Sustainable Development

WILEY

Sustainable Development

RESEARCH ARTICLE OPEN ACCESS

Delivering the UN Sustainable Development Goals Through Inclusive Stakeholder Engagement: The Case of Flood Alleviation Schemes in England

Maria Christina Georgiadou[1] | Sarah Louise Fitton[2]

[1]School of the Built Environment, London Metropolitan University, London, UK | [2]Aurora Engagements Ltd., Rochdale, UK

Correspondence: Maria Christina Georgiadou (c.georgiadou@londonmet.ac.uk)

Received: 14 February 2025 | **Revised:** 27 August 2025 | **Accepted:** 6 September 2025

Funding: This research was funded by a 2023/24 Quentin Hogg Trust (Small Grant). The original data was collected as part of a doctoral research at the Centre for Sustainable Development at the University of Cambridge between 2011 and 2015, funded by the Engineering and Physical Sciences Research Council and Ove Arup and Partners through an Industrial Cooperative Award in Science and Engineering (CASE) award.

Keywords: community engagement | flood alleviation schemes | inclusive design | project success | social value | stakeholder engagement

ABSTRACT

The United Nations Sustainable Development Goals (SDGs) provide an integrated framework for embedding social value in infrastructure planning and promoting inclusive, climate-resilient urban development. However, the operationalization and measurement of social sustainability across infrastructure projects remain inconsistent and underdeveloped. This study examines the relationship between community engagement practices and social value outcomes in flood alleviation schemes in the North of England, with reference to SDG 9 (Industry, Innovation and Infrastructure), SDG 10 (Reduced Inequalities), SDG 11 (Sustainable Cities and Communities), SDG 13 (Climate Action), and SDG 17 (Partnerships for the Goals). Through a comparative case study analysis of the Didsbury, Ripon, and Todmorden flood alleviation schemes, and 33 semi-structured interviews with practitioners, the research finds that projects characterized by meaningful, early-stage engagement and knowledge co-production achieved stronger alignment with local social value priorities and increased community trust. The study concludes that, whereas current practices often reduce social value to narrow economic or technical metrics, embedding co-production of knowledge with local communities is essential to achieving meaningful social value and aligning with multiple SDGs in flood risk management and infrastructure development.

1 | Introduction

The United Nations Sustainable Development Goals (SDGs) provide a widely recognized global framework for understanding and delivering social value, particularly in relation to environmental sustainability, inclusive growth, and equitable infrastructure delivery (United Nations 2015). Within this framework, social value refers to the long-term societal benefits generated through participatory, place-based development that promotes equity, wellbeing, and resilience (Raiden et al. 2019; Raiden and King 2022). SDG 11 (Sustainable Cities and Communities) and SDG 13 (Climate Action) emphasize the need for inclusive and net zero urban development, whereas others such as SDG 9 (Industry, Innovation and Infrastructure), SDG 10 (Reduced Inequalities), and SDG 17 (Partnerships for the Goals) highlight the importance of urban resilience, stakeholder inclusion, and cross-sector collaboration in shaping just and sustainable built environments (Raiden et al. 2019; Raiden and King 2022; United Nations 2015).

Infrastructure projects significantly influence society and the economy by addressing essential needs such as housing, energy,

sanitation, transport, flood protection, and safety (IPA 2023; Raiden et al. 2019; Raiden and King 2022). These projects are central not only to economic growth but also to delivering the UK's net zero ambitions and climate resilience (Dobson et al. 2020; RICS, Simetrica, and Jacobs. 2020). Stakeholder engagement has been identified as a key enabler for these efforts. The Climate Change Committee (CCC 2022; CCC 2021), for instance, stresses the importance of public involvement in driving behavioral change to meet climate targets. Nevertheless, engagement in infrastructure projects often remains limited, characterized by top-down, technocratic approaches that restrict local communities' influence over the design and decision-making process (Gerlak et al. 2023; Fujiwara et al. 2021; Pinto et al. 2022).

Flood alleviation schemes present specific challenges in this context. These long-term, capital-intensive projects are crucial to protecting vulnerable communities from climate-related risks (Allaway and Brown 2019; CCC 2022, 2021; George et al. 2016; Raiden et al. 2019). However, when community stakeholders are marginalized during the planning process, projects are more likely to experience delays, costly redesigns, and growing resistance from the community, which may manifest as public objections, protests, or disengagement (Fitton and Moncaster 2022). This lack of acceptance can significantly compromise both the perceived legitimacy and the long-term success of the scheme (UKGBC 2022; UKGBC 2020; Zallio and Clarkson 2021). Although inclusive, co-produced approaches are widely endorsed in policy discourse, their practical implementation remains inconsistent (Chambers et al. 2021; Gerlak et al. 2023), especially in flood risk management (Fitton and Moncaster 2022).

Barriers to effective community engagement in flood alleviation schemes often stem from a continued reliance on technical, engineering-led approaches and limited collaboration between agencies and local communities (Fitton and Moncaster 2022; Mees et al. 2016). These challenges are consistent with wider barriers to implementing Nature-based Solutions (NbS), such as institutional silos, unclear responsibilities, and limited stakeholder capacity (Frantzeskaki 2019; Frantzeskaki and Rok 2018).

This study adopts social power theory to examine how power and influence are distributed between institutional actors and local communities in the context of flood alleviation schemes (Lukes 2005b; Tew 2002). The framework highlights how dominant institutional norms shape whose knowledge is legitimized, whose voices are heard, and who influences decisions (Badi et al. 2020; Jennings 2009; Masrom et al. 2024; Whyte and Nussbaum 2020; Whyte and Davies 2021). In flood risk management, these dynamics often marginalize local perspectives and restrict meaningful engagement (Mees et al. 2016; Fitton and Moncaster 2019), thus undermining the potential to deliver social value.

This study addresses the following research questions:

1. How is social value interpreted and operationalized by professionals involved in flood alleviation schemes?
2. What are the key barriers to inclusive and effective stakeholder engagement in these projects?
3. How can stakeholder engagement be improved to foster genuine co-production with communities and maximize the social value of flood infrastructure?

The overarching aim is to examine how co-produced, inclusive approaches can enhance social value and advance SDGs 9, 10, 11, 13, and 17. It is driven by the need to connect technical success with social value in the growing number of flood schemes across Northern England, reconciling community with climate resilience (CCC 2022, 2021; Environment Agency 2024).

To address this aim, the study has three key objectives:

1. To conduct a thematic overview of stakeholder engagement, social value, and knowledge co-production, focusing especially on how the uneven distribution of influence and decision-making power between professionals and local communities affects the engagement process.
2. To examine current industry perceptions of stakeholder engagement, social value, and community involvement, based on empirical findings from 33 semi-structured interviews with industry professionals involved in three flood alleviation schemes in the North of Englandand.
3. To provide practical recommendations for enhancing inclusive stakeholder engagement by upskilling professionals and refining engagement frameworks in flood risk infrastructure delivery.

This study draws exclusively on the perspectives of industry professionals engaged in flood alleviation schemes, aiming to examine how social value is interpreted and operationalised within the professional practice of Design, Development, and Construction (DDC) teams. As social value delivery is predominantly industry-led, this focus provides a necessary foundation for understanding current engagement methods and the persistent theory-practice gap (Fujiwara et al. 2021; Mulholland et al. 2025), establishing the groundwork for further inquiry inclusive of community engagement approaches.

The paper is structured as follows: Section 2 reviews relevant literature, detailing the relationship between stakeholder engagement, social value in the built environment, co-production of knowledge, and social power theory, which informs the theoretical framework. Section 3 outlines the research design, including case studies and data collection and analysis methods. Section 4 presents the empirical findings, followed by a discussion in Section 5. Section 6 concludes with theoretical and practical recommendations, as well as suggestions for future research.

