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Defining inclusive innovation: challenges and lessons for innovation districts

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ABSTRACT

The concept of inclusive innovation has rapidly gained traction in academic and policy circles as a response to the distributional problems of traditional innovation strategies. It has since become a key focus in the design and implementation of innovation districts, geographically delineated spaces that foster collaboration among businesses and research institutions to drive innovation and economic growth. Despite this increasing interest, inclusive innovation remains a 'fuzzy', imprecise concept, and its application is occurring faster than grounded case study research is capable of understanding and informing best practice. To address this research and policy gap, this paper examines inclusive innovation policy and practice in four urban innovation districts: Belfast (Northern Ireland), Medellín (Colombia), Newcastle upon Tyne (England) and Pittsburgh (USA). Utilising qualitative research methods and a paired case study comparative methodology (Newcastle-Pittsburgh and Medellín-Belfast), we find that definitions of inclusive innovation are not fuzzy per se but deeply rooted in the local context, while significant disjunctions persist between how innovation investments are designed and delivered and how social inclusion objectives are realised. We conclude that inclusive innovation is the co-creation of new ideas, practices or technologies with local communities, businesses and organisations to address societal challenges, ensuring equitable benefit distribution and fostering community empowerment. Effective strategies prioritise outcomes that address local challenges, ensure equitable distribution of benefits and engage communities, particularly disadvantaged groups, in shaping intervention priorities and activities.

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1. Introduction

Innovation is an inherently geographical phenomenon: the conditions that enable innovation are spatially contingent, shaped by interactions among local and regional actors and institutions, and by localised political economic dynamics (Asheim & Gertler, 2009; Isaksen et al., 2018; Tödtling & Trippl, 2018). Despite this, significant challenges remain in determining how innovation can be harnessed to foster local economic growth and address spatial inequalities (Boschma et al., 2025; Coenen et al., 2015; Feola, 2020; Fuchs & Shapira, 2005). In response to critiques of traditional innovation models – particularly their failure to equitably distribute the benefits of science, technology, research and innovation (STRI) – attention has increasingly turned to the concept of inclusive innovation. This shift is particularly evident in the design and implementation of innovation districts (IDs), where inclusive innovation is gaining traction as a guiding principle. This paper explores the concept of inclusive innovation and identifies the key elements necessary to optimise its outcomes in innovation districts' surrounding communities.

The conceptualisation of innovation and innovation policy has shifted over time (Asheim et al., 2011; Coenen & Morgan, 2020). International innovation policy is converging toward social equity and inclusion goals, with frameworks including place-based innovation, transformative innovation policy and mission-oriented

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innovation aiming to address grand societal challenges (Mazzucato, 2018; McCann & Soete, 2020). Despite some policy progress in recognising the prospect of broader social spillovers from innovation policy, delivering inclusion outcomes at the sub-national scale remains complex and contested (Lee, 2023).

Nevertheless, it has been argued that IDs can offer opportunities to enhance social inclusion through the pursuit of innovation. IDs are an increasingly popular tool applied by city leaders seeking to enhance economic development, and their delivery are frequently couched in and justified by promises of inclusion, economic growth and urban regeneration (Katz & Wagner, 2014a). IDs represent a shift towards urban-centred, mixed-use developments designed to revitalise cities and agglomerate innovation activities (Morrison & Bevilacqua, 2017; Wolf-Powers, 2022). However, despite their popularity and stated inclusion goals, IDs often fail to deliver promised benefits to local communities. Instead, they often exacerbate urban segregation and contribute to gentrification (Clark, 2020; Kayanan, 2022). Thus, there is a need to explore how IDs can be designed and established to not only catalyse economic growth but also foster inclusion.

We address the following research question: how to define inclusive innovation, and how can policymakers design and implement IDs that foster more inclusive forms of innovation and science, technology, research and innovation (STRI)? This paper offers an empirically grounded examination of inclusive innovation policy and practices in four cities: Belfast (Northern Ireland), Medellín (Colombia), Newcastle upon Tyne (England) and Pittsburgh (USA). Each city has embraced inclusive innovation targets to guide and improve the outcomes of their place-based investments in innovation infrastructure, whilst addressing challenges associated with their post-industrial (Newcastle and Pittsburgh) and post-conflict (Belfast and Medellín) legacies. Using paired case study comparisons (Newcastle-Pittsburgh and Medellín-Belfast) and qualitative data derived from site visits, expert interviews and deliberative stakeholders' roundtables, we examine current practices of inclusive innovation in innovation districts, to define what inclusive innovation is and what elements are needed to improve its outcomes. Drawing from our case studies, we conceptualise inclusive innovation as a co-creation of new ideas, practices or technologies with local communities, businesses and organisations to address societal challenges, ensuring equitable benefit distribution and fostering community empowerment. Yet, we argue that this definition should be operationalised locally, through the collaboration of policy, business and community groups. Furthermore, inclusive innovation strategies should include three key elements: identifiable, locally accountable and collaborative leadership, intentional and collaborative community engagement and placemaking, and a wider vision for strategic alignment and territorial equity to ensure delivering inclusion outcomes.

