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MAZUMDAR, Suvodeep <http://orcid.org/0000-0002-0748-7638>, QI, Jie, THAKKER, Dhavalkumar and GOODCHILD, Barry <http://orcid.org/0000-0001-8572-3598>

International Journal of E-Planning Research
Volume 12 • Issue 1

Understanding Urban Planning Outcomes in the UK:
Practitioner Perspectives in Outcome Assessment

Suvodeep Mazumdar, University of Sheffield, UK*
https://orcid.org/0000-0002-0748-7638

Jie Qi, University of Sheffield, UK
https://orcid.org/0000-0002-2002-1541

Dhavalkumar Thakker, University of Hull, UK

Barry Goodchild, Sheffield Hallam University, UK
https://orcid.org/0000-0001-8572-3598

ABSTRACT

The planning process in the UK is a highly complex system, developed over many decades, and is in the process of rapid transitions into digital planning. Among these transformations is a desire to move from an outputs-based assessment to an outcomes-based assessment process. This is challenging, and in this paper, the authors explore the variety of factors that make outcomes assessment challenging. The authors first studied the literature to understand how outcomes are complex, ranging across different sectors and practices, identifying 359 indicators related to outcomes. The authors then conducted a knowledge mapping exercise to understand the characteristics of the indicators in multiple themes. The authors also invited practitioners for an interview on their perspectives of outcomes assessment, definitions of outcomes, barriers to outcomes, the benefits of outcomes assessment, and how practitioners envision a world with outcomes assessment. The authors conclude the paper with future directions of research.

KEYWORDS

Impact Assessment, Interviews, Knowledge Mapping, Outcomes Assessment, Urban Planning

INTRODUCTION

The aim of this article is to assess, from the practitioners' viewpoint, their understanding and approach towards outcomes-based planning in the UK. In doing so, the authors aim to highlight the challenges of understanding outcomes, the wide range of considerations that are involved in assessing outcomes,

DOI: 10.4018/IJEPR.326126 *Corresponding Author

and practitioner perspectives on the practicalities of establishing an outcomes-based assessment, which, although highly beneficial and impactful, requires considerable effort. Although there have been efforts in bringing together outcomes for specific aspects of planning such as environmental sustainability (Yigitcanlar & Teriman, 2015), health (Northridge & Sclar, 2003) and so on, to the authors' knowledge, there are no existing studies that have explored the broader topic of urban planning outcomes.

While multiple definitions exist that aim to capture the variety of nuances in expressing outcomes and outputs, for the purposes of this paper, the authors focus on outcomes and outputs from the perspective of the UK Government's application of Theory of Change within different contexts such as the Department for International Development (Parsons et al., 2013) and the Department for Business, Energy & Industrial Strategy (BEIS Research Paper Number 2020/016, 2020), where outcomes are the benefits that projects or interventions are designed to deliver while outputs are the tangible and intangible products that result from the activities in the intervention. Therefore, outputs are specific, quantifiable impacts of interventions, while outcomes are more generic, holistic, and wider impacts informed by outputs. Wong et al. (2007) further discussed these perspectives of outputs: "Outcomes should be viewed as the combined effects on socio-economic and environmental changes brought about by the planning system and other forces that seek to achieve sustainable development and sustainable communities".

With the existing challenges in achieving an outcomes-based assessment framework in the UK, in this paper, the authors seek to answer the following research questions: How do practitioners perceive an outcomes-based planning future, and what practical barriers exist that hinder progress in this direction? The authors seek to answer these questions from three exercises: (i) a literature review to highlight challenges identified in the literature (e.g., terminological differences and practical implications), (ii) a review of the literature on the interconnected nature of outcomes and a knowledge mapping exercise to highlight the range of themes emerging from the literature, and (iii) a set of interviews with practitioners in urban planning to understand their perspectives of challenges and outcomes-assessment.

This article consists of six sections: in Section 2, the authors discuss the issues around conceptualising urban planning outcomes and the different perspectives involved in assessing planning outcomes. The authors use their literature study to conduct a knowledge mapping exercise to present indicators that have been linked to different outcomes. In Section 3, the authors discuss their methodology of conducting a set of interviews with practitioners in urban planning to understand their perspectives in operationalising urban planning outcomes. The authors present key findings, as seen in Section 4, of their interviews. Section 5 presents some discussions around the findings of their interviews, and the authors conclude the paper with Section 6 on some future directions of research.

URBAN PLANNING OUTCOMES

Key to outcomes of planning processes is the role of 'impact assessments' (otherwise known as sustainability assessments), where applicants, or the local authority in the case of a local plan, highlight how an intervention will respond to trends or problems and will impact a variety of factors such as economic, environmental, health, transport, and so on. Impact assessments rest therefore on multi-criteria methods rather than single criteria associated with cost-benefit and other economic evaluation methods. Multi-criteria methods commonly comprise a mixture of qualitative and quantitative data and, as prepared by the local authority or external consultants, will generally involve visits to the proposed location of the intervention, consultations with local communities, and surveys. In preparing an impact statement, decision makers need to consider the short-, medium-, and longer-term implications of a proposed development. Local authorities also need to consider how a proposed plan can contribute to their strategic direction and targets – for example, their sustainability, housing, or carbon emission targets. Through this process of continued assessments, the planning system aims to support local

authorities in achieving their regional targets but also national and international targets such as sustainable development goals (UN SDGs, https://sdgs.un.org/goals). In aligning these strategic targets to the spatial planning system, decision makers assess plans based on outputs (also at times interchangeably termed as impacts). However, since the introduction of the 2006 Local Government white paper in England (Strong and prosperous communities – The local government white paper, 2006), there has been an increasing interest in focusing on outcomes.

Likewise, using slightly different language, the current version of the National Planning Policy Framework for England makes repeated reference to the clear justification of policies "in terms of proportionate evidence" (National planning policy framework, 2021). Evidence in this context means an evaluation of needs against current and future trends. The same document goes on: "Plans should be accessible through the use of digital tools to assist public involvement and policy presentation" (National planning policy framework, 2021, para. 16e). Accessibility means not just physical or online access but the presentation of material that assists public involvement and that is capable of being understood by informed members of the public rather than just professionals. This shift toward an evidential, outcome-based assessment is a considerable challenge for local authorities and urban planners for a variety of reasons, the first being, outcomes are difficult to conceptualise.

CHALLENGES IN CONCEPTUALISATION OF 'OUTCOMES'

Confusion among the terms 'outcomes', 'outputs', and 'impacts' introduces challenges in conceptualisation, where some of these have often been used interchangeably (Wong & Watkins, 2009). Although outputs have been proposed as intermediary steps persisting over a substantial period of time to contribute towards achieving longer-term outcomes (Garbarino & Holland, 2009; The green book, 2003), a more precise definition of outcomes is somewhat lacking (Wong et al., 2007). Outputs have been proposed to be quantitative assessments of short-term impacts of interventions, while outcomes are larger scale longer-term impacts that are often qualitative in nature (The green book, 2003). Garbarino and Holland (2009) further defined outcomes as short- and medium-term effects of an intervention's outputs, while Wong et al. (2007) argued for the consideration of spatial dimensions when defining outputs (impacts in/on local levels) and outcomes (impacts at regional or national levels). In discussing blue or green infrastructure projects, Suleiman (2021) notes that although outcomes and outputs deal with assessing projects (also referring to the projects as "transition experiments"), outputs are technical and societal learning and structural changes resulting from the experiments, while outcomes are "short- to medium-term results that concern the uptake of experiments" (Suleiman, 2021).

Another reason for the challenge in moving toward an outcomes-based assessment process is the temporal and multi-caused aspect of assessment. Sustainability assessments are undertaken at an early stage in plan preparation but can be revised if required, for example, by an inspector during an examination. However, they generally provide only a description of existing conditions or trends and do not attempt to assess the impact of previous planning permissions or plans. In any case, the planning decisions and policies exist along many independent economic and social trends so that the actual impact of such decisions is generally difficult to isolate in quantitative terms. Levels of air pollution may be changed, for example, through regulating the design of motor vehicle engines rather than by regulating the number of vehicles on the road or the design of streets. Unemployment is caused by economic trends as well as the availability of employment land. The multiplicity of causes does not affect the selection of indicators but does influence their interpretation.

A further challenge of moving toward outcome-based assessments is the difficulty in the task of measurement itself. While physical interventions can lead to quantifiable outputs as observable changes in physical space, population, or even community behaviour, outcomes are largely qualitative, often subjective, and observable over a longer period. Finally, while many environmental, transport, mobility, and economic indicators exist that can be quantified and measured using sensors and performance

metrics, such hard data often offer snapshots into how local environments and communities are impacted by urban planning interventions. The larger, more holistic perspectives of assessing how each intervention influences wider outcomes are often missed out.

Multiple Perspectives in Planning Outcomes

Whilst practitioners from different disciplinary perspectives approach outcomes from their own practice, often there is a need to consider a wider range of factors in studying outcomes, which requires a multi-disciplinary view. In this section, the authors approach outcomes from the different perspectives of economy, environment, health and wellbeing, and physical infrastructure to highlight the multi-faceted nature of outcomes. In doing so, the authors first broadly studied the literature in terms of aspects (or indicators) that have been associated with specific outcomes from a range of disciplinary contexts. This led to a set of 359 indicators that they spread across a range of themes such as economy, environment, governance, health and wellbeing, physical spaces, societal contexts, and transport as a knowledge mapping activity, as seen in Appendix A. The authors encountered challenges in restricting each indicator to single themes – for example, 'access to affordable homes' (Doick et al., 2009) or 'accessibility for people with disability' (Garau & Pavan, 2018) could be relevant to a theme on physical characteristics of places. However, they could also be relevant to themes around economy or accessibility. Despite the challenges of assigning themes, the authors believe the knowledge mapping exercise highlights the range of indicators that could potentially be used to inform outcomes assessment and can serve as a first step towards operationalising outcomes assessment in the future.