2 | Literature Review

2.1 | Stakeholder Engagement in the Built Environment

Infrastructure is essential for meeting societal needs and driving economic development (Dobson et al. 2020; Fujiwara et al. 2021). The construction industry plays a key role in the UK Government's £700–775 billion investment plan, focusing on roads, hospitals, and schools to promote growth

(IPA 2023). This supports the "leveling up" agenda, reducing socio-economic inequalities and advancing SDG 9. The Infrastructure and Projects Authority (IPA)'s 2030 roadmap prioritizes infrastructure that generates social value, particularly through place-based interventions (IPA 2021). The Construction Playbook advocates a collaborative, evidence-based approach to achieving social value while ensuring sustainability and social value, contributing directly to SDG 9, 11, and 13 and the UK's net-zero and climate-resilient infrastructure goals (UK Government 2022).

Beck et al. (2023) emphasize Stakeholder Value Creation (SVC) as critical to achieving SDGs through inclusive and transparent decision-making. Effective stakeholder engagement, particularly in the planning and design stages, is key to achieving sustainable and climate-responsive outcomes (Doloi 2020; Gerlak et al. 2023; Masrom et al. 2024). Early stakeholder identification and analysis improve project success (APM 2018; Eskerod and Huemann 2024). Stakeholder mapping based on power, interest, and expectations supports proactive project management (APM 2018). Strong engagement builds trust, mitigates resistance, and contributes to social equity and place-based development, key to delivering SDG 9, 10, 11, and 13 (Beck et al. 2023; Frantzeskaki and Rok 2018).

However, managing stakeholder engagement in large infrastructure projects can be challenging due to diverse interests, power imbalances, and evolving stakeholder dynamics (Doloi 2020). Poor engagement can lead to delays, reduced legitimacy, and diminished social value (Zhang et al. 2024). Prioritizing technical and financial considerations over stakeholder inclusion undermines long-term value and limits alignment with sustainability targets (Vargas et al. 2022). Pinto et al. (2022), and Beck et al. (2023) identify a gap in understanding how sustained engagement impacts long-term outcomes, highlighting the need for integrated approaches that explicitly align stakeholder engagement with social value delivery, climate resilience, and broader SDG outcomes.

Flood alleviation projects are unique within infrastructure delivery, as their implementation simultaneously supports multiple SDGs, especially SDG 9, 10, 11, 13, and 17. The flood sector is also one of the few public infrastructure domains in the UK where spending has consistently increased, reflecting the growing impact of extreme weather events (CCC 2022; Environment Agency 2024). Flooding, unlike drought or wildfire risks, represents the most significant extreme climate threat to the UK, causing sustained disruption to housing, infrastructure, and community well-being (CCC 2021).

2.2 | Stakeholder Engagement and Social Value

Infrastructure projects with long lifecycles must deliver social value across generations due to their public nature and diverse stakeholders (Fujiwara et al. 2021; Vuorinen and Martinsuo 2019). The Construction Playbook defines social value as maximizing public procurement benefits, creating jobs, and supporting net-zero goals (UK Government 2022). The UK Green Building Council (2022) adds enhancing quality of life through better living, working, and leisure spaces, especially in response to flooding. Social value arises from engaging stakeholders and ensuring their active involvement (Beck et al. 2023; Fitton and Moncaster 2019; Fitton et al. 2015), with the Institute of Social Value (2020) and the UKGBC (2022) Social Value framework further highlighting the importance of inclusive stakeholder engagement, particularly with local communities.

Flood alleviation schemes reduce flood risk and the associated fear from repeated or anticipated flood events, supporting livelihoods and enhancing overall well-being (DEFRA, 2022; Environment Agency 2024). Unlike conventional infrastructure investments, these schemes are distinctive in that they address both physical and psychological vulnerabilities. Community engagement is essential not only due to the technical complexities but also because flooding disproportionately impacts certain groups within the same area. Vulnerable populations are more prone to psychological impacts from flooding, including stress, chronic anxiety, and trauma linked to the persistent threat of future floods (Bubeck et al. 2012; French et al. 2019). These outcomes hinder progress toward SDGs, including also SDG 3 (Good Health and Well-being), reinforcing the need for inclusive, adaptive, and socially responsive flood risk management alongside SDGs 9, 10, 11, 13, and 17.

Infrastructure projects can deliver social value through environmental sustainability, job creation, local procurement, and improved access to services (Raiden et al. 2019; UK Government 2022). These contributions reduce inequalities, enhance social mobility, and foster long-term well-being (Fitton and Moncaster 2022; Institute of Social Value 2020). However, quantifying social value remains challenging due to the absence of standardized frameworks to measure social outcomes (Vargas et al. 2022; Vuorinen and Martinsuo 2019). Misalignment between stakeholder expectations and project objectives can lead to dissatisfaction and conflict. In high-stakes contexts like flood risk, inclusive engagement across the project lifecycle is vital to reducing conflict and ensuring sustainable outcomes (Yang et al. 2011; Zhang et al. 2024).

2.3 | Co-Production in Stakeholder Engagement

Early and sustained stakeholder engagement that empowers communities through collaboration and co-production can significantly improve project outcomes (Chambers et al. 2021; Djenontin and Meadow 2018; Frantzeskaki and Rok 2018; Wamsler 2017). Co-production, defined by Mees et al. (2016) as the active involvement of stakeholders in both decision-making and delivery, fosters mutual learning and shared ownership. In flood alleviation schemes, the shortcomings of conventional engagement approaches (often dominated by expert-led perspectives) become especially apparent, frequently overlooking local lived experiences (Fitton and Moncaster 2022; Mees et al. 2016). This marginalisation can exclude the voices of those most affected by risk, undermining efforts to support psychological well-being and community resilience (Djenontin and Meadow 2018; Frantzeskaki and Rok 2018).

Co-production addresses these issues by redistributing power and enabling communities to define their own priorities and values (Chambers et al. 2021; Chilvers et al. 2014; Gerlak

et al. 2023). This is particularly critical in flood risk management, where impacts are unequally experienced across physical, social, and psychological dimensions (Kellens et al. 2013; Quinn et al. 2023). Embedding diverse voices into planning processes not only enhances the relevance of interventions but also contributes to their long-term sustainability (Frantzeskaki and Rok 2018).

Recent efforts in built environment research have increasingly focused on equality, diversity, and inclusion, aiming to involve all societal groups, particularly the most vulnerable (UKGBC 2020; Wamsler 2017; Zallio and Clarkson 2021). Participatory tools, such as community forums, digital visualization, mapping, and gamified modeling, enhance engagement, build trust, and support social learning. They are especially valuable in flood alleviation efforts, where securing community buy-in is essential and past exclusion may have eroded trust (Jennings 2009; Kellens et al. 2013). These approaches also contribute to SDG 17 by promoting cross-sector collaboration (Sustrans 2024).

Current practice in flood infrastructure in the UK often fails to address systemic inequities, with vulnerable and marginalized groups frequently underrepresented both in decision-making processes and in the distribution of project benefits (UKGBC 2020). Traditional industry stakeholder engagement tools, such as the power-interest matrix, tend to prioritize outcomes from the developer's perspective rather than reflecting the needs and priorities of local communities. This narrow focus restricts the potential to create long-term social value and to build genuine community resilience (UKGBC 2022).

2.4 | Social Power Theory

Social power theory explains how stakeholder relationships and power dynamics shape decision-making and outcomes in project management and infrastructure projects (Badi et al. 2020; Doloi 2020). This is particularly important in flood alleviation schemes, where vulnerable communities face disproportionate socio-economic and health risks (Kellens et al. 2013; Quinn et al. 2023). Recognizing and addressing power imbalances is crucial to ensure equitable project processes while collaborative leadership strategies can foster more inclusive decision-making and long-term engagement (Eskerod and Huemann 2024). Project management frameworks that incorporate stakeholder power dynamics can help shift the focus beyond time and cost management to include social impacts in evaluating project performance and success (Badi et al. 2020; Eskerod and Huemann 2024; Pinto et al. 2022; Vuorinen and Martinsuo 2019).

Arnstein's (1969) foundational work defines social power as the redistribution of control from professionals to local communities, emphasizing the importance of participatory governance. Building on this, social power theory offers a framework for understanding how power shapes relationships and stakeholder engagement in infrastructure projects. Lukes (2005b) identifies three dimensions of power: visible decision-making, the shaping of values and beliefs, and the influence over people's preferences and perceived choices. Tew (2002) distinguishes between "power over," which limits agency, and "power together," which enables collaboration and shared outcomes. Rather than being solely about domination, social power often emerges from personal interests and negotiated relationships (Brauer and Bourhis 2006). Lukes (2005a) also highlights that power is fluid, relational, and co-produced through ongoing interaction.