The remainder of the paper is organised as follows: Section 2 explores the pervasive conceptual fuzziness of inclusive innovation, and the contradictions of ID as a tool for inclusive innovation. Section 3 introduces the research methodology and case studies. Section 4 summarises the results, before the concluding discussion in Section 5.

2. Inclusive innovation and innovation districts

Approaches to the question of who and what should be 'included' in conceptualising inclusive innovation differ markedly across research fields. Innovation studies research refers to inclusive innovation within the innovation cycle, distinguishing between product and process innovations, and considering inclusion in terms of lower income consumers, gender disparities and peripheral regions (Chataway et al., 2014; Foster & Heeks, 2013; Schrock & Lowe, 2021). Meanwhile, geography and regional studies mostly refer to the spatial unevenness of innovation and its benefits (Boschma et al., 2025; Clark, 2020). Research on promoting and increasing innovation in the Global South illustrates inclusive innovation as innovation holding three key characteristics: people-focused, participatory and accessible (Pansera & Owen, 2018; Zehavi & Breznitz, 2017).

Regional scholarship commonly critiques the uneven spatial distribution of innovation (Iammarino et al., 2019). Recent research underscores the difficulty of attracting high-tech activities to local economies (Kemeny & Osman, 2018) and shows how socio-economic benefits of innovation are unevenly shared across sectors (Unger et al., 2019), people (Planes-Satorra & Paunov, 2017) and places (Evenhuis et al., 2021). Our research contributes to these debates with comparative research that examines how claims to inclusion in place-based innovation policy are being enacted, and whether the global proliferation of IDs provides any convergence in best practices regarding inclusive innovation policies.

IDs emerged from mid-to-late twentieth century innovation-led economic development, most notably from Silicon Valley, Boston's Route 128, the Research Triangle in North Carolina (USA) and Cambridge Technology Park (UK) (Castells & Hall, 1994; Katz & Wagner, 2014b). These districts served as models for university-driven science and technology innovation and investments in regions across the world. Their physical form was intentionally designed as suburban and exurban knowledge complexes, situated far from factories and production plants (Yigitcanlar et al., 2020). This created different geographies to the landscape of de-industrialising cities. City governments, partnering with universities, viewed investments in new university-led, innovation-driven research complexes as a revitalisation strategy for disinvested neighbourhoods, centred on innovation and new production activity, whilst connecting housing, retail and entertainment amenities in the urban core (Kayanan et al., 2022; Wolf-Powers, 2022). Researchers observed the changing preferences and locational factors that previously bound university-led innovation to new suburban technology parks to more spatially integrated, mixed use, twenty-first century IDs that are now retooled as city-based placemaking, economic development revitalisation strategies by local governments (Katz & Wagner, 2014b; Morrison & Bevilacqua, 2017; Yigitcanlar et al., 2020).

The ID model is growing in popularity as a local policy tool intended to increase urban STRI outcomes (ultimately impacting economic growth), attracting high skilled workers, provide employment opportunities for the local population, attracting multinational firms and inward investment, and promoting entrepreneurship (Katz & Wagner, 2014a; Kayanan et al., 2022). Complicating the ID narrative are findings showing how inward investment can generate gentrification and negative affordability effects. Further, IDs can be inherently exclusive since the concentration of high-income, high-skilled jobs may be inaccessible to the locally based workforce, and the sense that new ID campuses tend to be geographically exclusionary and create an us-versus-them distinction between new and traditional communities (Kayanan, 2022; Mulgan et al., 2024).

Evaluating ID formation strategies is increasingly urgent to determine whether this part of the regional development toolkit is at odds with the policy aspirations of inclusive innovation (Kayanan, 2022; MacKinnon et al., 2022). This research should be comparative in its design and global in its focus, since further diffusion of IDs that stymie inclusive growth goals would create negative headwinds in an emerging era where the overall value of community-based economic spillovers via inclusion or equity are already subject to political critique. Global evaluation will test whether accepted elements to advance inclusive innovation such as education, entrepreneurship and employment (including job security and wages) (Lowe et al., 2021) and attention to the foundational economy (parts of the economy that provide essential goods and services people rely on for everyday life) and public services (Parsons et al., 2024) are replicated across IDs. We argue that context must continue to matter, as inclusiveness targets are contextual (vary from place to place) and contingent (vary according to local needs and priorities).

2.1. The fuzziness of inclusive innovation

Inclusive innovation is regarded by many, including Lee (2023, p. 7), as a classic 'fuzzy concept' since both 'inclusion' and 'innovation' can be variously interpreted. That said, Lee also notes the concept's significance as a policy goal so long as policymakers reflect on the questions on how and for whom it is implemented. Inclusive innovation targets policies and investments with the goal of increasing the innovation's benefits distribution. Supporting broader social objectives to address economic disparities involves integrating elements including education, entrepreneurship in high-tech and foundational economy areas and workforce training (Lee, 2019; Parsons et al., 2024). Additionally, inclusive innovation policies encourage community engagement of disadvantaged groups in the design and implementation of strategies. Despite growing academic debate and policy interest, defining inclusive innovation remains challenging, and its implementation is outpacing grounded case study research that establishes the best practices for achieving the policy goals.