Current research on evaluating the economic aspects of planning outcomes is characterized by many studies aimed at providing an overview of the assessment of policy schemes such as urban regeneration, transit-oriented development, and housing and community development (Cervero & Dai, 2014; Ferm & Jones, 2016; Spina, 2019). These studies are directly informed by the relationships between migration, employment, and housing with regard to how planning policies affect these variables (Abelairas-Etxebarria & Astorkiza, 2020). The evaluation of urban planning policy highlights the central role of capitalising the performance and potential of local and regional development (Cleave & Arku, 2020; Deng et al., 2018; Kuçi et al., 2016). In their study of economic outcomes, Ferm and Jones (2016) note that development needs to balance the demand of housing and the need for protecting lower value employment land (commercial land use). Linking the housing and labour market is therefore at the core of economic development, especially within the regional context (Goodchild & Hickman, 2006). This makes transport infrastructure planning a matter of on-going policy concern in terms of understanding the relationship between accessibility and economic development (Banister, 2012; Owen et al., 2012). Recently, the emerging concept of Transit-Oriented Development (TOD) emphasizes the role of public transport in balancing transport infrastructure and urban growth in terms of encapsulating the development of housing, urban amenity, infrastructure, and public services (Yang & Pojani, 2017). Studies evaluating the economic effect of transport infrastructure highlighted the positive correlation between accessibility improvements and regional growth, drawing on the size and distribution of transport infrastructure (Polyzos & Tsiotas, 2020) and economic factors such as regional capital, wages, income, and employment (Rokicki & Stępniak, 2018). However, in practice, it is challenging to balance economic development with environmental sustainability in terms of attaining desired urban planning outcomes (Hiremath et al., 2013). The disruptive economic effect of transport planning such as uneven economic concentration of manufacturing and service sectors (Ding, 2013), income inequality (Cigu et al., 2019) and gentrification (Less, 2017) should also be noted.

Environmental sustainability is one of the key components of desired urban planning outcomes to help cities secure and maintain their prosperity (Yigitcanlar et al., 2015). The integration of environmental interests in evaluating planning outcomes has been widely studied, especially those associated with environmental impact assessment (Agol et al., 2014; Reicher et al., 2021), measuring quality of urban life and community sustainability (Moroke et al., 2020) and assessing the socio-

ecologcial systems of urban areas (Cai et al., 2020). Environmental impact assessment against planning instruments such as transport planning (Hensher & Ton, 2002; Rajak et al., 2016), master planning (Gao et al., 2011), and environmental conservation (Legnér et al., 2020) generally are consumption-based or metabolism-based for anticipating the attribution of impact (Baynes & Wiedmann, 2012). For example, Castellani and Sala (2013) suggest the incorporation of self-sustainment indicators, such as ecological footprint (from food, housing, transportation, goods, and services) and biocapacity (ecological services in a given area such as vegetation, water), represent a good proxy for local environmental sustinability resulting from urban planning.

In light of exploring the intersections between urban environmental quality and human wellbeing, environmental sustainability is a pre-requisite in enhancing the quality of urban life and building sustainable communities (Moroke et al., 2020). Evaluating the quality of urban environment is considered an important methodological approach that consists of objective measures in terms of addressing planning outcomes and challenges such as urban deprivation (Basu et al., 2015), social exclusion (Ward Thompson et al., 2013), and liveability (Howley et al., 2009). In the context of enhancing quality of urban life, indicators such as access to facilities and services (e.g., public transport, hospitals, schools, etc.) (Morais & Camanho, 2011), green space coverage and distribution (Douglas et al., 2019), walkability (Rogers et al., 2011), and biodiversity (Marans, 2015) are the environmental attributes which integrate sustainability with quality of life effectively. In the same vein, the quality of the built environment is often embedded in the assessment of community sustainability, especially concerning social dimensions of planning outcomes such as place attachment (Mazumdar et al., 2018) and social cohesion (Uzzell et al., 2002).

Health and wellbeing outcomes are increasingly important in urban planning (Cassarino et al., 2021; Koohsari et al., 2013; Lee & Moudon, 2004), given the links between health outcomes and urban environments. The majority of the studies identified a diverse range of indicators related to the links between the built environment and people's health and wellbeing by highlighting their effects on physical health (Browning et al., 2022), mental wellbeing (Baba et al., 2017), and provisions of social support and cohesion (Child et al., 2016; Engel et al., 2016). Studies highlight the important role of how our urban environment is configured and developed and how it is inextricably linked to people's health-related behaviours (McCormack et al., 2008). For example, in order to promote physical activities, urban environments need to possess high levels of accessibility, mixed use within walking distances, green open space, and safety and security (Kent & Thompson, 2014). To measure the positive effects of built environment features on physical activity, design, diversity, and destination are suggested to be the most appropriate dimensions in terms of assessing the physical health outcomes of urban planning (Zapata-Diomedi & Veerman, 2016).

Similarly, walkability, green space, transport infrastructure, and security are positively associated with states of subjective wellbeing, e.g., in regard to happiness and life satisfaction (Baba et al., 2017; Cassarino et al., 2021; Guo et al., 2021). On the other hand, economic and ecological drivers of distress such as water insecurity (Tallman, 2019), neighbourhood poverty (Buffel et al., 2013), and environmental perceptions (e.g., perceived danger) (Jones et al., 2021) underline the influence of insufficient urban planning in terms of social consequences and mental health outcomes (Barros et al., 2019). Place attachment, sense of community, and social cohesion are extensively researched from the perspectives of built environment professionals in terms of understanding the effects of urban design and planning in encouraging social interactions and overcoming social exclusion (Trillo, 2017). Assessment tools that underpin theoretical frameworks like social cohesion and social capital measures like social interactions, community engagement, and social networks are often adopted to assess the impacts of physical environment planning at a neighbourhood scale (Cabrera & Najarian, 2015; Mazumdar et al., 2018). Overall, this strain of literature reveals the wider planning outcomes of policy initiatives such as neighbourhood regeneration (Giles-Corti et al., 2020), transport planning (Crista et al., 2018), and mix-use design for walkability (Hooper et al., 2015) from the perspective of public health. It further highlights the important role of physical space such as public space, green

space, urban amenity, and road network in urban planning for creating healthy and liveable cities (Lowe et al., 2015; Pacione, 2003).

The difficulty in establishing quantitative assessments or measures of outcomes also challenges the development of a framework. As described here, the multi-faceted nature of outcomes assessment highlights the need for a systematic study into factors that can inform outcomes. To this end, the authors' Knowledge Mapping activity (studying the literature to identify key factors considered for outcomes) highlights (see Appendix A) a large number of themes that emerge from the literature and with them, a variety of indicators (359) that have been identified from the literature. While not an extensive study of indicators, the breadth of themes and the types of indicators identified that there is a strong potential avenue for future research on expanding this activity to potentially map outcomes assessments with indicators. There is a considerable number of potential indicators as well as many existing assessment frameworks such as Berkeley (Berkley Group, 2020), HACT (Housing Associations' Charitable Trust, 2023), TOMS (Social Value Portal (2022), the Rockerfeller City Resilience Framework (Arup &The Rockefeller Foundation, 2015), BEAT (National Center for Chronic Disease Prevention and Health Promotion, 2021), BREEAM (Burton et al., 2005), and REAT 2.0 (National Institute for Health Research, 2023) as a part of a knowledge mapping activity the authors conducted, as seen in Appendix A. The list of existing assessment frameworks demonstrates the complexity of the issues and the range of perspectives that are considered in assessment. This is an area of research the authors aim to explore in further detail in future work. While comparing the UK's planning system with international efforts in outcomes assessment is beyond the scope of the paper, some international comparisons of neighbourhood-level assessments have been undertaken (Sharifi & Murayama, 2014). A more extensive review of the practice on this would be a valuable expansion of the authors' research.

METHODOLOGY

Urban planning is, in any case, a discipline that is practice-driven, and various specialisations exist within the planning practice. At the same time, specialisations are also constantly evolving and have increased over the past several decades (Brinkley & Hoch, 2021), as new disciplines and requirements emerge. As a result of disciplinary differences, it was necessary to understand the perspectives of urban planners and practitioners and how they see outcomes-assessment. The authors, therefore, conducted interviews with stakeholders from different disciplines and experiences to help understand their perspectives[1]. A first-hand account of stakeholders involved in planning is critical to establish how their practice is currently dealing with outcomes and the challenges they are currently (or will potentially) encounter. The authors invited a variety of UK local authorities and planners to a semi-structured interview session.

Participants

Key individuals at several local authorities, planning consultancies, and law practices were initially identified by the Connected Places Catapult team (from professional networks, prior contacts, and engagement events) based on their expertise and knowledge of planning processes. A list was created of potential participants who were introduced to the first author via email. The inclusion criteria for the stakeholder interviews is listed below.

- An employee of an organisation that is involved in planning or planning-related processes.
- At a sufficiently senior level.
- Have oversight of planning processes.
- With insight into digital services within the organisation and beyond.

The primary need was to ensure that stakeholders would have either hands-on or management experience with digital planning, decision-making, and evaluation of planning. When the initial list of potential participants was exhausted, a request was made to the PlanTech channel on Slack, inviting any participants to the interviews.

The primary author initially contacted all stakeholders with an overview of the project and the scope of discussions together with an information sheet and consent forms. In the emails, participants were also provided with the topics expected to be covered. Meeting date-times were decided over email, and a meeting request was sent to all participants of the meeting using Google Meets. In total, over a period of one month (mid-February 2022 to mid-March 2022), eight online interview sessions were organised, with the opportunity to extend to other experts if necessary. Following these interviews, the authors agreed that this extension was not required at this stage of research. All interviewees were informed that none of them would be named and all identifying information in the data and reporting would be anonymised. Whilst the authors report on the interview findings anonymously, it may help to note that the participants were from a range of organisations, sectors, and practices that offer insights into the wider aspects of outcomes in urban planning.

The Interview Process

Online meetings were scheduled as a one-hour slot, starting with an initial welcome and introduction to the interviewee. The interviewer would then discuss the aims of the project and provide an overview of the interview, which was expected to take 45 minutes. The interviews were recorded after receiving another verbal confirmation and consent for the recordings.

