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Strategies for Mainstreaming Edible Cities with Focus on the City of Lincoln: A Critical Cross-Case Study Analysis of Community Growing Groups in the UK

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Abstract: The socio-political climate in the UK, compounded by government austerity measures, has intensified the cost-of-living crisis, significantly impacting the affordability of the food supply chain. This has led to an increasing disconnect from healthy dietary practices and has contributed to declines in mental and physical wellbeing. This paper examines the role of edible city (EC) initiatives in addressing these challenges by enhancing food security, fostering social resilience and supporting community wellbeing. The aim of this research is to understand the tangible links between EC mechanisms and how they align with local, cultural and geographical perspectives. Focusing on the City of Lincoln, UK, this study aims to develop a contextualised EC framework that is culturally and geographically relevant and aligns with global goals for sustainable urban development as outlined in the United Nation's Sustainable Development Goal 11 (SDG11), promoting inclusive, environmentally safe and economically viable communities. Utilising a mixed methods approach, this research combines qualitative interviews and a critical cross-case analysis of four community growing groups in the UK, alongside quantitative socio-demographic data analysis. The findings reveal that successful EC initiatives adapt to their environment and socio-cultural conditions and highlight the importance of EC diversification for long-term sustainability. Four core themes emerged across the case studies: (1) social prescribing, (2) social capital (3) knowledge sharing and (4) social value. These findings inform the creation of a novel flexible EC framework, Lincoln, providing actionable insights and policy recommendations to support sustainable urban regeneration and enhance community resilience. This research contributes transferable knowledge to inform EC strategies across diverse global urban contexts, promoting a pathway toward resilient and socially cohesive urban environments.

Keywords: edible cities; community growing groups; social prescribing; social value; local resilience

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1. Introduction

1.1. Global, National and Local Sustainability Challenges

By 2050, rapid urbanisation is expected to pull 60% of the global population's 9.7 billion into cities [1,2]. Urban food procurement is placing enormous strain on the world's environmental resources, currently expending 26% of all greenhouse gas (GHG) emissions [3]. The globalisation of cheap, long life, processed food [4] together with ineffective governance [5] has meant that 43% are overweight [6], yet 30% still face food insecurity [7]. COVID-19 exposed weaknesses within the global supply chain [8], bringing to the forefront food security as a leading threat to civil society [9] and social determinant to health [10]. In order

to close the gap between urban food and agriculture [4,11–13], regenerative Nature-Based Solutions (NbSs) [14,15] have transformed Green Infrastructure (GI) [16] into functional Edible Green Infrastructure (EGI) [10]. Edible city solutions (ECSs) address these global challenges by aiming to reduce food miles [17], provide food insurance [10], alleviate social inequalities and improve quality of urban life [14].

The implementation of Edible cities (EC) in the UK is driven by national socio-political influences such as the Ukraine war [18] and Brexit [19], which have contributed to the UK's cost-of-living crisis with supermarket prices rising to a 45-year high [20]. This, combined with a decade of UK government austerity, has seen growth in food deserts [21–23] and a reduction in public health services, which has further exacerbated social inequalities and created a second health emergency [18,24].

On a local level, Lincolnshire faces enormous environmental, economic and social sustainability challenges as a consequence of global and national action (Figure 1). The agricultural county encounters increasing competition from housing development and the solar farming industry [25], together with extreme, frequent environmental flooding [26]. Lincolnshire produces 30% of the UK's food [27], yet lies within the top third percentile for food insecurity risk [24,28], widening the disconnect between food and health. According to the Office for National Statistics' (ONS) health index scores, the City of Lincoln is the tenth unhealthiest local authority, highlighting daily life, crime, personal wellbeing and mental health as the worst scoring [29]. As a result, reliance on foodbanks has increased by 81% since 2021 [30], while donations are not keeping up with the demand [31]; this is a short-term solution to an uncertain economic future and proves to be disempowering to citizens [32]. Unhealthy processed food contributes to huge strains on the National Health Service (NHS) with waiting times reaching 30 to 50 h at Lincoln County Hospital A&E [33].