As such, important questions regarding the design and delivery of inclusive innovation remain unanswered, such as: how to measure and track success, how to reconcile inclusion goals with the need to stimulate innovation, how to identify and involve key community beneficiaries of inclusive innovation (as opposed to STRI) intervention strategies, and what governance structures are best suited to the design and delivery of inclusive innovation in IDs. Our research considers these questions through the

examination of four IDs, areas identified as such and built with the purpose of foster innovation and growth, in cities transitioning from post-industrial and post-conflict contexts. This study thus evaluates the potential of inclusive innovation in city-regions facing significant economic transitions.

3. Global comparison, local cases

3.1. Comparative global urbanism

Contemporary scholarship in regional economic development and urban studies recognises how initial case study selection can influence the direction and eventual findings of a research project. Basing our analysis on a synoptic and comparative model of urban research, our cases provide complementary perspectives highlighting challenges and key lessons of inclusive innovation in STRI-based IDs. 'Launched' from an initial case in Newcastle, UK, we expanded to include additional cases that traced links with other IDs to answer how to define inclusive innovation, and how can policymakers design and implement IDs that foster more inclusive forms of STRI. The research approach was deliberative, evolving and flexible, ensuring adaptability to different contexts, allowing a sequential case selection. Initially, Newcastle was chosen, followed by Pittsburgh due to similarities in post-industrial characteristics. The scope later expanded to include post-crisis cities, selecting Medellín and then Belfast.

Preliminary desk research followed case selection to establish (a) the city's economic development background and ID development timeline, (b) the relevant actors pursuing an STRI agenda, and the city's overall innovation agenda, (c) the sites and strategies related to that agenda and (d) local academic interlocutors who could assist with interpreting the findings. Desk research also helped us to map key stakeholders and innovation pathways. This preliminary analysis generated brief 'scene-setter' documents then distributed to prospective interviewees in the city. This phase led to a scoping visit, in which two members of the research team visited the city to establish initial contact with potential participants.

The core research activities occurred on-site, with four to six researchers collaborating over a five-to-seven-day period. The Newcastle Helix was researched in 2022, Pittsburgh's Hazelwood Green in 2023 and both Medellín's Ruta N and Belfast's Innovation City in 2024. Two main data collection strategies occurred during the field visits. First, semi-structured qualitative interviews were conducted with local informants (~20 per city, 45–60 min each). Detailed notes and/or electronically recorded transcripts were produced during the interviews, subject to the agreement of the participant. The interviewees in each city included a range of informed experts including academics and university strategists, business representatives, economic development officials, elected politicians and civil society actors. Interviews followed ethical practices including gaining consent for the interview, informing the interviewee of the meeting's purpose and overall project goals, and used a standardised question guide.

Second, policy roundtables in each city brought together interviewees subjects and other stakeholders for discussion and dissemination of our preliminary findings. These policy roundtables included information on the research project, findings from the scene-setter documents and a set of interactive, facilitated exercises that elicited further information about the role and maturation of inclusion outcomes in each city, including a rapid appraisal to assess the effectiveness and inclusivity of policy interventions, a forensic inquiry tool for in-depth investigation of innovation processes and impacts, and a simple 'dos and don'ts' framework to establish best practices and avoid common pitfalls (further details about these methods can be found in the forthcoming book by Glass et al. (n.d.).

3.2. Introduction to the four cases

Table 1 provides a detailed outline and introduction to the four case study cities and sites. Newcastle (England) and Pittsburgh (USA) have legacies of traditional manufacturing and have undergone significant transformations since the late twentieth century, with new accumulation strategies focused on sectors associated with research-intensive universities supplanting industrial modes of production. The transformation of urban economies into a 'post-industrial' era creates significant personal and regional trauma for affected communities, as new urban narratives erase historic identities in favour of the new spaces, industries and residents deemed by city leaders to be conducive to more prosperous city and regional futures

Table 1. Case studies description.