The interviews would start with the participant being asked to introduce themselves and briefly discuss their current roles. Based on the definitions previously discussed, the participant would be given a broad overview of what the authors refer to as outcomes and outputs. This would then lead to specific questions to guide the ensuing conversations:

1. How would you define outcomes in urban planning?
2. For you, what are the primary barriers in assessing outcomes of urban planning?
3. As a part of your daily work, do you deal with impact assessments? If so, are any of these assessing outcomes?
4. Which part of the planning process do you envisage outcome assessments to have a key role in?
5. In which among the different sectors (specialisations) of urban planning do you believe an outcomes-based assessment approach would have the greatest impact?
6. If the planning process were to have had an implementation of outcomes-based assessments, what would your vision of that world be like?

Interviews were semi-structured, where participants were guided through the initial set of 6 questions (above), with the flexibility of expanding on a specific topic if a need arose. Discussions therefore centered around the subject matters listed below.

- The participants' perceptions of outcomes-based on their experience.
- Understanding the barriers to assessing outcomes.
- Perceptions of the benefits of outcome based assessments.
- Vision of an outcomes-based assessment framework.

Analysis of Interviews

Data collected during the interviews were primarily in the form of video recordings and interviewer notes. Participants were also invited to send any further thoughts or ideas if they had not been discussed during the interviews. Two participants provided further details on the topics they had mentioned

to be explored in greater depth on another occasion. This included whitepapers, links, and pieces of work that the participants have been directly involved in, some of which are not available in the public domain. These will be studied in future research, particularly since that will involve interviewing the participants in more depth. Interview recordings were transcribed using an automated online service, HappyScribe[2], which is a paid service for transcribing audio recordings. Transcripts of all the interviews were then manually read and coded using (inductive) thematic analysis by following the steps of familiarisation with the data, generating initial codes, searching for themes, reviewing themes, defining themes, and writing up (Braun & Clarke, 2006). The codes and themes were synthesised into broad topics on the perception of outcomes, barriers, and sectors that can benefit from an outcome's focus and on scenarios of success. The authors present the codes and themes in Appendix B.

RESULTS

Participant Profiles

In order to understand the perspectives of the practitioners (8 participants), the authors asked them to share about their current roles and their responsibilities. To preserve their anonymity, the descriptions of the participants have been kept vague while sufficiently detailed to highlight variations in subject and practice:

- Project management; senior analyst in the built environment, and policy development and assessor and user of the planning system.
- Town planner with experience in different sectors (transport planning, policy enforcement, and finance).
- Planning solicitor and strategic advisor specialising in digital planning and data ethics.
- Developer of software and products working with local authorities.
- Digital lead working on digital landscapes to be used by planners.
- Planning practitioner working in government, focusing on digitisation of the planning system.
- Planning practitioner with a specialisation on strategy and economy within shared planning.
- Senior land manager for a housing developer.

Given the interviewees' highly skilled and specialised nature of expertise and the need for an in-depth understanding of their perspectives, the authors believe this study offers relevant insights into the community. The broad range of expertise and practice in the participants highlights the different disciplinary perspectives the authors could capture.

Perception of Outcomes

Given the varied set of experiences among participants, the authors invited them to share their views about what outcomes mean to them. Some participants explained their perspectives of outcomes by discussing what outcomes are not, with a broader overview of the planning process. One participant noted that although planning is often discussed from the perspective of one profession, it involves two broad areas – development management and policymaking. Some professionals also sit between these areas and deliver projects on behalf of councils and are therefore impacted by both the areas. However, activities in these two areas are often conducted in silos, and while some of these activities might lead towards outcomes, there is often not a clear thread between the different strategies. The participant also noted that there are many discussions and efforts around outcomes in planning, but these do not get to the level of detail of what is required on a project basis to ensure on-the-ground delivery. Another participant reflected on the reasons for planning to originate, which involves improving places where people live, work, and grow up to ensure development. The participant notes that in planning, growth is planned in a sustainable and positive way, to enable people to have access

to space, green space, health, education, and jobs and to be able to afford a home. Unfortunately, much of this essence has been lost in the bureaucratic, political, and market processes that planning now needs to consider. Although according to planners, planning is about outcomes, often more of the arguments and discourse are around quantitative issues like house numbers and arbitrary figures which do not really measure outcomes.

One participant mentioned outcomes to understand how a project conforms to specific criteria set out in the planning permissions, while another noted that outcomes are a result of actions that have been taken and some outcomes are quantitative while others are qualitative in nature (e.g., customer experience). One participant mentioned that outcomes are long-term social impacts that planning decisions have on people and relate to 'softer' aspects such as strength of attachment to place, happiness, and overall feelings and emotions. The participant notes that to them, outcomes are longer-term cumulative impacts of outputs. In discussing the measurement of outcomes, a participant mentioned the planning process itself could highlight some outcomes such as how many planning decisions are overturned on appeal, how many decisions have been challenged, and so on.

One participant reflected on the user experience of planning and noted that outcomes, to them, indicate the holistic perspective of the statutory process, decision notice, award, action, and delivery of plans in a transparent and integrated manner (instead of the opaque nature of planning processes). Another participant highlighted the difficulty in interpreting the terminology of planning outcomes – outcomes have different definitions and practitioners, so professionals, planners, and citizens will have different definitions. The participant notes that, to them, unlike quantified objectives that practitioners work towards, the citizens' definition of outcomes would be less quantifiable but more important. The participant notes, "it's important to bring the perspective of the residents and citizens. … We should serve their vision and not enforce our's and planning is a means to allow for this to occur".

One participant noted that, to them, outputs are tangible achievements that can be measured by numbers, while outcomes are more qualitative achievements:

To me, it's that difference between qualitative and quantitative. And not to say they're mutually exclusive, but I think we're a bit more reliant on quantitative because it's a bit easier to do and less so on the quality because we don't, as local authorities, we don't have the cash, but we don't have the resources and the access to the capabilities to accurately monitor this.

The participant indicated the relative ease of measuring outputs as one of the primary reasons why outcome assessment is a difficult task.

While the different viewpoints on outcomes emerged, it was clear that all participants agreed that developing an outcomes-based assessment framework is not a trivial task. While local authorities and planners may strive to achieve outcomes as a part of their practice, in real terms, outcomes are highly complex and difficult to measure.

Barriers

While all participants highlighted barriers in establishing outcome assessment processes in urban planning, the barriers varied among the participants, as is expected due to their different disciplinary perspectives.

Varying Needs of Populations

The wide range of stakeholder perspectives of what outcomes mean to them highlighted how differently outcomes are viewed by practitioners. Disciplinary differences, areas of focus, and previous experiences could all amount to account for the reasons for these different viewpoints on outcomes, in addition to the previously explored points that outcomes are inherently difficult to be defined. One participant noted that the varied outcomes could also reflect on the citizens and communities who are residents and visitors to the areas concerned. Different user groups and communities will have

different interests and therefore will have varying needs from the planning process. Furthermore, many areas will experience considerable changes over the short-term among the local population – with people moving or shifting priorities as family-sizes grow or even as a result of experiencing global events such as the COVID-19 pandemic. This makes it difficult to establish a definitive set of outcomes and priorities and poses a considerable barrier to planners, who, as one participant noted, aim to serve the interests and needs of local communities.

One participant stressed the broader issue that 'outcomes' might mean varying impacts on different populations and stated it is difficult to understand what a generally positive outcome can mean:

The biggest barrier will be everyone's going to have a different idea of what a good outcome is. And maybe I think the biggest challenge we have is we think of outcomes as one solid thing or this is what it should look like. No, actually, we don't.

The participant highlights that this might mean looking at weighing up the benefits and trade-offs of specific decisions and aligning the outcomes with what citizens would need. One possible approach could be instead in developing outcomes that indicate the influence communities and citizens can bring about in the planning process:

Maybe we should just stop defining what good looks like and go, 'What do you need?' And maybe we should be looking at finding outcomes as what can we create to empower citizens or empower residents to live the lives that they want. Is a pretty street an outcome? or, is it access to it? or, is it a well-connected street that allows people to have more autonomy over what it should look like?

Engagement With the Planning Process

Outcomes in planning by nature are intended to understand the qualitative experiences of local populations. While some regions experience rapid transitions in their population, making it difficult to understand the varying needs of local residents, the differing levels of engagement with the planning process in itself bring difficulties. One such example on how citizens can engage with planning is in the consultation process, where planning authorities are required to undertake a formal period of public consultation prior to making decisions on planning applications. However, existing processes rely on physical consultations and often may have little legal weight in influencing planning decisions. Due to the physical nature of consultations being usually held as community meetings, only certain demographics usually engage in the process. Consultations are defined in the general development procedure order, as a paper-based exercise and digital means are used but not legally mandated. The relative low legal value and the participation from one section of the public risk bringing only certain outcomes into the forefront, as mentioned by one participant:

And even that is more difficult now to quantify than it used to be, because if you did your classic consultation, a paper-based exercise, then you would reach what I would call the usual suspects in the planning system, which is the generally older, generally more affluent, generally quite static populations, and you would get one particular assessment of wellbeing.

Including newer forms of communication such as social media channels can potentially help in bringing in the voices of other sections of the public; however, mandating specific platforms could be difficult, owing to the varying engagement mechanisms of the platforms. For example, younger adult populations might have a preference toward consumption of short forms of media (e.g., TikTok, Instagram), which would require a more complex mechanism of translating complex plans into more consumable and digestible content.

Existing Structures in Planning System

One of the most significant barriers discussed by participants was around the structural issues in existing processes and establishments in planning. The two primary practices on planning – policymaking and development management – need to work in collaboration, where policymaking sets policies for the future, while development management decides how new plans adhere to policies and help to achieve the strategic goals of the local authorities. However, resources across both areas are strained, and planners are stretched with increasing workloads. Planning, by its nature, is strategic, and often planning at a policy and strategic level is reliant on data which is estimated rather than based on hard observations. It is important to understand these constraints among the two areas, as one participant notes while discussing development control officers:

Four or five years ago, they'd have had 30 or 40 applications on their desk at any one time. You can double that. And you speak with development control officers. And if they wanted to, they could spend their entire week just giving updates to applicants and their agents. … Forget doing any work. That is how overloaded they are. And they are measured on their ability to deliver their application decisions within the statutory periods.

Planning policy professionals, on the other hand, are measured on the timeliness and cost-effectiveness of their local plans:

[…] so their metrics, as it were [involves answering the question], is my local plan up-to-date? Very few are, as we know, and what do the members want, which is where the politics comes in. So rather than be measured on anything more meaningful as a quantified metric, it is the political sway of the moment.