This theoretical framing underpins recent literature on co-production and stakeholder involvement in flood infrastructure. Chambers et al. (2021), Mees et al. (2016), Masrom et al. (2024), and Vargas et al. (2022) highlight how early and continuous engagement enables communities to shape project outcomes and address local needs. Everett et al. (2021) propose a blue-green infrastructure framework grounded in co-production, designed to empower communities and reduce socio-economic inequalities by rebalancing power through collaborative governance. This aligns closely with the core principles of NbS, which emphasize participatory planning, equity, and context-specific implementation (Frantzeskaki 2019; Kabisch et al. 2022).

In industry, the UK Social Value framework assesses the broader social impacts of infrastructure projects beyond traditional economic metrics (UKGBC 2022). Despite its growing use in professional practice, there remains a notable lack of theoretical frameworks integrating social value with inclusive stakeholder engagement in the built environment (Mulholland et al. 2025). This gap is significant, particularly as social value is increasingly recognized as essential to achieving the SDGs (Beck et al. 2023; Fujiwara et al. 2021; Raiden and King 2022; Raiden et al. 2019).

3 | Research Methodology

This study explores the concept of social value and community engagement in the context of flood alleviation schemes, using a qualitative, constructivist grounded theory approach (Flick et al. 2014). As social value in the built environment is largely shaped by practitioners (Fujiwara et al. 2021; Mulholland et al. 2025), this methodology supports the development of theory rooted in empirical evidence, enabling research to respond to the evolving nature of community engagement and its implementation within the flood sector. An overview can be found in Figure 1.

To investigate these dynamics within real-world contexts, the research draws on case studies of flood alleviation schemes. Case studies allow for detailed examination of phenomena within their actual settings and offer a richer contextual understanding of how social value is perceived and negotiated among stakeholders (Flyvbjerg et al. 2012; Yin 2018).

A set of criteria was developed for selecting case studies, including projects within a single Local Authority boundary in England, protection of no more than 1000 homes and commercial properties, project completion within the last 15 years, contactable DDC teams, and schemes that had gained awards of commendation for best practice within the industry. The selection of flood alleviation projects from the last 15 years ensures relevance to current industry practices, capturing advancements in policy, technology, and stakeholder engagement. This

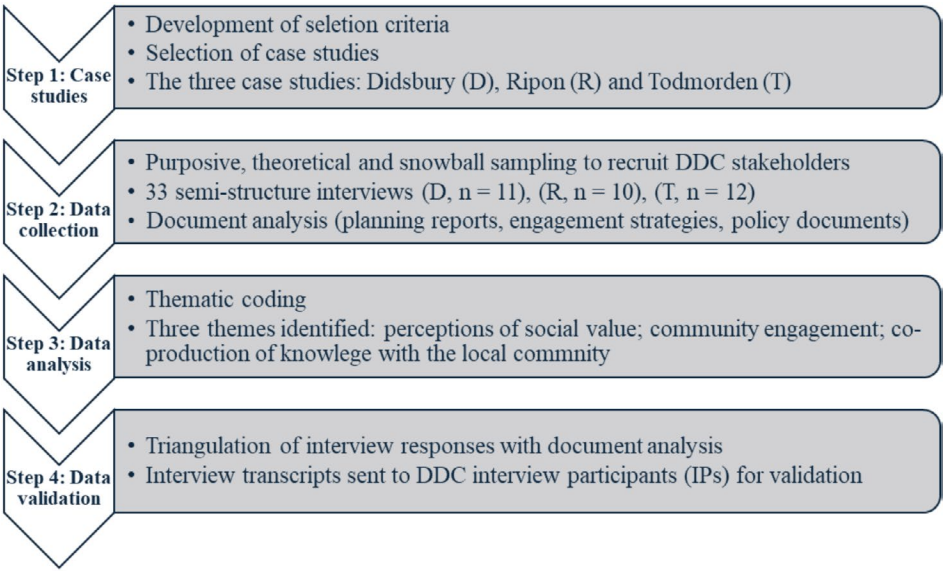

FIGURE 1 | Research design. *Source:* Authors.

period reflects the shift towards net-zero and climate resilience, as outlined in the UK Government's 25-Year Environment Plan (UK Government 2018), and highlights modern approaches to community involvement and socio-environmental challenges.

A systematic analysis of these criteria led to the selection of the three most suitable case studies for primary data collection: namely, the Didsbury, Ripon, and Todmorden schemes.

3.1 | Data Collection Methods

After selecting the case studies, appropriate qualitative methods were employed to gather data aligned with the research aim (Bryman 2022; Creswell 2022; Yin 2018). To explore differing perceptions of social value among DDC professionals of flood alleviation schemes, semi-structured interviews were conducted. Compared to surveys or unstructured interviews, this format proved more effective in examining complex social dynamics and stakeholder perspectives (Creswell 2022). Document analysis was used to provide contextual background on each flood alleviation scheme and to support respondent validation by enabling direct comparison between interview data and official project documents, including planning applications, design reports, policy documents, engagement strategies, and consultation records (Yin 2018). This helped verify interviewees' accounts of engagement practices, clarify project timelines, and assess the consistency of stakeholder narratives with documented actions and outcomes.

Participants were selected through purposive sampling, with theoretical and snowball sampling used to expand and refine the participant pool (Bryman 2022; Bryant and Charmaz 2019). Initial contacts were identified through document review and professional networks. Sampling evolved iteratively, informed by ongoing data analysis, consistent with grounded theory principles (Hood 2007). The process continued until theoretical saturation was achieved, when additional data no longer contributed new insights (Bryant and Charmaz 2019; Bryman 2022).

Empirical data were gathered through 33 semi-structured interviews with industry practitioners from DDC teams involved in three flood alleviation schemes carried out between 2013 and 2014. The distribution of interviewees was as follows:

- 11 from the Didsbury flood storage basin improvement scheme
- 10 from the Ripon Rivers flood alleviation scheme
- 12 from the Todmorden flood alleviation scheme

Participants included representatives from the Environment Agency, DDC consultants, and local planning authorities. Interviews focused on stakeholder engagement and the co-production of knowledge, particularly in relation to the challenges and success factors in engaging with different professional perspectives.

Each interview lasted approximately 60 min and took place at the participants' workplaces. All interviews were audio-recorded with informed consent and transcribed verbatim. Citations follow the format [Industry Practitioner (IP) Case Study—Interview Number], for example (IP2 Ripon).

3.2 | Data Analysis Methods and Validation

The interview data were analysed following the systematic approach outlined by Miles et al. (2018), emphasizing an iterative coding process to identify core themes across interviews. Constant comparison was used to examine similarities and differences between industry professionals (e.g., design teams, consultants, and planners) and across project phases, providing deeper insight into how community engagement practices were shaped by power dynamics and aligned with social value practices. The interview transcripts were returned to interviewees for respondent validation, allowing participants to confirm the accuracy of their views and ensuring credibility in the subsequent stages of coding and thematic analysis (Creswell 2022).

Document analysis also contributed to data triangulation, reinforcing the credibility of the findings.

The selection of three key coding themes was informed by social power theory (Badi et al. 2020), the concept of transitions and temporalities, which highlights power dynamics in participatory processes and how shifts across project phases influence the continuity or disruption of community engagement practices (Whyte and Davies 2021; Whyte and Nussbaum 2020), and the role of inclusive stakeholder engagement in fostering social value through trust, legitimacy, and equitable participation (Doloi 2020). By blending these three strands, the analysis explains how power relations shaped the co-production of knowledge between stakeholders and local communities. This integrated approach guided the development of three core coding themes that capture how community engagement and stakeholder priorities evolved over time as flood alleviation projects progressed from design to ongoing operations. These themes were applied to the three case studies of flood alleviation schemes, enabling a comparative exploration of how engagement practices adapted and evolved in different social and temporal contexts.

