planning and Management*. Advance online publication. doi:10.1080/09640568.2026.2646475.

- Payne, Sarah. 2013. "Pioneers, Pragmatists and Sceptics: Speculative Housebuilders and Brownfield Development in the Early Twenty-First Century." *Town Planning Review* 84 (1): 37–62. doi:[10.3828/tpr.2013.3](https://doi.org/10.3828/tpr.2013.3).
- Powell, Walter W., and Paul J. DiMaggio. 2012. *The New Institutionalism in Organizational Analysis*. Chicago: University of Chicago Press.
- Rauschmayer, Felix, Tom Bauler, and Niko Schöpke. 2015. "Towards a Thick Understanding of Sustainability Transitions—Linking Transition Management, Capabilities and Social Practices." *Ecological Economics* 109 (2015): 211–221. doi:[10.1016/j.ecolecon.2014.11.018](https://doi.org/10.1016/j.ecolecon.2014.11.018).
- Reimer, Mario, and Karsten Rusche. 2019. "Green Infrastructure under Pressure. A Global Narrative between Regional Vision and Local Implementation." *European Planning Studies* 27 (8): 1542–1563. doi:[10.1080/09654313.2019.1591346](https://doi.org/10.1080/09654313.2019.1591346).
- Roberts, Cameron, and Frank W. Geels. 2019. "Conditions for Politically Accelerated Transitions: Historical Institutionalism, the Multi-Level Perspective, and Two Historical Case Studies in Transport and Agriculture." *Technological Forecasting and Social Change* 140 (2019): 221–240. doi:[10.1016/j.techfore.2018.11.019](https://doi.org/10.1016/j.techfore.2018.11.019).
- Schöpke, Niko, Ines Omann, Julia M. Wittmayer, Frank Van Steenberghe, and Mirijam Mock. 2017. "Linking Transitions to Sustainability: A Study of the Societal Effects of Transition Management." *Sustainability* 9 (5): 737. doi:[10.3390/su9050737](https://doi.org/10.3390/su9050737).
- Schwarze-Rodrian, Michael. 2021. "Green Infrastructure Ruhr: Urban Regeneration through NBS." In: *Nature-Based Solutions for More Sustainable Cities—A Framework Approach for Planning and Evaluation*, edited by Edoardo Croci and Benedetta Lucchitta, 291–300. Leeds: Emerald Publishing Limited.
- Smith, Adrian, Jan-Peter Voß, and John Grin. 2010. "Innovation Studies and Sustainability Transitions: The Allure of the Multi-Level Perspective and Its Challenges." *Research Policy* 39 (4): 435–448. doi:[10.1016/j.respol.2010.01.023](https://doi.org/10.1016/j.respol.2010.01.023).
- Smith, Wendy K., and Marianne W. Lewis. 2011. "Toward a Theory of Paradox: A Dynamic Equilibrium Model of Organizing." *Academy of Management Review* 36 (2): 381–403. doi:[10.5465/AMR.2011.59330958](https://doi.org/10.5465/AMR.2011.59330958).
- Suleiman, Lina. 2021. "Blue Green Infrastructure, from Niche to Mainstream: Challenges and Opportunities for Planning in Stockholm." *Technological Forecasting and Social Change* 166 (May 2021): 120528. doi:[10.1016/j.techfore.2020.120528](https://doi.org/10.1016/j.techfore.2020.120528).
- Thornton, Patricia H., William Ocasio, and Michael Lounsbury. 2012. *The Institutional Logics Perspective: A New Approach to Culture, Structure and Process*. Oxford: Oxford University Press.
- United Nations General Assembly. 2015. *Transforming Our World: The 2030 Agenda for Sustainable Development*. A/RES/70/1. New York: United Nations.
- Van Cauwenbergh, N., P. A. Dourojeanni, P. van der Zaag, M. Brugnach, K. Dartee, R. Giordano, and E. Lopez-Gunn. 2022. "Beyond TRL – Understanding Institutional Readiness for Implementation of Nature-Based Solutions." *Environmental Science & Policy* 127 (January 2022): 293–302. doi:[10.1016/j.envsci.2021.09.021](https://doi.org/10.1016/j.envsci.2021.09.021).
- Van Oijstaeijen, Wito, Steven Van Passel, and Jan Cools. 2020. "Urban Green Infrastructure: A Review on Valuation Toolkits from an Urban Planning Perspective." *Journal of Environmental Management* 267 (August 2020): 110603. doi:[10.1016/j.jenvman.2020.110603](https://doi.org/10.1016/j.jenvman.2020.110603).
- Versini, Pierre-Antoine, Leydy Alejandra Castellanos-Diaz, David Ramier, and Ioulia Tchiguirinskaia. 2023. "Evapotranspiration Evaluation by 3 Different Protocols on a Large Green Roof in the Greater Paris Area." *Earth System Science Data Discussions* 2023 (2023): 1–24. doi:[10.5194/essd-16-2351-2024](https://doi.org/10.5194/essd-16-2351-2024).
- Wang, Yanan, Qing Chang, and Peilei Fan. 2021. "A Framework to Integrate Multifunctionality Analyses into Green Infrastructure Planning." *Landscape Ecology* 36 (7): 1951–1969. doi:[10.1007/s10980-020-01058-w](https://doi.org/10.1007/s10980-020-01058-w).
- Weber, Theodore, and John Wolf. 2000. "Maryland's Green Infrastructure—Using Landscape Assessment Tools to Identify a Regional Conservation Strategy." *Environmental Monitoring and Assessment* 63 (2000): 265–277. doi:[10.1023/A:1006416523955](https://doi.org/10.1023/A:1006416523955).
- Wild, T. C., J. Henneberry, and L. Gill. 2017. "Comprehending the Multiple 'Values' of Green Infrastructure – Valuing Nature-Based Solutions for Urban Water Management from Multiple Perspectives." *Environmental Research* 158 (October 2017): 179–187. doi:[10.1016/j.envres.2017.05.043](https://doi.org/10.1016/j.envres.2017.05.043).

- Wittmayer, Julia M., and Derk Loorbach. 2016. "Governing Transitions in Cities: Fostering Alternative Ideas, Practices, and Social Relations through Transition Management." In: *Governance of Urban Sustainability Transitions: European and Asian Experiences*, edited by Derk Loorbach, Julia M. Wittmayer, Hideaki Shiroyama, Junichi Fujino, and Satoru Mizuguchi, 13–32. Berlin: Springer Nature. doi:[10.1007/978-4-431-55426-4_2](https://doi.org/10.1007/978-4-431-55426-4_2).
- Zabel, Astrid, and Mara-Magdalena Häusler. 2024. "Policy Instruments for Green Infrastructure." *Landscape and Urban Planning* 242 (February 2024): 104929. doi:[10.1016/j.landurbplan.2023.104929](https://doi.org/10.1016/j.landurbplan.2023.104929).
- Zalejska-Jonsson, Agnieszka, Sara J. Wilkinson, and Richard Wahlund. 2020. "Willingness to Pay for Green Infrastructure in Residential Development—A Consumer Perspective." *Atmosphere* 11 (2): 152. doi:[10.3390/atmos11020152](https://doi.org/10.3390/atmos11020152).
- Zimmerman, Rae, Ryan Brenner, and Jimena Llopis Abella. 2019. "Green Infrastructure Financing as an Imperative to Achieve Green Goals." *Climate* 7 (3): 39. doi:[10.3390/cli7030039](https://doi.org/10.3390/cli7030039).