As a result, professionals in the two areas are severely strained, responding to challenges and pressures in their own domain of expertise, as noted by the participant: " … are so fixated on their day jobs and there is no obligation for them to communicate".

There is, therefore, a need for distinct opportunities for consistent feedback between the two practices and for sharing data. The participant notes that this 'siloed' structure might not necessarily be the case for all councils, but several participants mentioned the need for better seamless flow of data between the two practices of planning policy and development management. With this need for data sharing between the two practices, there is also a need for feedback channels, where the practices can learn and improve by inspecting the challenges from the past retrospectively, particularly when decisions have been wrong. It is important to be studying the decision-making processes that were involved and developing strategies to avoid future mistakes.

A few participants also noted the challenges that planners struggle with around the political aspects of planning. However, the nature of planning makes it difficult for the planning system to be isolated from politics, as one participant notes: "And depending on the volatility of the administration or the people who are in power on that particular Council, usually those elections are almost always fought on the back of poor planning". It is this intertwined nature of the planning system that makes it difficult to navigate political pressures. However, another participant notes that while politics is an issue, the structures in the planning system could be better streamlined:

The current situation seems pretty dark and disjointed, but at the same time, there is some comfort that there's a future where these two things will become linked up. But I don't think it'll come from statutory changes in government intervention. I think it will only come from a realization by members and officers that this is probably a better way to do things, but we'll see.

Existing Processes in the Planning System

Participants noted that one of the main reasons why planning relies heavily on outputs rather than outcomes is the ease of measuring quantitative numbers. This, while helping serve the purpose of meeting KPIs and project objectives, however, is at the cost of losing the broader perspectives of the outcomes for communities. As one participant notes, in discussing how outcomes are more holistic:

Usually that is the case, but it's also understanding. It's almost understanding context and nuance with this stuff. And that's the difficult stuff because we really would love to work with things that are easy to measure and manage and to box. But unfortunately, when you do that, it's reductionist. So, you reduce it and actually take away that context and that nuance. And you realize you've been doing it for so long, actually not achieving any of the things that you're trying to achieve because you've reduced it so much to simple reporting methodology.

The participant goes on to explain how, in economics, GDP is used to measure economic success of countries but, for a nuanced understanding of the economic health of a country, there is a need to rely on many other measures. The participant explains that there is a need for a balanced outlook where easy forms of reporting/measuring are a valuable component of the planning process but also notes that the wider perspectives also need to be considered:

The problem is we need to get that balance between having it easy to be able to report so we can understand how well we're doing or something, but also not lose the nuance and the granularity of the important stuff. In some ways don't have the answer to that.

In discussing existing processes in using measures and outcomes, one participant noted that often, in understanding outcomes, planners struggle to get an accurate picture of their areas of focus. One of the reasons for this is that decisions are sometimes based on many years of experience, intuition, and assumptions and these may often result in an inaccurate picture of the contexts. While the inaccuracies may not be significant and experience has offered planners the insights to respond appropriately, it would benefit the practice to have hard data about these outcomes. Specialised consultants are at times involved in the process of assessments such as economic and environmental assessments, but often information received might be out of date. The participant notes:

There's a sneaking suspicion it's been cut and paste from the last local authority and the title has been changed. That's an extreme example and I'm being cynical, but very rarely is it done in-house, nor is it up to date. And that obviously has knock-on effects. And those impacts and knock-on effects only get bigger the further up we go.

In elaborating on the knock-on effects, the participant mentions that plans from local authorities are fed up with central government and these assumptions and out-of-date data get aggregated, resulting in policies which could be better designed for communities in need. The participant notes:

So, if we're feeding up numbers to central government and everyone else is feeding up numbers to central government, the central government are saying we need to build 300,000 new homes every single year. Do we? Maybe we need to build 400,000 homes every year, or maybe it's less, but we just don't know. And we just don't know because we aren't using the best available data and sourcing it from the most accurate sources.

Well-designed outcomes, using data and automated processes, with local governments having sufficient tools and resources would provide an ideal solution for the wider issue around relying on estimates:

But rather than rely on anecdotal evidence, you're able to say, look, here is a link and you can see patterns that you would never have thought of, and you can start making more granular decisions quickly in real time.

Participants also highlighted barriers around the way planning is organised across different sectors such as environmental, economic, health planning, etc. While sectoral specialisations are critical to the planning process, it is important to also highlight that planning does not often work across multiple sectors. Therefore, it is common for outcomes and outputs to be specialised to individual sectors and thematic areas. Existing assessments as a result are also on specific thematic areas, and cross-sectoral assessments are rare. For example, environmental impact assessments do not look at social capital or development on social capital, loneliness, or health. However, the impact of outputs in one sector can be observed in another – for example, the role of the environment and green space on mental and physical health is well known. Assessments across sectors could offer more holistic perspectives that may have been traditionally missed.

Organisational Culture and the Wider Environment

As can be expected, a transition to outcomes-based assessment may require a radical shift in processes in the planning industry. However, achieving this practically is not trivial. The planning process has evolved over many decades and, although not always the most efficient, has many years of experience. As such, there is often a lack of willingness to accept new technologies and approaches, which can be a considerable barrier. As with other transformations, in addition to the development of technology, there needs to be an equal emphasis placed on building trust and confidence. One participant notes:

Whilst lots of impetus and time and money resources are being put into developing building information modelling and data standards, etc., I think almost an equal weight needs to be put into account into hearts and minds with local authorities to say this is how things can be done. It's not big and it's not scary [and] to kind of build confidence but also trust with it.

The participant highlights from their experience the excitement of new technologies and processes may often need to be contrasted with concerns from experts in the field:

I thought I had a bit of an idea and I worked on it with a few others and then took it to my director at the time and just presented it to them. … It hadn't occurred to me, and I didn't have the empathy to realize that the director I bounded up to had been doing that job for the last 30, 35 years. . . . And here was me just appearing saying all that stuff you've been doing for three decades – forget that! That's not relevant anymore – do this instead! And that was [the] wrong, I quickly learned that's the wrong way to approach it because it is counterproductive.

Another participant noted the difficulty in ensuring outcomes are met when they are designed higher up in the organisations as evaluation and monitoring are not currently embedded in governance processes or structure of teams. The participant notes if a new policy that aligns with an outcome is passed to development management, they would need to take decisions on cases based on these outcomes. If planning applications provide operational performance metrics that align with the outcomes, there are few checks to ensure that the metrics are adhered to. The responsibility of

reaching the operational metrics is up to the developers, and it is assumed that they will fulfil their obligations. The participant mentions:

How are they going to know whether they ever actually do it? You don't. That's the thing. I mean, policy teams usually have monitoring, but on a very macro level. . . . But to what extent your built environment is actually responding to your policies and the way you know what policies are working and what are really difficult to know. Unless you have someone actively lobbying or complaining that something doesn't work.

The participant also highlights the difficulty in ensuring outcomes are translated consistently within one organisation across teams, particularly for large councils involving multiple projects. With an organisation that is outcomes-based, the difficulty in having a shared collective vision of what outcomes means and how they are to be interpreted is considerable. The participant notes:

How that real corporate strategy feeds down into particular projects, especially for a large, complex Council, how you make that link better is really tricky. And I don't know the answer to that because you see it time and time again. It's such an ask for an organization to be well synchronized, well-coordinated from the top to the bottom, efficiently.

Prior Knowledge for Benchmarking

An outcomes-based assessment approach, if implemented, will be a considerable transition from how the planning practice currently operates. Current practice often requires KPIs or reporting measures that are determined for plans; however, they may not always be the most appropriate for the purposes of reporting on outcome measures. A participant explains:

Often you do have kind of KPIs or reporting measures, but it's often a scramble and very ad hoc in terms of how you get that data, and then not everyone agrees with that being the right KPI as well.

The participant mentions: "So there's something in how they're crafted and how that understanding is mutual, and how well those KPIs are linked to an outcome is often questioned". This indicates there is a need to systematically develop the outcomes from such KPIs that are agreed within the community, and a subsequent need for clarity on how such KPIs inform the outcomes.

In the development of such frameworks, it is also important to set baselines based on prior (or ongoing) knowledge efforts. One participant highlights the need to benchmark and compare against other projects or initiatives:

What's the point of measuring this if we can't aggregate it to higher level impact assessment? So, what's assessing the impact of my project, if I can't then compare it against something else? There's a lot of work to be done, I think, in baselining and getting that essential guidance there.

Another participant explains: "How do you monitor? What metrics do you use? No one uses the same [metrics], and we have very similar issues with resources", highlighting the constraints around resourcing. One participant mentions:

When you sort of gone through the planning system is all you know, and you don't come from another industry, you don't know what good looks like and you don't know what automation of processes looks like. So, you might not be so interested in something that you kind of don't know what it is. You know, when you talk about integration, when you talk about data, when you talk about new

government processes, it's so in the high level and it's so foreign to you that you don't always have the incentive to do that.

Benefits of Outcomes Assessment

One of the questions the participants were asked to elaborate on was how they envisaged an outcomes assessment process could impact specific sectors in planning. Overall, all participants agreed that outcomes assessment would bring about a systemic change in not only planning but also policy and, as a result, communities and citizens. Some participants noted that researchers should be looking not at how outcomes would impact a specific sector (e.g., environment, energy) or practice (e.g., policymaking or development control) but instead at the holistic process of planning. One of the most challenging barriers, according to the participant, was the sectoral silos that are created as a result of specialisations such as transport, environment, etc.:

I think we should be looking at it in terms of outcomes. And I think that's precisely the problem. If you have transport planners, you don't talk to place planners, you don't talk to energy providers, and that's the barrier we're really coming across. . . . It needs to be place driven; it needs to be geographical, and I think that's the way we need to approach it. So, one aspect is demystifying the planning system, taking it as a service; the other is reframing the way we think about planning.

An outcomes assessment would help bring together the specialisations naturally and, in doing so, foster conversations, knowledge sharing, and data sharing. This would eventually help aggregate impacts across sectors in a holistic manner:

We don't see accumulated impact of planning decisions precisely because those sectors don't exist in that way in real life. They're messy and they intersect and they have these really complex interactions. It is a complex system and I think we need to be able to understand that. And if outcome space planning can start to work towards that and reframe that, I think that would be really valuable.