	Newcastle (UK)	Hazelwood (USA)	Medellín (Colombia)	Belfast (UK)
Demographics	ca 300,000 residents in the city, 1.7 million residents in the metropolitan area	ca 300,000 residents in the city, 2.3 million residents in the metropolitan area	ca 2.4 million residents in the city, 4.2 million residents in the metropolitan area	ca 650,000 residents
Challenge	Post-industrial transition, from coalmining and shipbuilding from the eighteenth Century until the late twentieth Century, followed by rapid economic and population decline	Post-industrial transition, from steel production and related manufacturing from the eighteenth Century until the late twentieth Century, followed by rapid economic and population decline	Post conflict transition with elements of post-industrial (textiles, footwear and manufacturing). Disinvestment and structural weaknesses led to deindustrialisation and the rise of narcotrafficking. Amongst the world's highest homicide rates and organised crime through the 1980s and 1990s	Post conflict transition with elements of post-industrial (shipbuilding, textiles and ropemaking). A sectarian and political conflict in Northern Ireland (late 1960s – 1998) leading to thousands of deaths, deepened sectarian divisions, economic disruption. The conflict ended with the 1998 Good Friday Agreement
Innovation District	Helix Innovation District	Hazelwood Green	Ruta N Innovation District	Innovation City Belfast
Physical delineation	10 hectares on former Newcastle Brewery site in West End communities of city centre	178 acres on former LTV coke/steel mill site in Hazelwood neighbourhood	114 hectares in Sevilla neighbourhood	Dispersed. 400 acres from Queen's Island to York Street, covering parts of the city centre, Titanic Quarter and Belfast Harbor Estate
Designation	Initial acquisition 2005; site name 2016	Initial acquisition 2002; site name 2017	2009 marks the beginning of the project's development, including planning and land procurement.	2019 marks the beginning of planning and strategic vision for the Belfast Region City Deal
Partners/Purchase	North East Regional Development Agency (abolished in 2012), Newcastle City Council, Newcastle University; Legal & General (UK multinational financial services and asset management company)	ALMONO Partners, Regional Industrial Development Corp., University of Pittsburgh, Carnegie Mellon University, Pittsburgh Steelers	Mayor's office Medellin, EPM Empresas Publicas de Medellín (Public utilities, owned by the municipality of Medellín), UNE (today Tigo UNE, telecommunications company, originally a division of EPM, merged with private telecoms TIGO in 2014).	Queen's University Belfast Ulster University Belfast City Council Belfast Harbour Catalyst (innovation hub) Invest NI (advisory partner)
Investment package	GBP 350 million	USD 500 million	Undisclosed	GBP 200 million in financing through the Belfast Region City Deal, part of a broader £350 million investment strategy
Inclusion goals	Sustainable urban living Connecting business, research and communities	Foundation funding in Hazelwood community and small business investments; training programmes and youth programmes	Equity in access to innovation, skills development focused on underrepresented populations, social innovation, digital transformation to reduce inequality and improve access to services, education and economic opportunities.	Sustainability, connectivity and inclusive economic development
Governance	Newcastle University, local authorities, Legal & General	Almono Limited Partnership (3 private foundations)	Public corporation under the mayor's office, with a Board of directors comprised of representatives of the mayor's office, EPM UNE, city's innovation ecosystem (CUEE – University-Business-Government Committee)	Collaborative and multi-actor: Innovation City Belfast (ICB, formed in 2021), partners.
Innovation & entrepreneurship emphasis	Tech, medicine, healthcare	Autonomous vehicles, life sciences, biomanufacturing, engineering, robotics	Technology and software development, advertising technologies and media innovation, biotechnology and health tech, data analytics and AI, green tech and sustainability	Cyber security, FinTech, green tech, life & health sciences, screen & media innovation, digital healthcare

Source: Authors; adapted from Kayanan et al., 2022.

(Deitrick & Glass, 2022). Whereas scholarly debates persist regarding the labelling of cities as 'post-industrial' (Luger & Schwarze, 2024), our research framed Newcastle and Pittsburgh as a paired post-industrial study because of the comparable political economies between the two cities (Glass, 2024).

Additional cases were chosen to better understand how inclusive innovation is defined and practiced in different contexts and under different challenges. We selected two urban cases that were recovering from circumstances of structural urban violence. Urban violence is shown to destabilise urban function, realigning governance arrangements and reducing urban social resilience (Glass et al., 2022). The City of Belfast (Northern Ireland) was selected as a prominent UK-based example of a city riven by urban violence, while Medellín, Colombia was selected as an example of post-conflict urbanism that could provide more and diverse information on inclusive innovation in a upper-middle-income country in the Global South. Medellín is regarded as an exemplar city of innovation globally, having been named as the world's most innovative city by a consortium of Citi Group, The Wall Street Journal and Urban Land Institute in 2013 (Urban Land Institute, 2013).

4. Inclusive innovation: clarifying a fuzzy concept

As with innovation, inclusive innovation is inherently geographical. Newcastle's conceptualisation centres on creating economic growth through STRI, with a long-term expectation of job creation. The Helix Innovation District has successfully promoted collaborations between researchers and innovative businesses, yet local communities do not yet benefit equitably. Pittsburgh's Hazelwood Green site focuses on urban regeneration. The project holds potential for large-scale urban redevelopment, but challenges also remain in aligning economic benefits with the needs of the historically marginalised communities both in Hazelwood Green and in the city-region. In Medellín, inclusive innovation emphasises territorial equity and crisis recovery, focusing on integrating marginalised communities and enhancing urban mobility and regeneration through social urbanism. Medellín has advanced its global reputation as a knowledge-based hub through effective public-private partnerships, yet sustainable inclusion of disadvantaged communities remains challenging. In Belfast, inclusive innovation means ensuring the city's digital, high-tech and innovative economy provide shared benefits across all societal sectors, particularly disadvantaged ones. However, efforts are frequently hindered by political challenges and the need for better integration of long-term social inclusion strategies with the city's innovation goals.

IDs in the four cities have been designed as both an innovation policy instrument and urban intervention. Accordingly, they are designed to fulfil a dual purpose: fostering growth led by research and innovation and regenerating urban spaces. The spatial configuration of each ID is distinctive, involving significant investments in physical infrastructure concentrated in disinvested urban areas. Reinvestment has transformed each site through site rebranding, the addition of new office buildings, research facilities, co-working and meeting spaces, green and recreational areas, and educational facilities. Students housing and green spaces were added in Newcastle and new housing is provided in Pittsburgh. In Medellín, cultural, educational and knowledge infrastructure, including a botanical garden and an interactive science and technology museum were incorporated into the ID, also as part of a wider innovative transportation infrastructure project (metro, cable cars, bus rapid transit and bike paths). In Belfast, although the areas designated for innovation activities are dispersed across and adjacent to the city centre, these have been transformed with new and repurposed infrastructure articulated with new transport solutions such as The Glider (bus rapid transit, launched in 2018), with the same purposes of revitalising urban spaces.