1. *Perceptions of social value*: This theme examined how industry participants perceived the social value generated by the flood alleviation projects. Social value was assessed in terms of its impact on the local community, including enhancements to infrastructure, social cohesion, and overall quality of life. Participants' views on both tangible and intangible community benefits were central to understanding how social value was interpreted within the context of infrastructure projects.
2. *Community engagement*: This theme focused on the processes and practices of engaging local communities throughout the project lifecycle. It explored the methods used to involve communities, the challenges in maintaining meaningful engagement, and how communication strategies evolved as the project progressed. The influence of power dynamics on the depth and nature of engagement was a key factor in understanding how these relationships developed.
3. *Co-production of knowledge with the local community*: This theme investigated the collaborative process of knowledge creation between the project team and local communities. It examined how local knowledge was integrated with technical expertise to co-create solutions that addressed both the project's needs and the community's concerns. This process was seen as critical in building trust, empowering communities, and ensuring a more inclusive decision-making process.

This study examines industry perspectives on social value in flood infrastructure projects, intentionally excluding community viewpoints to enable a focused analysis of current professional practices. Although stakeholder engagement is widely endorsed, research highlights a persistent gap between intent and practice, often shaped by regulatory pressures and limited resources (Dobson et al. 2020; Fujiwara et al. 2021; Mulholland et al. 2025; UKGBC 2022; UKGBC 2020). These constraints can render community involvement more symbolic than substantive. The exclusion of voices such as homeowners or local businesses at risk of flooding is acknowledged as a limitation; however, it allows for a focused interrogation of the status quo—how industry actors interpret and enact engagement within institutional settings. In the absence of established theoretical frameworks that integrate community perspectives into infrastructure design (Chambers et al. 2021; Dobson et al. 2020; Fujiwara et al. 2021; Mulholland et al. 2025), social power theory provides the critical reflexivity needed to examine professional assumptions, behaviors, and power dynamics. By centering professional viewpoints, this study offers insight into existing practice and establishes a foundation for the development of future theoretical and conceptual frameworks that meaningfully incorporate community input.

3.3 | Case Studies

3.3.1 | Case Study 1: Didsbury Flood Storage Basin Improvement Scheme

Didsbury is situated 4.5 km to the south of Manchester City Centre. The Didsbury Flood Storage Basin came into operation in 1979. It is 62 ha in size and is required to relieve peak flows on the River Mersey, as illustrated in Figure 2. The basin also lies within a Conservation Area with a local nature reserve.

The project was completed in 2011 and was commended by the Institution of Civil Engineers in 2012 for its work with the local community (Fitton and Moncaster 2019). Key works of the scheme included new monitoring and telemetry equipment to provide more accurate readings of flood levels, construction of a floodwall and floodgate to protect two residential properties, renovation of a rugby clubhouse to raise the floor and roof levels, and construction of a new outfall into the River Mersey to facilitate floodwater removal from the eastern section (Fitton and Moncaster 2019).

3.3.2 | Case Study 2: Ripon Rivers Flood Alleviation Scheme

Ripon is a city situated in a rural setting north of Harrogate, Yorkshire, with a history of flooding as it lies at the confluence

FIGURE 2 | The new floodwall constructed as part of the Didsbury scheme. *Source:* Authors.

of the River Skell and River Laver. The Environment Agency commissioned the Ripon Rivers Flood Alleviation Scheme, which was completed in 2011. Over 500 residential and commercial properties were at risk of flooding. The scheme served to protect 548 houses and 96 commercial properties (BBC 2012). The main approach to reducing flood risk was the construction of a dam (Fitton et al. 2015).

Further works to reduce the risk of flooding were carried out around the city in keeping with the conservation area status and enhancing local biodiversity, including floodwalls, piled walls, grass-over defenses, and redesign of smaller and less obtrusive weirs, as shown in Figure 3. The scheme won the 2011 Green Apple Environmental Award and the Considerate Contractors Scheme National Site Award. In 2012, it won the Silver Considerate Constructors Scheme National Award (Fitton et al. 2015).

3.3.3 | Case Study 3: Todmorden Flood Alleviation Scheme

Todmorden is located on the boundary of West Yorkshire and is in a Conservation Area, where development works are subject to strict planning controls. The town has suffered flooding from the River Calder and Walsden Waters and had no previous formal flood defenses. In total, 772 residential and 58 commercial properties were at risk from flooding in the valley bottom. In 2004, the Environment Agency was granted planning permission by Calderdale Council for the five phases of the Todmorden Flood Alleviation Scheme.

The study focuses on Phase 3 of this project, initiated due to funding constraints in 2011, consisting of new flood defense walls, repair and maintenance works to five culverts, and renovation of three listed buildings (Premier 2024) as shown in Figure 4. The scheme was a gold Considerate Constructors national award winner in 2013, awarded an International Safety Award with Merit by the British Safety Council in 2012, and a silver Considerate Constructors National Award in 2012 (ibid).

4 | Results

4.1 | Perceptions of Social Value

All industry participants recognized the importance of social value in flood alleviation schemes, viewing it as integral to project success and community well-being. However, their interpretations varied, often shaped by their professional roles and the dominant technical and economic appraisal frameworks in use.

One participant noted, "I think it is needed [social value]. It's very important. At the end of the day you don't want to be doing the type of scheme that is not going to supply social benefit ... We should be considering who is benefitting and what the impact is on their lives." (Ripon IP10). This view illustrates a general commitment to socially beneficial outcomes, yet the scope of social value tended to be narrowly framed in terms of reduced flood risk and physical protection of property, livelihoods and business continuity. Todmorden IP5 reported reduced day-to-day anxiety during rainfall, as the risk of losing homes or livelihoods to flooding was perceived to be significantly lower. This was described as a key aspect of the social value generated by the scheme. Another participant stated, "... the fact the town is much more protected, the long-term social value ... reduced insurance premiums, businesses being able to operate normally, being able to invest in the long term." (Todmorden IP12).

Despite this recognition, the integration of social value into decision-making was limited. A key theme was the difficulty of quantification, with interviewees expressing that intangible benefits, such as emotional wellbeing or community cohesion, were hard to translate into measurable outcomes. As one participant highlighted, "It is very difficult to put it in monetary terms... if it can't be quantified then nothing can be done about it" (*Todmorden IP1*). The current systems used to appraise schemes tend to prioritise technical and financial metrics, as reflected in the follow quotes. "... It [social value] is described through business cases and appraisal reports and justification ..." (Ripon IP6).

FIGURE 3 | Alma Wier, part of the Ripon scheme. *Source:* Authors.

FIGURE 4 | A flood wall part of the Todmorden scheme. *Source:* Authors.

> ...it's hard to put a price on the damage to sentimental items and emotional distress, how do you value that? (Didsbury IP8).

Interestingly, some participants perceived efficient project delivery as social value, suggesting that delivering schemes on time and within budget constituted a service to the community. This reveals a practical, process-oriented view of value creation. "I think for the public, they have seen that the [Environment] Agency has acted on what they promised and I think they have seen this in the finished job ..." (Todmorden IP3). Beyond flood protection, a small number of professionals referred to aesthetic and recreational benefits as social value, often in the context of corporate social responsibility (CSR) or compliance with "Considerate Contractor" standards. Didsbury IP9 provided examples of sympathetic design like landscaped gardens and improved park access, whereas Didsbury IP10 explained efforts to minimize disruption to local recreation and maintain amenity value by protecting the allotments, golf course, and rugby club. Similarly, Didsbury IP11 argued that social value was recognized through "sympathetic design and well used public space, ... making sure that it did blend in—minimum impact on basin users."

These insights reveal a fragmented understanding of social value, influenced by technical rationalities, organizational priorities, and the limitations of current appraisal tools. Although industry actors acknowledged its relevance, social value remained conceptually vague and institutionally marginal, often subordinated to deliverables that are easier to evidence or justify.