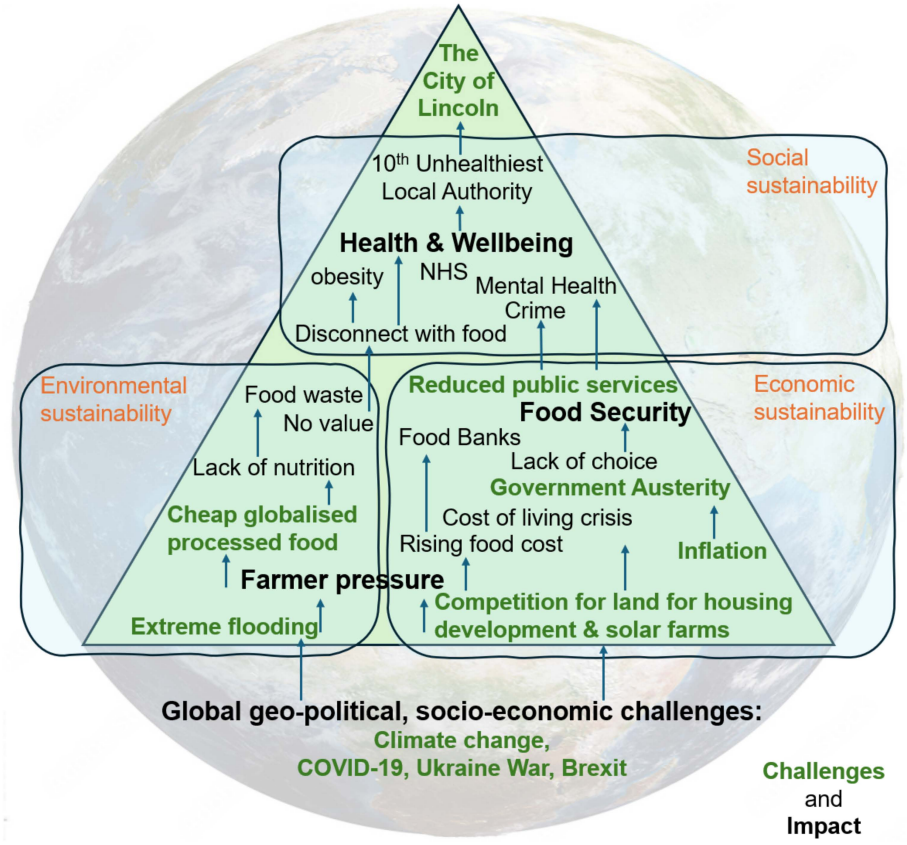

Figure 1. Global and national sustainable development challenges linked with their associated local impacts for the City of Lincoln (authors' own).

1.2. Edible Cities as a Scalable and Transferable Solution

While this paper focuses on UK case studies, local EC initiatives can serve as a blueprint and pilot project for global application. In addition to addressing local socio-geographical challenges, the findings of this study have global significance. The challenges of food security, human wellbeing and sustainable urban development are universal, as demonstrated by similar initiatives worldwide; one example is the creation of community food gardens in corridors of residential blocks in Poland [34]. The four case studies critically analysed and presented in this paper present important lessons learnt, and the results contribute to advancing the specialised EC literature. In addition, the EC framework proposed in this study can be adapted across varied urban contexts and cultures, supporting the universal call for the innovative use of outdoor and indoor public spaces to enhance urban resilience. The strategies outlined for Lincoln, such as community engagement through shared knowledge and green social prescribing, are equally applicable in urban centres globally. Such approaches could be adopted in densely populated megacities where limited green space necessitates innovative use of vertical or indoor growing spaces.