The design and objectives of IDs in all four cities share intentions to enhance inclusive growth, addressing inequality and enhancing social mobility. These social inclusion goals aim to create spillover effects for the broader urban system but translating them into tangible outcomes remains challenging. While key institutional actors in each site (government, businesses, universities and communities) express commitment to inclusion, their strategies and actions tend to prioritise STRI activities and investment over inclusion objectives. Furthermore, investors (including governments) often have diverse interests and requirements that complicate multi-actor collaborations and create conflict between inclusion objectives and priorities such as commercial, financial and property interests. The challenge of translating the inclusion intentions of IDs into effective action is not surprising, considering that these sites are primarily designed as spaces prioritising traditional drivers of economic growth and job creation (Clark et al., 2010; Kayanan, 2022), rather than as mechanisms for addressing spatial unevenness.

The implementation of inclusive innovation reveals a trade-off between growth metrics (short-term property, financial, business growth and research metrics) and long-term inclusion outcomes. The four cities show that beyond growth metrics, even if these include employment opportunities across different skill levels and not just for highly skilled workers, are insufficient to assess inclusive innovation outcomes. Several other metrics were highlighted (see Table 2) as being crucial to evidencing the inclusiveness of inclusive innovation. The list in Table 2 is, however, not exhaustive and will likely change insofar more cities, regions and contexts are added to the analysis.

Our findings also show that innovation is mostly seen as something reserved for the digital and knowledge sectors, which limits integration into sectors catering to foundational economic needs such as healthcare, education and local businesses. Consequently, the inclusive side of innovation tends to be confined to short-term distribution of benefits, rather than fostering a sustainable ecosystem that ensures equal participation and access to opportunities for all communities.

> Whilst IDs need to be a success in innovation and property terms, they must be more than property projects and seek inclusion impacts and outcomes (…) They are long term projects and should be assessed over medium and longer time periods, within these inclusion concerns will necessarily have different profile and priority at different phases in ID development and operations. (Innovation district stakeholder, Pittsburgh, July 2023)

As the quote shows, another trade-off comes with the temporality of the interventions. A short-term perspective of inclusive innovation is often driven by political and investors pressure for seeking quick wins to justify the investment. This is problematic as far as long-term inclusion is concerned. Inclusive innovation goals (as shown in Table 2) are difficult to measure and take many years (or decades) to materialise. Transitioning from a society defined by industrial and often unionised jobs to the comparative precarity of post-industrial futures, or from a society exacerbated by violent conflict toward peace and social cohesion, is highly complex and requires a focus on multigenerational poverty and trauma. IDs cannot always and completely compensate for the perpetuation of poverty and unemployment in families, but should at least not contribute to exacerbate them.

Even if inclusive innovation is a geographically embedded phenomena, drawing from our case studies we can assert that inclusive innovation is the co-creation of new ideas, practices or technologies with local communities, businesses and organisations to address societal challenges, ensuring equitable benefit distribution and fostering community empowerment. A precise definition for the interventions and strategies should be place-based and reached through consultation between relevant stakeholders. Yet, these strategies need to include elements such as an identifiable, locally accountable and collaborative leadership, intentional and collaborative community engagement and placemaking, and a wider vision, strategic alignment and territorial equity to ensure delivering inclusion outcomes. We explore these elements in greater detail in the following subsections.

4.1. Identifiable, locally accountable and collaborative leadership

> That leadership role, it is exactly one of the big questions we've had … Where does it sit? How to make it accountable to ensure that such a diffuse set of competencies is brought forward and we deliver? (Interview with Innovation City Belfast, Belfast, November 2025)

Table 2. Elements of Inclusive Innovation.

Dimension	Rationale and description
Economic inactivity	Address issues among individuals who are economically inactive, including people with disabilities, former convicts and facing other economic barriers, to guarantee access to opportunities within the innovation economy.
Health and wellbeing	Address issues of poor health outcomes, health inequalities and other barriers to healthy living prevalent in relevant local left-behind communities
Gender perspective	Ensure gender inclusivity in the urban and policy design, as well as for access STEM jobs.
Education	Promote education from preschool to college to equip individuals with skills needed to achieve high skilled careers.
Inclusive integration	Integrate immigrants, youth and other marginalised people into the workforce.
Poverty alleviation and social resentment	Tackle generational poverty and poverty traps, targeting at remedying senses of resentment and isolation as urban economies change
Net zero and climate adaptation	Co-create and develop decarbonisation solutions that are affordable and accessible to local communities and improve the resilience of households and neighbourhoods

Source: Authors.