4.2 | Community Engagement

Across all three case studies, industry participants reported that community engagement was viewed as a success, largely because of the time and effort dedicated by the DDC teams. However, the methods and depth of engagement varied, reflecting both local context and organizational strategy. A critical element of project success was sustained engagement with the local community to ensure that the selected options were compatible with their needs and circumstances (Didsbury IP1). Ripon IP8 argued that close collaboration with property owners, often working within private gardens, was essential to minimize disruption and respect individual spaces. Furthermore, public consultation sessions provided an opportunity to present multiple options and solicit feedback from residents and stakeholders, thereby facilitating the identification of solutions deemed acceptable by the community (Didsbury IP4).

In Didsbury, engagement was proactive and multi-faceted, involving newsletters, briefings, public drop-in sessions, and one-to-one interactions with affected residents and businesses (Didsbury IP4). As one participant recalled, "We had a video going ... posters, maps, diagrams ... so people could just walk around and ask ..." (Didsbury IP3). This process reached approximately 200 members of the local community, facilitated knowledge exchange and allowed for feedback on specific design elements. Participants highlighted efforts to engage a wide range of local stakeholders, including various departments within Manchester City Council (regeneration, leisure services, and environmental health), as well as the Mersey Valley Wardens, local highways authorities, city arborists, and the ecological unit (Didsbury IP7).

In Ripon, a dedicated Public Liaison Officer (PLO) served as the central point of contact throughout the final design and construction stages. The PLO's presence provided a consistent channel for communication: "There was a full-time public liaison person ... who went along and spoke to them ... any time day or night ..." (Ripon IP4). The PLO played a key role in facilitating one-to-one discussions with residents whose properties were directly affected, particularly where construction took place within private gardens (Ripon IP2). This allowed for agreement on design details and clear communication about how spaces would be altered and restored.

Additional engagement included public drop-in sessions following final design approval. These informal events enabled residents to speak directly with the Environment Agency, design, and construction teams about the anticipated impacts of the works. Discussions often focused on construction methods and the visual appearance of interventions, such as flood walls in private gardens. As one participant described, "We had various drop-in sessions ...almost like an open evening ... people would just come and go as they please" (Ripon IP7).

In Todmorden, the community engagement strategy involved public meetings, stakeholder panels, and an online portal. A key difference in this case was the strategic use of engagement to rebuild trust, following earlier project phases that had generated public resistance. "We didn't have a good reputation ... there was resistance to start with from the public. They took a lot of winning over." (Todmorden IP4).

Although all schemes incorporated mechanisms for community input, the focus was typically on sharing information and managing concerns, rather than on shaping core technical decisions. This aligns with a more instrumental view of engagement, aimed at smoothing delivery rather than embedding public knowledge into project design.

A PLO was also employed for the final design phase of the Todmorden scheme. Public meetings were held, and the local community could view information, such as technical drawings and plans, in public areas such as the Town Hall, the local library, and the marketplace (Todmorden IP7, Todmorden IP8). A community stakeholder panel was also set up to discuss the progression of the scheme's non-technical aspects. This involved discussing the interests of the local community groups and the possibility of delivering additional work to suit these requirements. A communication strategy was developed to inform how and when to engage with the community. The main way of disseminating information to the local community was via a dedicated website holding information and updates about the scheme. Regular newsletters concerning the commencement of key works were distributed to members of the local community who were directly impacted by the scheme's construction.

4.3 | Co-Production of Knowledge With the Local Community

Industry participants suggested that they had experienced some degree of co-production of knowledge with the local community, which they had not expected (Didsbury IP4, Ripon IP7), and this was challenging because the systems that shaped their attitude

toward community engagement did not facilitate the inclusion of subjective information (Todmorden IP10).

> You have a lot of conflict and requirements and whilst we can resolve some of those conflicts and requirements, the timescales and the budgets are always very restraining.
>
> (Todmorden IP6)

> From a cost and programme view, you need to be in there on time, but managing expectations of the public and senior managers puts you in a lose-lose situation.
>
> (Ripon IP1)

Other interviewees discussed that the resources and budget were not considered a priority allocation for co-production either because this information was not perceived as credible enough for consideration or because it posed a potential threat to industry expertise. This was particularly evident in the Todmorden scheme, where flooding remains a concern but, during Phase 3, DDC placed greater emphasis on managing public expectations (Todmorden IP2). However, the community engagement process focused less on co-producing knowledge with the local community or inclusively understanding their needs and values, and more on rebuilding the DDC organization's reputation and preventing further conflic.

> Phases 1 and 2 had a massive impact and they didn't specifically go to plan as much as we would have liked. We didn't have a good reputation when we were going in [for the next phases]. So, there was resistance to start with from the public. They took a lot of winning over.
>
> (Todmorden IP4)

> There was a lot to do to try and win everybody back and we thought if we don't do this right, it is going to cost us a lot of money. We had to do it right ...
>
> (Todmorden IP9)

Community engagement in the three schemes only allowed community input into certain areas of the design, regardless of the level of local knowledge or lived experiences held. The industry participants believed this was their professional role; they had the knowledge, training, and expertise. However, the majority's attitude towards the inclusion of "lay" local knowledge and community experience was somewhat limited. When discussing the level of input the local community had, industry participants explained how they were heavily involved in the aesthetics and finishes, the "extra" aspects, but not the technical aspect (Todmorden IP4, Todmorden IP11).

Some industry participants argued that the consideration of social aspects of schemes fell outside their responsibility, indicating that community engagement and social value were the responsibility of other team members at different stages of the scheme's development; co-production and inclusive engagement were not an ongoing consideration.

> But as a job role for me, I do not need to think about it [community engagement].
>
> (Ripon IP9)

> I just go and bang a peg in the ground.
>
> (Ripon IP5)

> I am very much on the delivery side [...] I build things!
>
> (Todmorden IP12)

However, few industry participants understood the importance of inclusive stakeholder engagement and co-production of knowledge. These participants mentioned the process of collaborating with third-sector organizations, such as local flood action groups, to understand the local issues and knowledge of those affected by flood risk (Didsbury IP2). For those, the perception of social value was intertwined with community engagement. "The social value ... I would say the main value itself was through the engagement with the community." (Ripon IP3).

5 | Discussion

5.1 | Co-Production as a Tool for Inclusive Community Engagement

The cross-case analysis shows that inclusive community engagement requires mapping the social value of local communities, which in turn demands dedicated time and resources to engage meaningfully with residents and understand their lived experiences (Eskerod and Huemann 2024; Djenontin and Meadow 2018; Gerlak et al. 2023; UK Green Building Council 2022). Gaining insight into local communities' needs, values, and risks empowers these communities to collaborate, thereby challenging traditional top-down engagement approaches (Chambers et al. 2021; Djenontin and Meadow 2018; Frantzeskaki and Rok 2018; Mees et al. 2016; Wamsler 2017). The value of this approach lies in grounding knowledge in "real world" experiences, facilitating the creation of context-specific solutions (Djenontin and Meadow 2018; Eskerod and Huemann 2024; Frantzeskaki and Rok 2018).

The Didsbury scheme is notable because the local community wielded considerable social power in shaping design decisions, which contrasts with the more conventional approaches seen in the Ripon and Todmorden schemes. However, integrating local knowledge into the design process has yet to become standard practice within the industry. In many instances, local knowledge has been relegated to a secondary concern, often considered an afterthought rather than an integral component of the scheme's development (Cook et al. 2013; Cooke and Kothari 2001; Chilvers et al. 2014; Gerlak et al. 2023; Fitton and Moncaster 2019).

Industry practices have historically undervalued "community knowledge," reinforcing the dominance of professional expertise

(Chambers et al. 2021; Chilvers et al. 2014; Gerlak et al. 2023). This has led to the exclusion of local perspectives, preventing them from challenging the power dynamics that are inherent in professional practice (Eskerod and Huemann 2024; Lukes 2005b). This approach directly contrasts with the UK Green Building Council (2020) recommendations for more inclusive community engagement, which emphasize the importance of integrating social value into the very core of project development.