Another participant builds on this view of outcomes assessment relating to the broader holistic aspects and explains:

I think that subdivision of the sector, I think, is artificial. I don't think it's actually that. I don't think we should ever be seeing it. I think that's why I like the templates making. I don't like the term place-making because you don't make places. But I think the idea of you need to see these things holistically. And this is the problem with specialization in general.

One participant also noted the different practices can also link better and development control could be more tightly coupled with policymaking via more streamlined data sharing and positive feedback mechanisms. This could help improve policymaking processes, supported by hard data and evidence. Another participant highlighted that the benefit could also be for development control and what should be or should not be built based on a much broader understanding of local contexts. An outcomes-based assessment could also help improve consistency across the sector.

Some participants, however, identified specific sectors that could immediately benefit from implementing outcomes assessment. This is possibly because of the immense challenges that local and central governments have been dealing with recently. One such challenge identified pertained to climate change, and one participant notes the most obvious sector benefiting from outcomes is the environmental sector because of NetZero commitments. Another participant noted the benefit could be towards affordable housing, due to the challenges around homelessness and rising house prices. An outcomes assessment could have immense benefits in making better use of the housing stock.

One participant highlighted that the benefit could also be in integrating sectors such as housing and environment with social value outcomes.

Vision of Outcomes Implemented

We asked participants to project their vision of how an outcomes-assessed planning system might look as a means to understand how the participants visualised the benefits in a holistic manner. Some of the participants' vision related to the planning system – for example, one participant shares their vision of a process that supports monitoring and understanding how planning is performing:

For me, ultimately, you'd have a positive feedback loop. You'd want to set your hypotheses, you want to validate them, you test something out, and then you just monitor how it works really fundamentally. And that's what you need to be embedding in the planning system.

Another participant discusses the efficiency this can bring about in processes – planners and case-officers spend days blocked-out to look at a range of calculations for development, which can be easily digitised and automated. An (automated, digital) outcomes-based assessment framework could help free up their time, and the planning system could move "toward accurate and timely outcomes, better and faster decisions, and help free up time [for planners and case officers] to focus on the softer aspects of outcomes". Another participant shared their vision of the planning system being able to conduct accurate scenario testing and what-if scenario analysis, which builds on complex models driven by outcome assessment. One participant shared their vision of a streamlined, efficient, data-sharing process between different departments and sectors, which could easily integrate data with existing (and future) models – so planners could have access to each other's data to be able to make decisions quicker and know their impacts. For example, housing planning data could easily integrate with traffic and transport data.

Some participants shared their vision of how an outcomes-assessment approach would help members of the public. To one participant, this vision was about how outcomes assessment could empower people to inclusively participate in planning and be able to contribute to planning processes. Another participant noted that an outcomes assessment approach would result in very clearly defined outcomes for planning which would be universal; they also noted there would be multiple steps to achieving these outcomes and the framework could link across these steps. Much of the technology required to facilitate this transition is already there in the form of digital technology. One participant highlights the needs of citizens and communities:

I think a clear understanding of what those indicators are for just the normal person, knowing what key things are being monitored, to see if what it's improving - is it life expectancy, is it cost of living? Is it just a clear communication about what are the indicators that are being used to determine if life in general is improving?

DISCUSSION

The findings from the study raise several questions regarding moving towards an outcome-based assessment approach in the planning context of the UK. In this section, the authors refer back to their research questions, "How do practitioners perceive an outcomes-based planning future, and what practical barriers exist that hinder progress in this direction?" The authors highlighted the challenges in conceptualising planning outcomes and the need for outcomes to consider multiple perspectives, and the outputs of the authors' knowledge mapping activity presents the range of indicators that can be used as a starting point for future efforts in outcome assessment. The practitioners discussed barriers around (i) difference in practices, (ii) varying local populations, (iii) the range of participation

in planning, (iv) challenges of existing planning practices (e.g., resource, political, procedural etc.), (v) communication challenges, and (vi) lack of benchmarking data. The authors' interviews with practitioners present the disciplinary differences and the various challenges that arise in conceptualising outcomes. It is evident that a range of issues exits moving towards outcomes-based planning, especially in relation to the practical challenges listed below.

- Inconsistent assessment methods and progressive approaches towards comprehensive application of planning outcome.
- Varying definitions and perceptions of outcomes.
- The varied and limited use of indicators driven by data availability and quality.
- The marginalisation of stakeholder participation and lack of focus on citizen perceptions and satisfaction signal a need to establish a baseline for planning outcome assessment with the help of diverse stakeholders from public and private sectors, the promises of information and communication technology and big data (Karjalainen & Juhola, 2021).

This research is a step in that direction.

Although the spatial and temporal characteristics of planning outcomes are recognized by urban planning and built environment scholars such as Wimark et al. (2020) and Wong and Watkins (2009), the authors' findings of assessment frameworks and the existing indicator systems (i.e., UKGBC, BREEAM, LEED-ND, etc.) utilised do not account for the multiplicity of dimensions of planning outcomes. The lack of clarification in the differentiation and association between planning outputs and outcomes regarding their temporal and spatial disparities has been identified in the literature (Wimark et al., 2020; Wong et al., 2007; Xie et al., 2019) and in practice (Bramley & Watkins, 2016; Leather & Nevin, 2013). This is also evident in the use of indicators identified in this study and the findings from expert interviews regarding their perceptions of planning outcomes. The central critique lies in the need for a strategic overview of the cumulative planning interventions gauged by policy-specified output indicators within a time frame. This is seen as important as it ascertains a wider interpretation of the planning outcomes that seek to achieve sustainable development over a substantial period.

Existing assessment approaches are often limited in terms of operationalisation across different spatial scales. For example, while sustainability assessment tools like BREEAM and LEED can be applied at city-regional and district scale, assessment frameworks such as CSA, BREEAM, and LEED-ND were developed for assessment conducted at neighbourhood levels (Sharifi et al., 2021). Additionally, there is a disconnection between conformance-based evaluation (which focuses on the degree of agreement between the planning outcomes and local and context-specific targets set in the planning policy) and performance-centred assessment (which evaluates the role of policy and plans in the decision-making process) (Faludi, 2000; Laurian et al., 2007). In particular, the marginalisation of the monitoring process in planning assessment implementation is often overlooked when establishing assessment criteria for evaluating policies and plans. Therefore, it is critical to establish the links between planning goals, objectives, and outcomes (Guyadeen & Seasons, 2018). Specifically, the findings from the expert interviews further emphasise that separating monitoring and evaluation in the delivery process is essential in terms of ensuring transparency in evaluating the success and failure of planning instruments and practices.

The limitation and challenges in using indicators for assessing planning outcomes should not be neglected. This includes concerns of measurability and interdependence issues and the challenges of standardisation such as data availability driven (Sdoukopoulos et al., 2019). There are also concerns around lack of adaptability to different scales, locations, and situations in terms of capturing planning-generated effects and consequent best configurations of the planning or regeneration areas (La Rosa et al., 2017; Sharifi, 2019). Challenges also exist around the marginalised effects on the temporal and spatial relationships between outputs and outcomes. There is a crucial need to develop a more comprehensive baseline with (temporal and spatial) threshold systems which allow for more reliable,

inclusive, and comparable assessments across space and over periods of time (Karjalainen & Juhola, 2021). The authors' findings from the expert interview thus align with the conclusion of previous studies and call for the need of standardisation in data collection and information communication in terms of enabling interoperability and facilitating a natural transition to outcomes-focused assessment.

Based on the authors' results from the knowledge mapping activity and the expert interviews, the qualitative and social aspects of planning outcomes tend to be marginalised in the assessment due to the challenge of employing citizen knowledge and evaluating citizen perception such as the requirement of innovative data generation techniques (i.e., social media, participatory GIS techniques) for operationalisation of outcomes indicators (Karjalainen & Juhola, 2021). As planning outcome assessment is context specific, the development and use of indicators should reflect the local concerns of pertinent planning issues based on specific citizen needs (Marletto & Mameli, 2012). While promoting healthy and safe communities is one of the key planning provisions in the NPPF ("National Planning Policy Framework," 2022), many health, social (society), and environmental indicators related to the perceived quality and intangible values of urban space and physical infrastructure currently receive very little attention. The neglect of indicator coverage leads to inconclusive assessment results disregarding the sustainability issues that are clearly identified and considered in the principles and objectives of urban planning (Lamorgese & Geneletti, 2013).

Although initially unexpected, the marginalisation in stakeholder participation is identified as one of the shortcomings in the transition to planning outcomes. The challenge is twofold, which corroborates the concerns related to citizen-planner communication, enabling a participative procedure to select assessment indicators (Wilson & Tewdwr-Jones, 2020) and the establishment of public-private partnerships in the implementation of planning outcome assessment. The concept of public-private partnership has been widely established in the UK in the fields of urban regeneration, housing development, and delivering infrastructure projects such as transportation (Hwak et al., 2009; Kort & Klijn, 2011). However, planning outcome assessment is a largely fragmented field and often lacking in public-private partnership due to barriers such as the long planning-horizon, contract/project emphasis given to the financial aspects, hold-up problems caused by changes in the position of partners, and the cultural differences between private and public sectors (Nijkamp et al., 2002; Shu et al., 2021). Our expert participants call for the development of innovative processes of outcome-based assessment in planning practice by empowering public-private partnership. Although post-planning evaluation in public-private partnership is still under-developed and ambiguous, the creation of a basis with different evaluation stages, expanding benefit realisation approaches (Dabinett, 1998), and the incorporation of a learning emphasis on identifying trends and pitfalls for allowing integrative planning and research processes (Alade et al., 2022) can serve as a guiding concept and a goal of policymaking for planning outcome evaluation.

CONCLUSION

This paper has shown that the very concept of 'outcome', including the distinction between outcome and output, is sometimes unclear and that the economic and social context often changes in a way that obscures causal relationships; also, in any case, the interpretation of trends is always subject to political influences of various types. The practitioners the authors interviewed were well aware of the conceptual and technical difficulties in the use of outcome-based indicators, as these emerged on a routine basis in their work. The practitioners also added a further significant constraint, namely the pressures of the workplace and of staff shortages, that precludes innovation and creative thinking. Digital technologies can save time and therefore money in the long-term. Indeed, efficiency savings is a major rationale for digital investment in business. In the short-term, however, digital innovation has considerable start-up costs and requires experimentation.