Our interviews and policy roundtables reveal how IDs interact with the region's broader innovation ecosystem, and how regional and sector-specific development and change priorities could best support less-advantaged communities, remains a consistent challenge. Each city's ID has a different organisational structure, which is heavily contingent on existing organisational and governance structures and previous rounds of restructuring, and on the distribution of resources among key actors (see Table 3). In Newcastle, leadership and management are a collaboration between Newcastle University, Newcastle City Council and Legal & General, and UK-based asset management firm, creating potential tension as political and academic priorities shift. In Pittsburgh, the core leadership challenge is accountability and transparency, as the ID is owned and developed by private philanthropic foundations which are not subject to shareholder pressures and are largely distanced from community sentiment. This means that typical democratic mechanisms holding the public sector accountable are absent in this case.

Belfast's leadership structure is diffuse and dependent on multi stakeholders' collaborations. Complicating matters further is the fact that the city has experienced periods without a government, impacting consistency and long-term planning. Medellín has a complex system of multi-actor collaborations, but leadership is clearly articulated through public-private agreements, institutional strengthening and engagement across stakeholder groups (AS/COA, 2014; RUTA N, 2019). Medellín's transformation included different interventions over time, multi-actor collaborations, large urban infrastructure investments and a long-term innovation strategy that prioritised social innovation, social urbanism (especially connective infrastructure focusing on marginalised communities), and science and technology. Ruta N and the city's innovation system are led by the city's local authorities and other key organisations).

Ruta N remains a key node in mobilising and coordinating other actors in the innovation system, but its leadership lessened over time (attributed to a 'rupture' in the city's tradition of political continuity). The city's innovation system is proving resilient to political, economic or other disruptions, ensuring inclusive innovation remains as a priority, even as some respondents reflected on Ruta N's waning influence. Thus, the city's innovation system relies on a culture of collaboration, sustained consensus-building strategies, maintaining a coherent long-term vision, and a culture of innovation and problem-solving among the city's inhabitants. These findings corroborate previous research about regional innovation systems and institutional thickness in innovation ecosystems (Isaksen et al., 2018; Morales & Sariego-Kluge, 2021; Zukauskaite et al., 2017).

4.2. Intentional and collaborative community engagement and placemaking

> It is a potpourri of development sites (…) exclusive, prestigious, fragmented and walled off (…) It is a place for innovators but not a place for citizens. It is too splendid and rather intimidating and perhaps sends a signal that this is not for us. It will be unethical and regrettable if the housing turns into an island of wow because we've put another wall around it (…) it is a tough hill to climb if inclusion is just a bolt-on. (Interview with neighbourhood planner, November 2022)

If IDs are to deliver the dual functions of innovation-led growth and urban regeneration in inclusion-rich ways, explicit community engagement, co-creation and placemaking strategies are vital. Stakeholders will have varying degrees of flexibility regarding which aspects are open to negotiation and which constitute

Table 3. Leadership and management.

	Newcastle	Pittsburgh	Belfast	Medellín
Stage of delivery	Established	Emergent	Established	Established
Nature of collaboration and leadership	University-driven collaboration between the local government, the University and investors	Foundation-led leadership, distinct from city-university partnerships	Multi-actor collaborations between public, private actors and universities and college	Public-private partnership
Level of leadership	Identifiable leadership / management	Clear leadership by foundations through development agreement	Notionally clear leadership, but in practice diffuse and informal	Political leadership shared governance across different actors
Level and nature of community engagement	Limited, via formal consultative exercises	Limited	Limited	High both in design and outcome

Source: Authors.

non-negotiable boundaries. It is essential that those aspects amenable to consultation and those that are not, are clearly identified and agreed upon early in the design phase to ensure a transparent and effective collaborative process.

In all four cities, communities adjacent to IDs desire agreements around specific results, interventions, pathways and resources. In all cities except Medellín, community engagement lags 'elite' engagement, creating dangerous mismatches between the inclusion goals by policy makers, and the realities of the communities that will host the new infrastructure. For instance, the greater Hazelwood community frequently noted a disconnect with the ID despite earnest efforts by university leaders to include the community (such as the future siting of a community engagement centre on the ID site). The community dissatisfaction likely arises from the long lead time since closure of the former coke mill that is yet to provide identifiable workforce pathways for residents, and a feeling exacerbated by narratives from investors and stakeholders who describe Hazelwood Green as a 'blank slate' (Bagwell et al., 2024).

In Belfast, community engagement and placemaking are main objectives in the city's innovation policies, yet Belfast's urban transformation reveals persistent segregation based on class divisions. The city is compartmentalised, zones of high skilled work, housing and leisure remaining splintered, with people often driving between them while crossing deprived areas on their way but with little to no interaction with these neighbourhoods. Engaging more with civil society and different community segments, and ensuring that city planning requires consultation, especially with areas experiencing high levels of deprivation. However, obstacles such as identifying the right type of community leadership to engage with, managing community gatekeepers, offering long-term and sustainable support, and creating valuable jobs remain a challenge.

Medellín's approach reflects a deep commitment to social inclusion through continuous engagement with marginalised communities. This city-wide strategy seeks to extend benefits beyond the ID area, to reach the city's most disadvantaged neighbourhoods. A frequent theme during the site visit was the crucial role of transport infrastructure in integrating hillside residents into the city, making them feel a part of Medellín and not a part of a remote district. This effort is part of a broader long-term urban transformation plan that includes innovation, connectivity and climate change adaptation. Yet, the city remains largely segregated.