2. Literature Review

2.1. Edible City Solutions to Address Sustainability Challenges

Historically, there have been many examples of successful urban community growing groups, such as the WWII "Dig for Victory" campaign, which saw self-reliant citizens adapt to food insecurity and poverty [35,36]. While allotments have been around for centuries, the current concept of community gardens operating under new socio-environmental challenges means that they remain an evolving operation. Today's urban gardens are part of a new urban paradigm seeking environmental protection, the rediscovery of social interaction and a return to nature [37]. Currently, there is increasing interest for "productive solutions using nature for renewal" or NbSs to solve various socio-economic environmental challenges [4,38]. Edible city solutions (ECSs) are derived from NbSs and provide a wide range of functional growing strategies [39] within freely available public space, particularly in lower income neighbourhoods [37]. Thus, ECs respond to their geographical environment with an aim to address their immediate societal needs, which provide the following benefits:

- Short food supply chain (SFSC) [17] that is resource-efficient [4] and provides greater income for local businesses and the local economy [14].
- Nature observation [40] provides a sense of ownership, social responsibility and pro-environmental behaviour by connecting communities [11].
- Human–nature–food connection (HNFC) [39] reconnects the consumer to the food system while enhancing dietary visibility and food literacy [41].
- Support nutritional security and reduced malnutrition [11].
- Deliver urban justice, social equity and social resilience with the preservation of community and local cultural identity [5,10,14].
- Provide stress reduction, improved physical health and wellbeing [10].
- Therapeutic and prescriptive gardening supports mental health as studied in community gardens in London and Singapore [42,43].

The diagrammatic summary of ECs in Figure 2 is based on Säumel's ECS conceptual framework and encapsulates Ellen MacArthur's circular flow [14,44] with a wide range of sustainability benefits. Ten economies for urban regeneration [15] orbit the ECS framework as necessary processes for green city governance. However, grassroot growing groups are emerging in a semi-private way [45] and follow their own perceived interpretation of the ECS conceptual framework.