It is possible to map the main parameters of an outcomes-based system of monitoring and evaluation, as this paper has shown. Moreover, practitioners were generally supportive of the aims

of systematic, evidential evaluation. Without citing the latest edition of the National Planning Policy Framework, the practitioners recognised the same potential of digital technologies to promote public understanding and involvement. In this context, the task of digital innovation is to bridge gaps between the long-term benefits of digital evaluation and the current world of practice and to experiment with the application of knowledge mapping exercises in specific local contexts. As an extension of this work, future directions of research would be to examine the use of information platforms from the perspectives of various citizens' and advisory groups involved in planning and from the perspectives of developers and other stakeholders in the planning process. In the future, the authors would also involve a larger number of international participants through other mechanisms such as surveys and focus groups to collect more quantitative insights into practitioner perspectives of different national contexts. A further research activity would be to align the outcome indicators in Appendix A to the potential use of open data and information provided through the standard platforms in the planning process.

A final clarification is necessary, however. Putting aside the details of the mapping exercise in Appendix A (and the details will almost certainly require refinement and modification in the light of changed circumstances), it is not possible to introduce a complete, universal, and comprehensive evaluation framework. Comprehensive knowledge implies an impossible degree of omniscience and the absence of future learning. Yet, even if knowledge is always limited, it makes sense for decision-makers to expand the limits of their knowledge on a piecemeal basis and to communicate that knowledge to the public. If relevant data is not identified and presented clearly, it cannot be analysed clearly, and if it is not analysed clearly, it cannot be used clearly. Without clearly identified and analysed data, plan making, and strategic policy formulation becomes at best opaque and at worst hopelessly confused. Clarity of data, analysis, and the transformation of data into relevant, usable information remain crucial aspects of planning.

COMPETING INTERESTS

The authors declare no competing interests.

FUNDING STATEMENT

The research reported in this paper was funded by EPSRC Researcher in Residence project, UrbanMapper (project reference: EP/T517264/1). For the purpose of open access, the author has applied a Creative Commons Attribution (CC BY) licence to any Author Accepted Manuscript version arising.

ACKNOWLEDGMENT

The authors would also like to thank the Connected Places Catapult and Nick Woodward, Will Pearson, Euan Mills, Nissa Shahid, Kate Taylor, and Natalie Record for their invaluable support, expertise, and advice. The authors also gratefully acknowledge the stakeholders who had participated in the interviews for their valuable contribution, advice, and insights on the topic.

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ENDNOTES

1 Ethical clearance for this study was obtained from the University of Sheffield (reference number 044724) on 21/01/2022.
2 See HappyScribe Transcription, available at: https://www.happyscribe.com/.
3 See understanding the Contribution Parks and Green Spaces can make to Improving People's Lives, Lambeth, available at: https://moderngov.lambeth.gov.uk/(S(0cmzi2vta2o4ow55m5w2s455))/documents/s56922/02value_of_green_space_report1.pdf.
4 See Bristol Housing Festival, the co-modular home, available at: https://static1.squarespace.com/static/5bc84e0faadd34498199d831/t/5ddaf8edb53adb35ea982039/1574631713145/Brochure.pdf.
5 See Tempo Housing, http://www.tempohousing.com/.

APPENDIX A

Table 1. Knowledge mapping exercise: List of indicators for outcomes assessment

Theme	Topic of Theme	Indicator	References
Economy	Business	Increased opportunities for local SMEs and VCSE (Voluntary, Community, and Social Enterprise)	TOMS
	Business	Local supply chain supported and grown	UKGBC
	Business	Thriving local businesses	UKGBC
	Value (overall economy)	Increased overall economic value	Argent
	Value (property)	Increase in property value	Lambeth[3]
	Savings	Cost savings to the public sector from the intervention	Argent
	Value	Value added as a result of development	Argent
	Equality and Inclusion	Improved economic equality	Bristol[4]
		Inclusive growth	Bristol
	Individual Contexts	Debt and burden from debt of residents	HACT
		Number of supported children	HACT
		Residents are financially comfortable	HACT
		Homes of residents insured against theft	HACT
		Residents are able to save regularly	HACT
	Investment	Investment in activities and services	Berkeley
		Investment in local neighbourhood projects	Berkeley
		Inward investment and job creation	Tempo[5]; Bristol; Argent; HACT
		Presence of redevelopment and renewal efforts	Lambeth
	Job Creation	Number of jobs delivered	Argent; HACT
	Rental Spaces	Take-up of pre-let spaces	Argent
	Taxes	Increase / decrease in local taxes	Lambeth
		Increased / decreased tax base	(Doick et al., 2009)
Environment	General	Climate impact reduced/increased	TOMS
		Environmental maintenance	(Garau & Pavan, 2018)
	Air Quality	Level of air quality and air pollution	(Garau & Pavan, 2018); UKGBC
		Reduction/increase in air pollution	TOMS
	Noise	Noise in the area	(Araya et al., 2007; Garau & Pavan, 2018; Yang & Matthews, 2010)
	Soil	Level of soil pollution	(Garau & Pavan, 2018)
	Water	Access to clean water	(Garau & Pavan, 2018)
Governance	General	Presence of community-led governance	Lambeth; Berkeley
		Community control of local assets	Berkeley
		Place shaping and phasing approach	Argent

continued on following page

Table 1. Continued

Theme	Topic of Theme	Indicator	References
	Communication	Broad diverse spectrum of governance using a wide range of media	Berkeley
		Established formal and informal channels of communication	Berkeley
		Established points of contact	Berkeley
		Range of mechanisms for residents to have a voice	Berkeley
	Crisis Planning	Level of risks from natural disasters	(Garau & Pavan, 2018)
		Probability of natural disasters	(Garau & Pavan, 2018)
Health and Wellbeing	General	Presence of physiological stressors	(Gong et al., 2016)
	Mental health	Residents feeling in control	HACT
		Good overall mental health	UKGBC; HACT
		Residents suffering from depression or anxiety	HACT
		Youth feeling unhappy or worried	HACT
		Youth feeling useless	HACT
		Increased confidence in oneself	HACT
	Physical Health	Residents conducting frequent moderate exercise	HACT
		Good overall physical health	UKGBC; HACT
		Presence of initiatives and interventions for wellbeing	TOMS
Physical Space	General	Aesthetic value of place	(Doick et al., 2009)
		Attractiveness of place	(Garau & Pavan, 2018); Argent
		Enhancement and protection of natural and manmade assets	Rockerfeller Resilience Framework
		General ethos of place	(Garau & Pavan, 2018); Argent
		Physical form of a place	(Gong et al., 2016)
		Quality of area	(Araya et al., 2007; Villanueva et al., 2015)
		Type of architectural features	(Brown et al., 2009; Gavrilidis, et al., 2016)
	Built Environment (Housing)	Access to affordable homes	(Doick et al., 2009); HACT
		Accessibility for people with disability	(Garau & Pavan, 2018)
		Aesthetics of housing	(Gavrilidis et al., 2016)
		Affordability of well-decorated houses	HACT
		Affordable homes for future residents	UKGBC
		Affordable house prices	(Doick et al., 2009); HACT
		Age of housing	(Gavrilidis et al., 2016; Weich et al., 2001); BESSC
		Colour of housing	(Gavrilidis et al., 2016)

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Table 1. Continued

Theme	Topic of Theme	Indicator	References
		Comfortable homes for future residents	UKGBC
		Presence of community inter-generational co-housing	Tempo
		Density of housing	(Saarloos et al., 2011; Thomas et al., 2007)
		Form of housing	(Weich et al., 2001); BESSC; REAT2
		Height of housing	(Gavrilidis et al., 2016; Weich et al., 2001); BEAT
		Predominant outlook of housing	(Thomas et al., 2007)
		Presence of affordable rental houses	Tempo
		Presence of hedges and fences in houses	(Thomas et al., 2007)
		Quality of housing	(Garau & Pavan, 2018); UKGBC
		Type of housing	(Weich et al., 2001); BESSC; REAT 2
		Aesthetic characteristics of housing	(Garau & Pavan, 2018); UKGBC
	Built Environment (Housing | Buildings)	Predominant height of building	(Blečić et al., 2019; Gavrilidis et al., 2016; Weich et al., 2001); BEAT
		Height variability in buildings	(Blečić et al., 2019)
		Buildings shaping urban landscape composition	(Gavrilidis et al., 2016)
		Presence of buildings with broken or boarded windows	BEAT
		Density of buildings	(Gavrilidis et al., 2016)
		Distance between building and street	(Brown et al., 2009)
		Distance of largest building from sidewalk	BEAT
		Distance of smallest building from sidewalk	BEAT
		Diversity of building tenures	UKGBC
		Diversity of building usage	UKGBC
		Groups of buildings based on architecture, history, or cultural meanings	(Gavrilidis et al., 2016)
		Number of storeys of buildings	BESSC
		Presence of abandoned buildings	(Mair et al., 2010)
		Presence of air conditioning in multi-storeyed buildings	(Gavrilidis et al., 2016)
		Presence of balconies in multi-storeyed residential buildings	(Gavrilidis et al., 2016)
		Presence of building overhangs that provide shelter from weather	BEAT
		Presence of deteriorated buildings	(Mair et al., 2010)
		Presence of disused buildings	BESSC
		Presence of external beautification	REAT 2
		Thermic insulation in multi-storeyed buildings	(Gavrilidis et al., 2016)