4.3. Wider vision for strategic alignment and territorial equity

> I wouldn't know what could have been done differently, but I do believe that the route outlined in 2011 needs to be reviewed retrospectively, but also forward-looking, towards the city-region, because Medellín can no longer be seen as *just* [the city of] Medellín. (Interview with former planning director, Medellin, May 2024, authors' translation, emphasis added)

A wider vision refers to situating the ID within the broader urban context and trajectory of urban transformation. It involves assessing whether the thematic focus of the ID aligns with both the socio-economic characteristics and strategic opportunities of the immediate neighbourhoods as well as the wider city-region. It entails not only articulating this vision in planning and policy documents, but also ensuring that the broader policy ecosystem (e.g., skills development, higher education, economic development) is aligned with and reinforces the inclusive innovation agenda. Territorial equity underscores the importance of considering inclusivity at a regional scale, beyond the immediate locality of the ID. It involves examining how the benefits of inclusive innovation are distributed spatially.

Newcastle's approach to inclusion uses the Helix to catalyse economic growth and urban regeneration. Helix serves as a new urban quarter characterised by significant investments in infrastructure, fostering collaborations between researchers, businesses and the community. This initiative reflects a model of innovation-driven economic revitalisation, with an emphasis on traditional metrics of success like STRI outputs. Newcastle's project is attempting to bridge the gap between economic development and community involvement. The city aims to integrate commercial interests with inclusive growth ambitions, yet the apparent benefits of such initiatives remain unevenly distributed. This unevenness is exacerbated by the focus on traditional innovation metrics, which can overshadow broader societal impacts.

Pittsburgh's Hazelwood Green project represents a significant effort to leverage urban redevelopment, aiming to revitalise a historically marginalised area by creating a vibrant hub for innovation and

Table 4. Territorial equity.

Newcastle	Pittsburgh	Belfast	Medellín
Spatially delimited with limited prospects for a territorial or relational expansion.	Spatially delimited yet part of a much wider ambitious innovation ecosystem.	Spatially diffuse but concentrated around the city centre with expansion goals across in the Belfast region.	Spatially demarcated to begin, later expanded to the wider municipality. Inclusion success now spurring goals for Medellin to foster inclusion within the wider Antioquia region

Source: Authors.

employment. This initiative showcases Pittsburgh's commitment to redefining its post-industrial identity through strategic investment in STRI. A key challenge for the ID is ensuring that benefits extend beyond the site's physical boundaries and contribute to the adjacent Hazelwood community. However, the leadership structure behind ID (driven by private foundations), raises concerns about the commercial interests and how community needs and voices are incorporated into decision-making processes (Bagwell et al., 2024). The biggest trade off is balancing economic rejuvenation and bridging the gap between urban redevelopment and community empowerment.

Medellín's approach to inclusive innovation emphasises territorial equity and crisis recovery, focusing on integrating marginalised communities through social urbanism. Thus, inclusive innovation is collaborative and promotes equitable development, and has been foundational to both the city's crisis recovery, and its national and international positioning, even if the process has not been flawless (Franz, 2017). However, uncritical adherence to international STRI models could dilute the city's success.

Inclusive innovation in Belfast focuses on equitably distributing the benefits of a digital and high-tech economy, particularly to disadvantaged groups. It emphasises active participation from all communities and adheres to the principle of 'do no harm', ensuring that inclusive programmes do not unintentionally disadvantage those they aim to help, for example by conflicting with eligibility for other social programmes. However, Belfast's policy instruments primarily address employability and skills. While this is undoubtedly an important dimension of inclusive innovation, other critical areas such as supporting at-risk individuals, fostering foundational economy entrepreneurship, and addressing feelings of being left behind are not always prioritised. These aspects are frequently left to civil society, universities and colleges, rather than integrated into the core strategies of key institutional players in the innovation ecosystem.

Inclusion goals and a focus on territorial equity position all innovation districts (IDs), except Helix, as starting points for broader spillover effects. However, achieving significant inclusion impacts remains challenging for urban innovation systems, even with these intentions integrated into the ID and STRI agendas. Stakeholders in Belfast and Medellín are already adopting a regional approach to inclusive innovation. This matters in Medellín as the boundaries separating the city and the municipalities forming the metropolitan area are invisible, yet regional inequality causes profound challenges. Similar issues arise in Belfast, which is drawing human capital from all of Northern Ireland (Table 4).

5. Concluding discussion

In this paper, we conducted an empirical investigation into the concept of Inclusive Innovation within IDs by examining four case studies: Belfast, Medellín, Newcastle and Pittsburgh. Our analysis clarifies the meaning of inclusive innovation, and the essential elements required to optimise its outcomes when implemented through IDs.

The complexities of defining and achieving inclusive innovation requires grounded research to identify the emerging elements that can help reduce the 'fuzziness' of the concept. We found that inclusive innovation is inherently geographical, demanding tailored strategies that account for local socio-economic dynamics and disparities. The ingredients of inclusive innovation varied across each of the four case study cities, as did the overarching approaches taken by city-regional leadership to enact their innovation strategies. This finding echoes prior research that underscores the importance of contextual elements in constructing targeted innovation policy, as the needs and priorities can differ significantly by place and challenge (Lee, 2023; Parsons et al., 2024). Yet, with this paper we contribute to the understanding of inclusive innovation by unpacking its geographical nature and place-specific components to reject the 'fuzziness' and offer an evidence-based definition.