Despite these recommendations, the primary objective in the three cases remains technical, with engineering priorities driving the decision-making process (Didsbury IP5). For many industry participants, the concept of co-producing knowledge is perceived as abstract and disconnected from the practical realities of design and construction. This perspective extends to social value, which is frequently regarded as an "extra" benefit rather than an essential element of the project's core objectives (Fitton and Moncaster 2022; UK Green Building Council 2022). Consequently, social power within the industry remains concentrated within professional attitudes, shaped by education, training, and existing systems and technologies. These entrenched practices limit the potential for infrastructure projects to fully contribute to the achievement of the SDGs, particularly by restricting the integration of social value into project design and delivery (Beck et al. 2023; Raiden and King 2022).

5.2 | Social Power Theory as a Framework for Inclusive Community Engagement

The cross-case comparison reveals a spectrum of industry attitudes toward community engagement, ranging from tokenistic consultation to more participatory approaches that support the co-production of knowledge. Participants in all three schemes acknowledged community engagement as participatory to some degree. Tew (2002) argues that social power develops through the co-creation of knowledge; however, in the Todmorden scheme, community involvement was largely limited to confirming the suitability of a preselected option. Meanwhile, the DDC participants retained social power by restricting the options available, demonstrating a form of protective power focused on delivering a technical flood risk solution while safeguarding the community (Tew 2002). The industry's approach was shaped by systems that required predefined options, limiting opportunities to redistribute social power during decision-making (Badi et al. 2020; Brauer and Bourhis 2006). This lack of genuine influence by the community undermines the potential to achieve broader social value, as emphasized in SDGs 9, 10, 11, 13, and 17, which call for inclusive and participatory urban planning processes (Beck et al. 2023).

Empowerment of local communities arises through the redistribution of social power (Arnstein 1969; Djenontin and Meadow 2018; Frantzeskaki and Rok 2018). Mees et al. (2016) and Frantzeskaki and Rok (2018) highlight the necessity of building trust between "expert" and "lay" knowledge holders for effective engagement, with transparency playing a key role. However, when engagement is presented as participatory but lacks substance, hostility and mistrust often emerge (Frantzeskaki and Rok 2018; Fitton and Moncaster 2022). In the Didsbury scheme, the community exercised social power by uniting against the initial design proposal. Although this opposition challenged industry interests, it reflected a cooperative power aimed at protecting self-interests, as described by Tew (2002). This resistance emerged in response to industry dominance, with the local community refusing to accept the preferred solutions imposed by professionals (Brauer and Bourhis 2006). This example demonstrates how shifting social power dynamics can support SDG 13 by enabling community-led climate resilience (Beck et al. 2023; Raiden and King 2022).

Industry participants' attitudes suggest their engagement approach focused more on managing social power than fostering genuine engagement. Their primary goal appeared to be rebuilding reputation and avoiding conflict that could disrupt the existing social hierarchy (Frantzeskaki and Rok 2018). Design teams exercised oppressive social power to maintain control over scheme development (Tew 2002), often underestimating the community's capacity to influence power dynamics, as seen in Didsbury. After securing the project and the DDC teams' arrival, the Environment Agency recognized local opposition levels, leading to a reassessment of the design. This shift in social power altered how industry participants conducted community engagement and progressed the scheme. Avoiding further conflict became a priority, prompting exploration of alternatives to the basin design in response to community concerns. Managing public relations also became critical to prevent further issues, underscoring the importance of incorporating community perspectives in decision-making, an essential aspect of SDGs 9, 10, 11, 13, and 17 aimed at fostering inclusive and resilient communities (Raiden and King 2022; Raiden et al. 2019).

The redistribution of social power between the DDC teams and the local community ultimately influenced how community needs, experiences, and social values were integrated into the design process (Djenontin and Meadow 2018; Frantzeskaki and Rok 2018; UK Green Building Council 2020). In the final Didsbury design, which avoided impacting allotments, substantial community input played a decisive role, illustrating how feedback directly shaped design changes. Despite this outcome, industry participants remained constrained by systems that limited power redistribution (Chambers et al. 2021; Gerlak et al. 2023). The preference to avoid conflict and prioritize technical solutions reflects an exercise of social power consistent with Lukes' (2005b) analysis.

5.3 | Implications of Social Value and Stakeholder Engagement

This study reveals a notable gap in how social value is theoretically grounded within built environment research. Although theories of social power and co-production (Arnstein 1969; Badi et al. 2020; Djenontin and Meadow 2018; Lukes 2005b; Frantzeskaki and Rok 2018; Tew 2002) emphasize the potential of participatory engagement to redistribute power and benefit communities, social value itself lacks a clear and consistent theoretical framework. In practice, it is often seen as an add-on or secondary to technical metrics and performance targets, rather than a core part of decision-making. The Didsbury case

shows that when local communities are genuinely empowered, they can shape design outcomes; however, the integration of social value remains uneven and underdeveloped (Brauer and Bourhis 2006).

On a professional practice level, the lack of an academic framework for social value leads to tokenistic engagement. In the Todmorden and Ripon schemes, for example, predefined options restricted meaningful collaboration, and local knowledge was often overlooked in favor of professional expertise. This reinforces existing power imbalances and limits communities' ability to influence decisions that affect them (Cook et al. 2013; Chambers et al. 2021; Chilvers et al. 2014). Still, the Didsbury case highlights how recognizing and incorporating community input can result in more sustainable and widely accepted outcomes, showing the important role social value can play when it is thoughtfully embedded in the design process (Dobson et al. 2020; Doloi 2020; Eskerod and Huemann 2024; Fitton and Moncaster 2022).

6 | Conclusions and Recommendations

This study investigated how stakeholder engagement and knowledge co-production enhance the social value of infrastructure projects, focusing on flood alleviation schemes in Northern England. It examined the impact of incorporating local community perspectives on social value, particularly in relation to advancing the SDGs. Drawing on case studies from Didsbury, Ripon, and Todmorden, the research highlights both the importance and challenges of community engagement within flood risk management. Given the complex nature of flood projects, which encompass environmental resilience, infrastructure, social equity, and community well-being, enhancing social value contributes to multiple SDGs, notably 9, 10, 11, 13, and 17.

Findings reveal that although industry professionals recognize the importance of social value and community engagement, these aspects are often underutilized in practice. Collaboration tends to be limited, with communities mainly influencing non-technical design elements. The Didsbury scheme stands out as an example where inclusive engagement and the redistribution of power through co-produced knowledge led to more socially sustainable outcomes, aligning closely with SDG 11's focus on inclusive, resilient urban development. All three cases relate to SDG 13, emphasizing climate resilience as a core concern in flood risk management. Conversely, Ripon and Todmorden demonstrate risks associated with excluding vulnerable groups, reflecting the inequalities addressed in SDG 10. SDG 17, which highlights the importance of partnerships, emerges across all cases, endorsing the need for collaboration between professionals and communities. Together, these examples call for a shift towards community-led approaches that improve local outcomes and support the SDGs.

The study also shows that stakeholders often interpret social value narrowly, focusing primarily on measurable economic benefits such as reduced insurance costs, rather than considering broader social impacts like community well-being, empowerment, and cohesion. This limited perspective tends to prioritize technical delivery over long-term social benefits. Current engagement tools, such as power-interest matrices, fail to capture the emotive and subjective dimensions of community perspectives that are essential to fully understanding social value in infrastructure projects. These shortcomings reveal a persistent gap between theoretical ideals of stakeholder engagement and practical realities, often constrained by time, budget, and entrenched professional cultures. Based on these insights, the authors suggest several recommendations to improve the integration of social value into flood alleviation schemes and broader infrastructure delivery:

- *Incorporate local context and intangible social value*: Communities should be regarded as central stakeholders, with emphasis placed on understanding their unique social, cultural, and historical contexts. Alongside technical solutions, capturing intangible data such as local knowledge, lived experiences, and community values is vital for addressing community needs and social value. These often overlooked elements offer critical insights that lead to more effective and tailored interventions.
- *Reframe stakeholder engagement frameworks and tools*: Existing models like the power-interest matrix need to evolve to better support co-production by integrating subjective and emotive community perspectives with technical, quantitative data. Participatory methods such as community workshops combining spatial mapping with storytelling or timeline exercises can help capture lived experiences, local priorities, and vulnerabilities. Merging qualitative insights with quantitative risk data promotes meaningful engagement and embeds local knowledge in decision-making. Moreover, advances in artificial intelligence and data analytics offer opportunities to enhance inclusivity. Virtual consultations, interactive visualizations, and accessible online platforms can make complex information more understandable, enabling communities to engage and provide feedback in ways that suit their preferences. Combining these approaches moves engagement beyond mere consultation towards genuinely inclusive infrastructure delivery.
- *Align industry practice with policy and legislation*: As regulation and policies evolve, such as the UK Public Services (Social Value) Act and the Construction Playbook, clearer guidance is needed to integrate community perspectives into infrastructure projects and align these with SDG objectives. Practical frameworks should allocate resources and budgets for inclusive engagement from the earliest design stages, supported by professional education and training that emphasize the value of social inclusion and participatory methods.