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Table 1. Continued

Theme	Topic of Theme	Indicator	References
		Presence of TV aerials in multi-storeyed buildings	(Gavrilidis et al., 2016)
		Property maintenance	(Thomas et al., 2007); REAT 2; BEAT
		Resilient buildings and infrastructure	UKGBC
		Total number of dwellings	(Weich et al., 2001); BESSC
		Presence of security signs on houses	(Araya et al., 2007)
		Number of dwellings per entrance	BESSC
	Built Environment (Housing | Windows)	Different types of windows in multi-storey buildings	(Gavrilidis et al., 2016)
		Low sill height of windows	(Brown et al., 2009)
		Presence of bay windows	Berkeley
		Visible presence of ground floor windows	(Brown et al., 2009); REAT 2; BEAT
	Built Environment (Housing | Access)	Number of vehicular entrances	BESSC
		Presence of visible entrances from footpaths	BESSC; REAT 2
		Presence of visible front entrance porches	(Brown et al., 2009; Saarloos et al., 2011); REAT 2
		Type of access	(Weich et al., 2001); BESSC; Bristol Housing Festival
	Built Environment (Housing | Balconies)	Presence of balconies in housing	(Gavrilidis et al., 2016); Berkeley
		Proportion of homes with private balconies	BESSC
	Built Environment (Housing | Exterior Space)	Nature of space outside dwellings	BESSC; REAT 2; Bristol Housing Festival
	Built Environment (Housing | Gardens)	Maintenance of gardens	(Araya et al., 2007); BEAT
		Proportion of homes with private gardens	BESSC; BEAT
		Provision of gardens	(Weich et al., 2001); BEAT
	Built Environment (Urban Landscape)	Presence of sewage in urban landscape	(Gavrilidis et al., 2016)
		Quality of urban landscape	(Garau & Pavan, 2018)
	Built Environment (Community Spaces)	Presence of communal planting beds	Bristol Housing Festival

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Table 1. Continued

Theme	Topic of Theme	Indicator	References
		Presence of communal cooking and shared utility spaces	Bristol Housing Festival
		Presence of community gardens	HACT; Berkeley; BEAT
		Presence of playgrounds and play spaces	(Gavrilidis et al., 2016); BESSC; Berkeley
		Play spaces for toddlers	Berkeley
		Presence of communal spaces	Bristol Housing Festival
	Built Environment (Facilities)	Presence of facilities	(Araya et al., 2007)
		New facilities created	(Doick et al., 2009)
	Built Environment (Waste Sites and Industrial Land)	Number of toxic release inventory facilities	(Downey & Van Willigen, 2005; Yang & Matthews, 2010)
		Proximity to hazardous waste sites	(Saarloos et al., 2011; Yang & Matthews, 2010)
		Concentration of industrial land	(Blečić et al., 2019; Saarloos et al., 2011)
		Presence of industrial land	(Blečić et al., 2019; Saarloos et al., 2011); BEAT
		Proximity to industrial activity	(Downey & Van Willigen, 2005); BEAT
	Built Environment (Non-Residential Locations)	Concentration of cultural attractions	(Blečić et al., 2019)
		Presence of cultural attractions	(Blečić et al., 2019)
		Presence of non-residential locations	BEAT
		Presence of activity areas	BEAT
		Presence of safe and interesting spaces specially for youth	Berkeley
		Presence of shared recreational spaces	(Saarloos et al., 2011; Thomas et al., 2007); BESSC; REAT 2
		Provision of services or activities for particular groups	(Garau & Pavan, 2018)
		Spaces and services or activities suitable for children	(Garau & Pavan, 2018)
		Presence of food outlets	BEAT
		Presence of news agents	BESSC
		Presence of shopping centres	BEAT
	Built Environment (Neighbourhood)	Attractive neighbourhood	(Lowe, 2013; Villanueva et al., 2015)
		Good neighbourhood as a place to live	HACT
		Increased confidence from living in or around the area of development	Argent
		Negative neighbourhood contamination	(Mair et al., 2010)
		Presence of broken glass	(Mair et al., 2010); BEAT

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Table 1. Continued

Theme	Topic of Theme	Indicator	References
		Presence of cigarettes or cigars	SSO
		Presence of drug paraphernalia	BEAT; SSO
		Presence of graffiti	(Mair et al., 2010); BEAT; SSO; HACT
		Presence of liquor bottles or cans	BEAT; SSO
		Presence of litter	(Mair et al., 2010); REAT 2; BEAT; HACT
		Presence of political graffiti	SSO
		Presence of vandalism	BESSC; REAT 2
		Research and reflection of local history	Berkeley
		Visibility of water bodies	(Blečić et al., 2019)
	Built Environment (Parking)	Presence of bicycle racks	BEAT
		Presence of parking facilities	BEAT; Bristol Housing Festival
		Presence of private ground floor parking	(Brown et al., 2009)
	Built Environment (Roads)	Average walkability within buffer	Berkeley 2007, (Saarloos et al., 2011)
		Configuration of roads	BEAT
		Presence of drainage and gutters	BEAT
		Layout of roads	(Blečić et al., 2019); REAT 2
		Maintenance of roads	(Blečić et al., 2019); REAT 2; BEAT
		New paths created	(Doick et al., 2009)
		Perceived urban quality	(Blečić et al., 2019)
		Quality of roads	(Gavrilidis et al., 2016); BEAT
		Slope of roads	(Blečić et al., 2019); REAT 2
		Types of roads	(Blečić et al., 2019); REAT 2; BEAT
		Sustainable walkability	(Garau & Pavan, 2018)
		Width of roads	(Blečić et al., 2019); REAT 2; BEAT
		Presence and concentration of bus stops	(Blečić et al., 2019)
		Gutters present in crossing	BEAT
		Crosswalk built of different material	BEAT
		Dedicated signals for pedestrian crossings	BEAT
		Faded crosswalk markings	BEAT
		Presence of audible walk signal	BEAT
		Presence of countdown signals	BEAT
		Presence of marked crosswalk	BEAT

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Table 1. Continued

Theme	Topic of Theme	Indicator	References
		Presence of push buttons	BEAT
		Presence of raised crosswalk	BEAT
		Walk signals for pedestrian crossings	BEAT
		Poor condition of crossing surface	BEAT
		Poor visibility at corners	BEAT
		Presence of crossing aids	BEAT
		Presence of one-way streets through crossing	BEAT
		Presence of curb extensions	BEAT
		Bike-ability of the road	BEAT
		Condition of bike lane	BEAT; Berkeley
		Presence of cycle grids	(Blečić et al., 2019)
		Presence of obstructions in bike lane	BEAT
		Steep slope at intersection	BEAT
		Presence of protected refuge islands	BEAT
		Maintenance of sidewalks	(Araya et al., 2007); BESSC; BEAT
		Presence of buffer between walkway and road	BEAT
		Presence of condoms on sidewalk	SSO
		Quality of sidewalks	(Gavrilidis et al., 2016); BEAT
		Width of buffer between walkway and road	BEAT
		Width of sidewalks	(Araya et al., 2007); BESSC; BEAT
		Presence of neighbourhood watch signs	BESSC; REAT 2; BEAT
		Presence of orientation signs	(Araya et al., 2007); BEAT; Berkeley
		Presence of high-visibility striping	BEAT
		Presence of public signs	(Araya et al., 2007); BEAT; Berkeley
		Presence of stop lines on road	BEAT
		Dirtiness of streets	(Araya et al., 2007)
		Extent of physical disorder of streets	BEAT
	Built Environment (Vehicles)	Number of cars on both sides of street	REAT 2
		Number of cars on one side of street	REAT 2
		Number of cars parked privately	REAT 2
		Number of cars parked publicly	REAT 2
		Presence of abandoned cars	(Mair et al., 2010); BEAT; SSO
	Built Environment (Urban Features)	Presence of pleasant hardscape features	BEAT
		Presence of permanent obstructions	BEAT

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Table 1. Continued

Theme	Topic of Theme	Indicator	References
		Presence of temporary obstructions	BEAT
		Lack of street lighting	(Garau & Pavan, 2018)
		Quality of street lighting	BEAT
		Presence of benches or other places to sit	BEAT
		Presence and concentration of urban equipment	(Blečić et al., 2019)
		Presence of working drinking fountain	BEAT
		Availability of waste containers	(Garau & Pavan, 2018)
		Presence of public trash bins	BEAT
		Multifunctional and sustainable equipment	(Garau & Pavan, 2018)
		Presence of kiosks or information booths	BEAT
		Presence of urban furniture	(Gavrilidis et al., 2016)
		Presence of working public telephones	BEAT
	Built Environment (Urban Life)	Biodiversity protection and targets met	(Doick et al., 2009; Villanueva et al., 2015)
		Diversity of urban fauna	(Gavrilidis et al., 2016)
		Habitats established	(Doick et al., 2009)
		Presence of stray dogs	(Araya et al., 2007); BEAT
		Presence of hedges	(Thomas et al., 2007)
		Purposively planted vegetation in public spaces	REAT 2
		Number of trees in housing area	BESSC
		Presence of trees along the roads	(Araya et al., 2007); BEAT
		Presence of trees in front part of lots	(Blečić et al., 2019); REAT 2; BEAT
		Presence of trees on sidewalks	(Araya et al., 2007); BEAT
		Purposively planted trees in public spaces	REAT 2
		Roads lined by trees	REAT 2
	Built Environment (Land Use)	Area of land generated	(Doick et al., 2009)
		Amount of derelict land	(Weich et al., 2001); BESSC; Berkeley
		Innovative use of land	Tempo Housing
		Patterns of land use	(Gong et al., 2016; Saarloos et al., 2011); BEAT
		Proportion of space used in part ways	(Gong et al., 2016; Weich et al., 2001)
	Built Environment (Public Space)	Identifiable public spaces	Bristol Housing Festival
		Presence of multi-functional public spaces	Berkeley
		Public spaces properly overlooked	Berkeley

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Table 1. Continued

Theme	Topic of Theme	Indicator	References
		Use of public space	(Weich et al., 2001)
		Public spaces well populated	Berkeley
		General condition of public spaces	REAT 2
		Maintenance of public open space	BESSC; BEAT
		Portion of land reserved for public open space	(Villanueva et al., 2015)
		Quality of attractiveness	(Gavrilidis et al., 2016; Giles-Corti et al., 2005; Sugiyama et al., 2010)
		Size of public open space	(Paquet, 2013)
		View of natural environment	REAT 2
		Maintenance of green spaces	(Garau & Pavan, 2018); UKGBC
		View of green area	REAT 2; (Garau & Pavan, 2018)
Service	General	Services for advice and advocacy for renters	HACT
		Access to internet services	HACT
		Reliable communication	Rockerfeller Resilience Framework
		Continuity of critical services	Rockerfeller Resilience Framework
		High quality customer care	Berkeley
		High responsiveness	Berkeley
		Easy mobility service	Rockerfeller Resilience Framework
		Reliable mobility service	Rockerfeller Resilience Framework
		Presence of security guards	(Araya et al., 2007)
		Availability of services for people with disabilities	(Garau & Pavan, 2018)
		Presence of wellbeing initiatives	TOMS
		Amount of waste generated	(Downey & Van Willigen, 2005)
		Limitation of resource usage and wastage	UKGBC
		Quality of waste management services	(Gavrilidis et al., 2016)
		Waste disposal provided and sustainable recycling	(Garau & Pavan, 2018)
		Democratic provisioning of services	(Low et al., 2009; Wolch et al., 2005)
		Satisfaction with home and local neighbourhood	Berkeley
		Performance of police	HACT
		Security of local neighbourhood	(Weich et al., 2002; Weich et al., 2001)
Society	General	Enhanced perception and positive coverage in mainstream media	Argent