Drawing from our case studies we define inclusive innovation as the co-creation of new ideas, practices or technologies with local communities, businesses and organisations to address societal challenges, ensuring equitable benefit distribution and fostering community empowerment. Inclusive innovation is a place-based intervention, with socio-economic goals that should be defined according to each city's vision of their future economy. Inclusive innovation strategies should encompass different temporalities – past (addressing multigenerational segregation), present (providing opportunities) and future (building expectations for improved livelihoods).

Our findings also show that our sample of IDs feature inclusive innovation as a recurring goal, as has been argued in previous research (Katz & Wagner, 2014a). IDs, which combine mixed-use developments to stimulate innovation-led growth and urban regeneration (Morrison & Bevilacqua, 2017; Wolf-Powers, 2022), often fail to deliver equitable benefits to local communities. Ruptures between inclusion aims and the outcomes of IDs are highlighted in previous studies (e.g., Kayanan, 2022; Mulgan et al., 2024), and were also found in our cases. This demonstrates significant tensions between the economic and commercial objectives of IDs and the inclusive growth they aim to support. Our findings emphasise the need for IDs to broaden their focus beyond creating jobs, and to encourage place-specific needs such as addressing economic inactivity, ensuring gender inclusivity, promoting education and integration, and tackling social resentment and sectarianism, besides creating pathways for the novelties created in the IDs to benefit local communities.

To optimise inclusive outcomes, IDs should be designed to leverage opportunities for entrepreneurship, strengthen the foundational economy, and establish deeper connections between STRI initiatives and their broader host communities. For inclusive innovation to keep pace with contemporary shifts in innovation policy, it is important that IDs' aims and implementation align with societal challenges and emphasise an approach centred on societal well-being (McCann & Soete, 2020; Trejo Nieto, 2024). Furthermore, our findings show that for IDs as an innovation and urban regeneration policy (and perhaps for regional innovation policy in general) to deliver inclusive innovation outcomes, policy design and implementation needs to pay attention to three key elements. First, identifiable, locally accountable and collaborative leadership. Second, intentional and collaborative community engagement and placemaking. Third, a wider vision for strategic alignment and territorial equity.

The four cities demonstrate that inclusive innovation exceeds the local, and a comparative approach even across cities 'beyond compare' served to highlight that the ID is yet to define the role of inclusion in policy practice. Future research can examine the evolution of inclusive innovation policy across a broader range of cases, ensuring geographic diversity while maintaining methodological consistency. Such studies can go deeper to explain how genuine innovation has occurred, the processes through which it emerged, the influencing factors involved, and the mechanisms established to support its realisation, maintaining a critical view to differentiate the outcomes observed in practice from the intentions articulated in policy design.

Our findings also have key policy implications. We suggest IDs to have a more integrated approach aligning innovation goals with long-term and city-wide social inclusion strategies, ensuring all sectors of society participate and benefit equally and sustainably from innovation-driven growth. We also suggest designing strategies for intentional diffusion of ID benefits to surrounding communities. While designing and implementing ID interventions, policy makers and stakeholders can focus on the following points.

Types of Outcomes: Innovation infrastructure and services should be designed to address local or regional challenges impacting people's lives. STRI activities should prioritise solutions to these problems.

Distribution of Benefits: Communities and local businesses should receive tangible benefits from ID investments and services. This includes initiatives focused on employment and training, business support, supply chain linkages, and social programmes that facilitate access for less advantaged groups into the innovation ecosystem and the supportive foundational economy.

Community Agency: Inclusive Innovation policy should involve local and disadvantaged communities to influence and shape the priorities, physical spaces and activities of ID. This could involve utilising public spaces or communal areas, developing programmes of activity, or incorporating social capital infrastructure and services defined by the communities themselves. Future research should consider the appropriate calibration of community engagement and expert leadership.

Analysing the experiences of Belfast, Medellin, Newcastle and Pittsburgh, and considering the opportunities for these cities in delivering inclusive innovation, we argue that, far for being a fuzzy concept, inclusive innovation agendas can be progressive if designed and delivered more purposefully.

Finally, this paper provides an initial approach for policy reform that emphasises the need to integrate inclusive innovation into urban planning and regeneration efforts, placing it at the forefront of the cities' innovation strategies, including IDs. Our proposed definition and elements can enable policy makers to think at a granular level about their own specific definition for inclusive innovation: what are the priority communities, in which geographies, what level and type of benefits are most important, and over what areas of policy and practice can community involvement and direction be negotiated. Rather than invoking the fuzziness excuse, cities can develop, operationalise and apply a place-specific definition of inclusive innovation alongside community actors.

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Ethics statement

We confirm that informed consent was obtained from all human participants in accordance with ethical research standards. No identifiable information regarding participants is included in this publication, upholding their rights and privacy. Yet, while no identifiable information regarding participants is included in this publication, we confirm that participants have consented to the publication of the study.

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