Future research should broaden to include diverse infrastructure projects across different geographic, socio-economic, and cultural contexts. Comparative and longitudinal studies can deepen understanding of how engagement practices evolve and contribute to infrastructure delivery that prioritizes both community well-being and the achievement of the SDGs. Moving beyond tokenistic consultation toward genuine community engagement is essential for defining and realizing social value within the built environment.

Author Contributions

M.C.G. conceptualisation, funding acquisition, methodology, investigation, resources, visualisation, project administration, writing – original draft. S.L.F. investigation, visualisation, formal analysis, writing – review and editing.

Acknowledgments

The authors thank the interview participants who engaged in critical discussions during the interviews.

Ethics Statement

The study is covered under the University of Westminster Research Ethics Committee reference number ETH2324-0785, February 2024.

Conflicts of Interest

The authors declare no conflicts of interest.

Data Availability Statement

Publicly available documents on which the article is based are included in the reference list. Interview transcripts are not shared publicly in the interests of data protection and confidentiality; however, they can be made available upon request.

References

Allaway, B., and M. Brown. 2019. "The Legal Framework in the UK." In *Social Value in Construction*, edited by A. Raiden, M. Loosemore, and A. King, 39–59. Routledge. https://doi.org/10.1201/9781315100807-3.

Arnstein, S. R. 1969. "A Ladder of Citizen Participation." *Journal of the American Institute of Planners* 35: 216–224.

Association for Project Management. 2018. "Systems Thinking: How is it Used in Project Management?" https://www.apm.org.uk/v2/media/bfjjgz0j/systems-thinkingfinal.pdf.

Badi, S., W. Rocher, and E. Ochieng. 2020. "The Impact of Social Power and Influence on the Implementation of Innovation Strategies: A Case Study of a UK Mega Infrastructure Construction Project." *European Management Journal* 38, no. 5: 736–749.

BBC. 2012. "Ripon's £14.4m Flood Defence Scheme Completed." https://www.bbc.co.uk/news/uk-england-york-north-yorkshire-19988014#:~:text=A%20%C2%A314m%20scheme%20to,million%20cubic%20metres%20of%20water.

Beck, D., M. Ferasso, J. Storopoli, and E. Vigoda-Gadot. 2023. "Achieving the Sustainable Development Goals Through Stakeholder Value Creation: Building Up Smart Sustainable Cities and Communities." *Journal of Cleaner Production* 399: 136501.

Brauer, M., and R. Y. Bourhis. 2006. "Social Power." *European Journal of Social Psychology* 36: 601–616.

Bryant, A., and K. Charmaz. 2019. *The SAGE Handbook of Current Developments in Grounded Theory*. SAGE Publications Ltd. https://doi.org/10.4135/9781526485656.

Bryman, A. 2022. *Social Research Methods*. 6th ed. Oxford University Press.

Bubeck, P., W. J. W. Botzen, and J. C. Aerts. 2012. "A Review of Risk Perceptions and Other Factors That Influence Flood Mitigation Behavior." *Risk Analysis* 32, no. 9: 1481–1495.

Chambers, J. M., C. Wyborn, M. E. Ryan, et al. 2021. "Six Modes of Co-Production for Sustainability." *Nature Sustainability* 4, no. 11: 983–996. https://doi.org/10.1038/s41893-021-00755-x.

Chilvers, J., I. Lorenzoni, G. Terry, P. Buckley, J. K. Pinnegar, and S. Gelcich. 2014. "Public Engagement With Marine Climate Change Issues: (Re)framings, Understandings, and Responses." *Global Environmental Change* 29: 165–179.

Climate Change Committee. 2021. "Independent Assessment of UK Climate Risk (CCRA3)." https://www.theccc.org.uk/publication/independent-assessment-of-uk-climate-risk/.

Climate Change Committee. 2022. "UK Climate Change Risk Assessment 2022." https://www.gov.uk/government/publications/uk-climate-change-risk-assessment-2022.

Cook, B. R., M. Kesby, I. Fazey, and C. Spray. 2013. "The Persistence of 'normal' Catchment Management Despite the Participatory Turn: Exploring the Power Effects of Competing Frames of Reference." *Social Studies of Science* 43, no. 5: 754–779.

Cooke, B., and U. Kothari. 2001. "The Case for Participation as Tyranny." In *Participation: The New Tyranny?* edited by B. Cooke and U. Kothari, 1–15. Zed Books Ltd.

Creswell, J. W. 2022. *Research Design: Qualitative, Quantitative, and Mixed Methods Approaches*. 6th ed. Sage Publications.

Djenontin, I. N. S., and A. M. Meadow. 2018. "The Art of Co-Production of Knowledge in Environmental Sciences and Management: Lessons From International Practice." *Environmental Management* 61: 885–903.

Dobson, J., C. Behar, C. Ramsden, A. Crudgington, and C. A. Heulin. 2020. "Maximising Social Value From Infrastructure Projects." Institution of Civil Engineers and Useful Projects.

Doloi, H. 2020. "Stakeholder Engagement in Major Infrastructure Projects." In *Routledge Handbook of Planning and Management of Global Strategic Infrastructure Projects*, 135–154. Routledge.

Environment Agency. 2024. "Flood and Coastal Erosion Risk Management Report: 1 April 2023 to 31 March 2024." https://www.gov.uk/government/publications/flood-and-coastal-risk-management-national-report/flood-and-coastal-erosion-risk-management-report-1-april-2023-to-31-march-2024.

Eskerod, P., and M. Huemann. 2024. "Project Stakeholder Orientation Principles for Managing Projects Sustainably." In *Research Handbook on Sustainable Project Management*, 240–251. Edward Elgar Publishing.

Everett, G., O. Adekola, and J. Lamond. 2021. "Developing a Blue-Green Infrastructure (BGI) Community Engagement Framework Template." *Urban Design International* 28: 1–17.

Fitton, S. L., and A. Moncaster. 2019. "Arguments for a Co-Production Approach to Community Flood Protection." In *Proceedings of the Institution of Civil Engineers—Engineering Sustainability*, vol. 172, 335–344. Thomas Telford Ltd.

Fitton, S. L., and A. Moncaster. 2022. "Social Value, Infrastructure, and Stakeholder Engagement: A Complex Triangle." In *Proceedings of the Institution of Civil Engineers—Engineering Sustainability*, vol. 175, 194–201. Thomas Telford Ltd.

Fitton, S. L., A. Moncaster, and P. Guthrie. 2015. "Investigating the Social Value of the Ripon Rivers Flood Alleviation Scheme." *Journal of Flood Risk Management* 9, no. 6: 370–378.

Flick, U., R. Thornberg, and K. Charmaz. 2014. "Grounded Theory and Theoretical Coding." In *The SAGE Handbook of Qualitative Data Analysis*, edited by U. Flick, R. Thornberg, and K. Charmaz, 153–169. SAGE Publications Ltd.

Flyvbjerg, B., T. Landman, and S. Schram, eds. 2012. *Real Social Science: Applied Phronesis*. Cambridge University Press.

Frantzeskaki, N. 2019. "Seven Lessons for Planning Nature-Based Solutions in Cities." *Environmental Science and Policy* 93: 101–111.

Frantzeskaki, N., and A. Rok. 2018. "Co-Producing Urban Sustainability Transitions Knowledge With Community, Policy, and Science." *Environmental Innovation and Societal Transitions* 29: 47–51.