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Table 1. Continued

Theme	Topic of Theme	Indicator	References
		Residents feeling safe and perception of low crime	Berkeley
		Improved social equality	Govt. Bristol
		Increased sense of place	(Doick et al., 2009)
		Initiatives designed for reducing crime	TOMS
		Integration of communities with area and content	Argent; UKGBC; Berkeley
		New community collaborations created	(Doick et al., 2009); Lambeth
		Perception of security	(Garau & Pavan, 2018)
		Positive attitude of communities	(Doick et al., 2009)
		Promotion of social cohesion and engaged communities	Rockerfeller Resilience Framework
		Ratio of population	(Villanueva et al., 2015)
		Reduction in crime	(Doick et al., 2009); Lambeth; HACT; TOMS
		Residents participating regularly in sports	HACT
		Social inclusion in economic opportunities	(Garau & Pavan, 2018)
		Presence of panhandling	BEAT
		Presence of prostitution	BEAT; SSO
		Social stability, security and justice	Rockerfeller Resilience Framework
		Socially cohesive community	(Lowe, 2013; Villanueva et al., 2015)
		Socially inclusive community	(Lowe, 2013; Villanueva et al., 2015)
		Presence of a strong local identity	UKGBC; Berkeley
		Strong local ownership of developments	UKGBC
		Strong sense of belonging	HACT
		Adults loitering and congregating	SSO
		Teenagers loitering or hanging around	HACT
		Youth arrested by police	HACT
	Anti-social behaviour	Presence of drug dealing	BEAT; SSO
		Presence of gangs	BEAT; SSO
		Adults fighting or hostilely arguing	SSO
		Presence of hostile behaviour	BEAT
	Employment	Availability of apprenticeships	TOMS
		Improved employability of youth	TOMS
		Job satisfaction	HACT
		Local hard to reach groups employed	UKGBC
		Local people with skills for long-term employment	UKGBC

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Table 1. Continued

Theme	Topic of Theme	Indicator	References
		More employment opportunities for disadvantaged people	TOMS
		More local people employed	TOMS
		School leavers with career aspirations for industry	UKGBC
		Increased opportunities for training and apprenticeships	TOMS
		Transition from unemployment to volunteering	HACT
		Transition from unemployment to other forms of employment	HACT
	Homelessness	Initiatives designed to tackle homelessness	TOMS
		Residents moving from rough sleeping to secure temporary accommodation	HACT
	Liveability	Independent living for vulnerable people	TOMS
		Safe liveable conditions	(Lowe, 2013; Villanueva et al., 2015)
	Social Support	Activities designed to bring people together	UKGBC; Berkeley
		Attendees at social events	(Doick et al., 2009)
		Regular formal events for socialising	Berkeley
		Reduction in councils emergency social housing expense	Tempo
		Regular interaction between neighbourhoods	HACT; Berkeley
		Residents active in tenants groups	HACT
		Membership in a social group	HACT
		Opportunities for social networking	(Doick et al., 2009)
		Thriving social networks and availability of support	(Gong et al., 2016); UKGBC
		Contribution to local community projects	TOMS
		Residents involved around positive issues	Berkeley
		Number of volunteers participating in activities	(Doick et al., 2009); Lambeth
		Volunteering time for local community projects	TOMS
	Substance Abuse	Public drinking of alcohol	SSO
		Initiatives and interventions on reducing substance abuse	TOMS
		Presence of people intoxicated	SSO
		Problem with drugs smoking or alcohol	HACT
Transport	General	Maximum distance to travel	(Saarloos et al., 2011; Villanueva et al., 2015)
		Pedestrian accessibility	(Garau & Pavan, 2018); UKGBC
		Strong footfall	Argent
		Accessibility of traffic	(Garau & Pavan, 2018); UKGBC

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Table 1. Continued

Theme	Topic of Theme	Indicator	References
		Traffic volume in the area	(Araya et al., 2007; Garau & Pavan, 2018; Yang & Matthews, 2010)
	Transportation Links	Access to bus stops	BESSC
		Access to green space with transport other than cars	(Doick et al., 2009)
		Access to the nearest news agent	BESSC
		Presence of transport links with community services	(Lowe, 2013; Villanueva et al., 2015)
		Presence of transport links with educational institutions	(Lowe, 2013; Villanueva et al., 2015); BESSC; Berkeley
		Presence of transport links with healthcare services	(Lowe, 2013; Villanueva et al., 2015); BESSC
		Presence of transport links with employment locations	(Lowe, 2013; Villanueva et al., 2015); Berkeley
		Presence of transport links with leisure and cultural opportunities	(Lowe, 2013; Villanueva et al., 2015)
		Presence of transport links with local shops and amenities	(Lowe, 2013; Villanueva et al., 2015)
		Presence of transport links with public open spaces	(Lowe, 2013; Villanueva et al., 2015)
		Presence of bus lines and routes	(Blečić et al., 2019)
		Connectivity of street and road	(Blečić et al., 2019; Saarloos et al., 2011)
		Fair distribution of resources	(Cutts et al., 2009; Low et al., 2009; Wolch et al., 2005)

APPENDIX B

Table 2. Thematic analysis of interviews

Theme	Code	Sub-Code
Perception of outcomes	Areas of planning	Policy vs. development management
	Deficits in practice	Planning in silos
		Lack of detail on what is required
		Lack of a common definition
	Reality of planning	Intent vs. practice
		Measure of outcomes
	Defining outcomes and what they are	Conformance with planning permissions
		Results of actions taken
		Qualitative vs. quantitative

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Table 2. Continued

Theme	Code	Sub-Code
		Temporal perspectives
	Measuring outcomes	Considering citizen perspectives
		Understand user experience of planning
Barriers	Different practices	Disciplinary differences
	Local population	Different user groups and communities
		Shift in priorities and interests
		Changing communities
		Different views on outcomes
	Participation in planning	Different citizen participation
		Public consultations
		Availability of all citizen types
		Digital participation
	Existing planning practices	Resource challenges
		Political pressures
		Lack of streamlined processes
		KPI-driven objectives
		Prior practice and experience
		Out-of-date data aggregates
		Focus on individual sectors, not cross-sector
		Outcomes not embedded in governance processes
		Lack of metrics related to outcomes
		Lack of shared understanding of outcomes
	Communication challenges	Day-to-day priorities
		Increasing workloads
		Silo-ed policymaking and development management
		Lack of data sharing
		Opaque decision-making processes
	Benchmarking	Lack of knowledge on how KPIs inform outcomes
		Lack of best practices to compare with
Benefits	Change in practice	Improvement in specific sectors
		Improvement in policymaking and development management
		Wider improvements (citizens, communities)
		Improved consistency

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Table 2. Continued

Theme	Code	Sub-Code
		Help in achieving local and central government initiatives
	Change in planning structure	Breaking down disciplinary silos
		Ease in aggregating impacts cross-sector
		Holistic understanding
	Improved communication	Streamlined data sharing
		Positive feedback
Vision of outcomes	Understanding how planning works	Setting and assessing hypotheses
		Positive feedback loops
		Improved efficiencies
		Scenario-based assessment
		Efficient data sharing
		Improved data integration and modelling

Suvodeep Mazumdar is a Senior Lecturer in Data Analytics at the Information School in the University of Sheffield. His research explores developing techniques and mechanisms for reducing the barriers that impede user communities' understanding of vast complex multidimensional datasets. He conducts interdisciplinary research on highly engaging, interactive, and visual mechanisms in conjunction with complex querying techniques for seamless navigation, exploration, and understanding of complex datasets. Dr. Mazumdar has applied my research in a wide range of application domains, such as Aerospace Engineering, Health Informatics, Crisis/Emergency Management, Smart Cities, and Mobility Planning.

Jie Qi is currently a PhD student at University of Sheffield Information School. She received an MA in Urban Design and Planning from University of Sheffield and an MSc in Geographical Information System from Sheffield Hallam University. Her research sits in the intersections of urban design, planning, environmental behaviour studies. She is interested in researching the applications of volunteered geographic information (VGI), urban big data analytics & visualisation in understanding urban life and improving quality of urban environment.

Dhaval Thakker is a Professor of Artificial Intelligence and the Internet of Things at the University of Hull. He is the Director of Research and leads a group on Responsible AI. His current and evolving research interests include exploring the role of AI and IoT technologies within the contexts of Smart Cities, Digital Health, and the Circular Economy. His research has been recognized with multiple best paper awards, including in 2019 at the 10th IEEE Conference on IoT, Big Data, and AI for a Smart and Safe Future, and in 2015 at the 12th European Semantic Web Conference. To date, he has been successful as a Principal and Co-investigator in over £4 million worth of R&I projects, funded by national and international funding bodies and commercial organizations. Notable funders have included the European Commission, Innovate UK, HFCE, and GCRF. These projects have focused on addressing societal challenges around themes such as Smart Cities, Air Quality Monitoring, Flood Monitoring, Children's Health, Industry 4.0 (Smart Factories), and Archaeological & Drone-based surveys in War-torn areas.

Barry Goodchild is Emeritus Professor of Housing and Urban Planning at Sheffield Hallam University. Over a long career of teaching and researching, Barry has secured the publication of five books, including one in French and about 50 articles in refereed journals, Of these publications, the most widely cited works are those dealing with postmodernism in planning, with social balance policies in Britain, with the perception of the urban environment and the experience of living in innovatory low carbon housing.