French, C. E., T. D. Waite, B. Armstrong, G. J. Rubin, C. R. Beck, and I. Oliver. 2019. "Impact of Repeat Flooding on Mental Health and Health-Related Quality of Life: A Cross-Sectional Analysis of the English National Study of Flooding and Health." *BMJ Open* 9, no. 11: e031562. https://doi.org/10.1136/bmjopen-2019-031562.

Fujiwara, D., D. Dass, E. King, M. Vriend, R. Houston, and K. Keohane. 2021. "A Framework for Measuring Social Value in Infrastructure and Built Environment Projects: An Industry Perspective." In *Proceedings of the Institution of Civil Engineers—Engineering Sustainability*, vol. 175, 175–185. Thomas Telford Ltd.

George, G., J. Howard-Grenville, A. Joshi, and L. Tihanyi. 2016. "Understanding and Tackling Societal Grand Challenges Through Management Research." *Academy of Management Journal* 59, no. 6: 1880–1895. https://doi.org/10.5465/amj.2016.4007.

Gerlak, A. K., Z. Guido, G. Owen, et al. 2023. "Stakeholder Engagement in the Co-Production of Knowledge for Environmental Decision-Making." *World Development* 170: 106336.

Hood, J. C. 2007. "Orthodoxy vs. Power: The Defining Traits of Grounded Theory." In *The SAGE Handbook of Grounded Theory*, edited by A. Bryant and K. Charmaz. Sage.

Infrastructure and Projects Authority (IPA). 2021. "Transforming Infrastructure Performance: Roadmap to 2030. London, UK."

Infrastructure and Projects Authority (IPA). 2023. "Annual Report on the Government Major Projects Portfolio (GMPP). London, UK."

Institute of Social Value. 2020. "What Are the Principles of Social Value? Social Value UK." https://socialvalueuk.org/principles-of-social-value/.

Jennings, T. L. 2009. "Exploring the Invisibility of Local Knowledge in Decision-Making: The Boscastle Harbour Flood Disaster." In *Adapting to Climate Change: Thresholds, Values, and Governance*, edited by W. N. Adger, I. Lorenzoni, and K. L. O'Brien, 283–295. Cambridge University Press.

Kabisch, N., N. Frantzeskaki, and R. Hansen. 2022. "Principles for Urban Nature-Based Solutions." *Ambio* 51, no. 6: 1388–1401.

Kellens, W., T. Terpstra, and P. De Maeyer. 2013. "Perception and Communication of Flood Risks: A Systematic Review of Empirical Research." *Risk Analysis* 33, no. 1: 24–49.

Lukes, S. 2005a. "Power and the Battle for Hearts and Minds." *Millennium-Journal of International Studies* 33: 477–494.

Lukes, S. 2005b. *Power: A Radical View*. 2nd ed. Palgrave Macmillan.

Masrom, M. A. N., C. C. Ohueri, A. N. Azman, and M. Chan. 2024. "Guidelines for Facilitating Stakeholders Roles in Community Engagement in Green Social Infrastructure Development." *International Journal of Sustainable Construction Engineering and Technology* 15, no. 1: 1–14.

Mees, H., A. Crabbe, M. Alexander, et al. 2016. "Coproducing Flood Risk Management Through Citizen Involvement: Insights From Cross-Country Comparison in Europe." *Ecology and Society* 21, no. 3: 7.

Miles, M. B., A. M. Huberman, and J. Saldana. 2018. *Qualitative Data Analysis: A Methods Sourcebook*. 4th ed. Sage Publications.

Mulholland, C., M. C. Georgiadou, and S. Fitton. 2025. "Key Challenges in Social Value 2025: Responsible Stakeholder Engagement, Robust Data Management and Reliable Digitalisation. Identifying Nine Key Challenges From Research, Theory and Practice." Aurora Engagewolments Papers. 1–10.

Pinto, J. K., K. Davis, L. A. Ika, K. Jugdev, and O. Zwikael. 2022. "Coming to Terms With Project Success: Current Perspectives and Future Challenges." *International Journal of Project Management* 40, no. 6: 563–577. https://doi.org/10.1016/j.ijproman.2022.04.006.

Premier. 2024. "Todmorden Welcomes Flood Alleviation Scheme. Premier Construction News." https://premierconstructionnews.com/2012/02/03/todmorden-welcomes-flood-alleviation-scheme/.

Quinn, T., S. Heath, W. N. Adger, et al. 2023. "Health and Wellbeing Implications of Adaptation to Flood Risk." *Ambio* 52, no. 5: 952–962.

Raiden, A., and A. King. 2022. *Social Value in Practice*. Routledge.

Raiden, A., M. Loosemore, A. King, and C. Gorse. 2019. *Social Value in Construction*. Routledge.

RICS, and Simetrica, and Jacobs. 2020. "Measuring Social Value in Infrastructure Projects: Insights From the Public Sector." https://majorprojects.org/wp-content/uploads/2024/10/measuring-social-value_1st-edition.pdf.

Sustrans. 2024. "Landmark Collaboration Highlights Importance of Engagement Within Built Environment Sector. Sustrans." https://www.sustrans.org.uk/our-blog/news/landmark-collaboration-highlights-importance-of-engagement-within-built-environment-sector/#:~:text=25th%20JANUARY%202024-,Landmark%20collaboration%20highlights%20importance%20of%20engagement%20within%20built%20environment%20sector,in%20the%20built%20environment%20sector.

Tew, J. 2002. *Social Theory, Power and Practice*. Palgrave Macmillan.

UK Government. 2018. "25-Year Environment Plan: A Greener Future. Department for Environment, Food and Rural Affairs (DEFRA)." https://www.gov.uk/government/publications/25-year-environment-plan.

UK Government. 2022. "The Construction Playbook: Government Guidance on Sourcing and Contracting Public Works Projects and Programmes. London, UK."

UK Green Building Council. 2020. "Delivering Social Value: Community Engagement Hacked. UK Green Building Council." https://ukgbc.org/resources/delivering-social-value-community-engagement-hacked/.

UK Green Building Council. 2022. "A Guide for Delivering Social Value on Built Environment Projects. UK Green Building Council." https://ukgbc.org/resources/a-guide-for-delivering-social-value-on-built-environment-projects/.

United Nations. 2015. "Transforming Our World: The 2030 Agenda for Sustainable Development. United Nations." https://sdgs.un.org/2030agenda.

Vargas, C., J. Whelan, J. Brimblecombe, and S. Allendera. 2022. "Co-Creation, co-Design and Co-Production for Public Health: A Perspective on Definitions and Distinctions." *Public Health Research & Practice* 32, no. 2: 3222211.

Vuorinen, L., and M. Martinsuo. 2019. "Value-Oriented Stakeholder Influence on Infrastructure Projects." *International Journal of Project Management* 37, no. 5: 750–766.

Wamsler, C. 2017. "Stakeholder Involvement in Strategic Adaptation Planning: Transdisciplinarity and Co-Production at Stake?" *Environmental Science and Policy* 75: 148–157.

Whyte, J., and A. Davies. 2021. "Reframing Systems Integration: A Process Perspective on Projects." *Project Management Journal* 52, no. 3: 237–249.

Whyte, J., and T. Nussbaum. 2020. "Transition and Temporalities: Spanning Temporal Boundaries as Projects End and Operations Begin." *Project Management Journal* 51, no. 5: 505–521.

Yang, J., G. S. Shen, M. Ho, D. S. Drew, and X. Xue. 2011. "Stakeholder Management in Construction: An Empirical Study to Address Research Gaps in Previous Studies." *International Journal of Project Management* 29, no. 7: 900–910.

Yin, R. K. 2018. *Case Study Research and Applications: Design and Methods*. 6th ed. SAGE Publications.

Zallio, M., and P. J. Clarkson. 2021. "Inclusion, Diversity, Equity, and Accessibility in the Built Environment: A Study of Architectural Design Practice." *Building and Environment* 206: 108352.

Zhang, Y., W. Jiang, K. Ye, Y. Liang, and X. Wang. 2024. "Mapping Stakeholders' Relationships Management in Fulfilling Corporate Social Responsibility: A Study of China's Construction Industry." *PLoS One* 19, no. 1: e0294588.