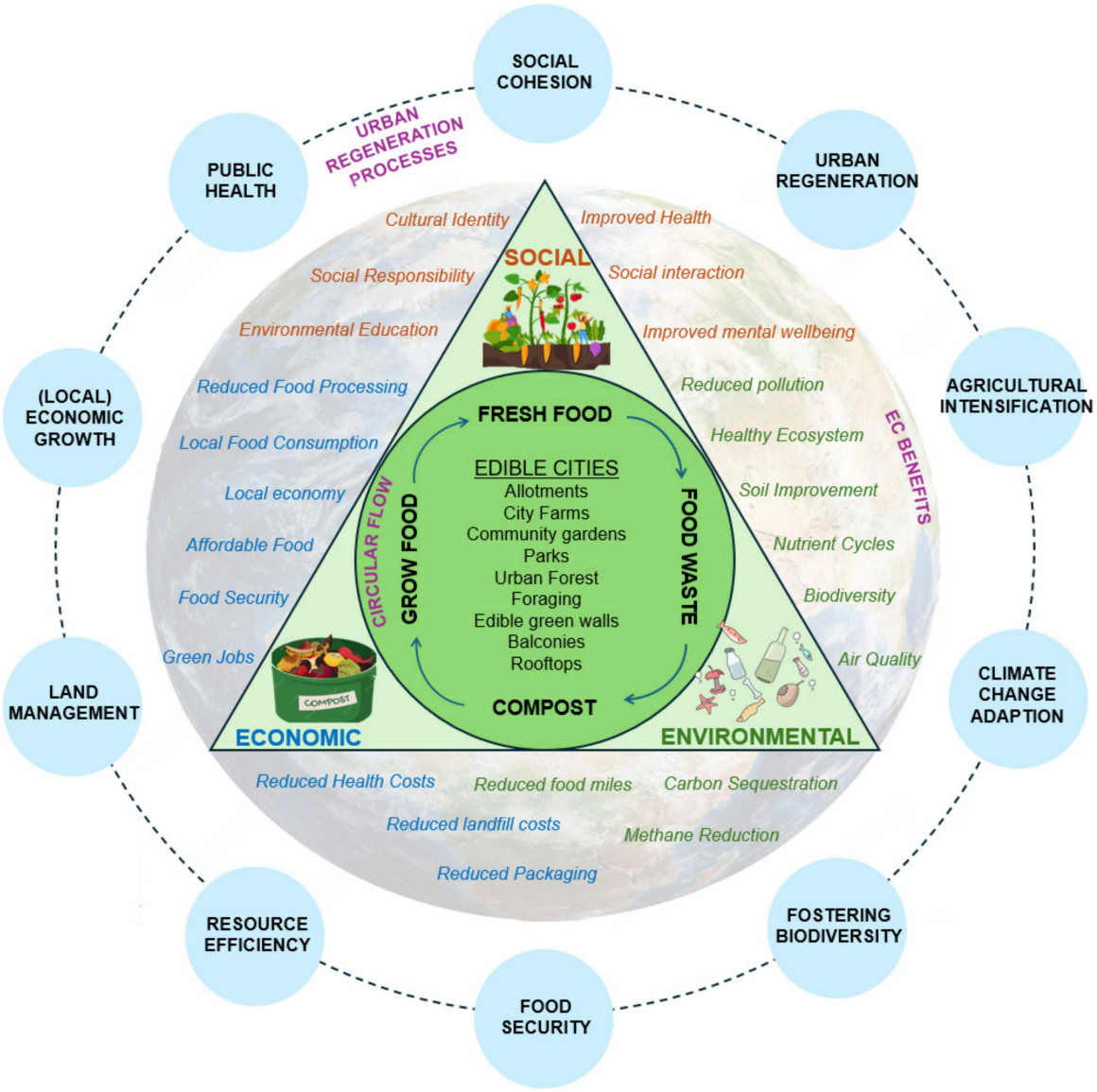

Figure 2. Diagrammatic summary of EC processes and their benefits (authors' own).

2.2. The Global Significance of Edible City Solutions

The issues associated with edible cities (EC) together with their solutions transcend national boundaries. The EC approach aligns with the universally recognised UN 17 Sustainable Development Goals (17SDGs), which aim to reduce hunger and make cities inclusive, safe, resilient and sustainable [46]. Since the 1990s' Smart City movement [47], there has been numerous international research on urban food production (UFP) [40] as a solution for food security and urban resilience.

Edible urbanism (EU) emphasises the importance of integrating "edible food components and structures" to preserve and enhance urban ecosystems [47]. While EU includes traditional methods of urban outdoor food production such as city farms, public forests, gardens and parks. EU also considers the broader concept of rethinking urban spaces, which includes innovative opportunities within or on top of urban structures. This demonstrates how adaptable ECs are to their unique environments. Examples range from food gardens within corridors of residential blocks in Poland [34] to underground hydroponic farms in London's derelict World War Two air raid shelters [48]. Oslo is transforming underutilised urban grey surfaces into pollinator friendly edible plants and also researching the feasibility of urban seafood production [13].

Urban agriculture movements and garden activism such as guerilla gardening in Los Angeles (L.A) unlawfully target public and private spaces of neglect [49]. Food deserts are increasing in sprawling cities like L.A and Detroit [50,51] and are exacerbating the health crisis. These grassroot initiatives champion communities to grow vegetables in an Uncontrolled Environment Agriculture (UEA) [52] for food security. UEA increases food availability, dietary visibility and connection to food, but has issues regarding contaminated land, safety regulations and city planning constraints.

Rooftop hydroponic systems and indoor vertical farming [53] in Singapore highlight how edible cities can adapt to diverse environments. Singapore currently imports 95% of all its vegetables [54] to 6 million inhabitants [55]. Singapore's sustainable development is proposing to simplify logistics and carbon footprint by growing their own urban food, advancing toward Controlled Environment Agriculture (CEA) or zero-acreage farming (ZFarming) [56]. This follows an organised system that applies innovative technologies such as vertical gardens, indoor farms and Building-Integrated Agriculture (BIA) [52]. Diehl's policy review concludes that the implementation of innovative agrotechnology parks in Singapore are similar to low-technology grassroot solutions because both need collaborative cross-agency policy development [57]. However, Diehl's advocation of Z-farming overlooks that Singapore has a unique geographical context of high density with huge economic wealth. Singapore's definition of food security is not necessarily about the health of its citizens or eliminating food deserts, but rather the fragility of their food supply chain and reliance on imported food. Scharf took an opposing low-technology view from Diehl in that economics, technologies and even governments are not the solution for EC success; instead, collaborative community are the key actors. Scharf onsiders a broad social evaluation of ECs in Berlin using the term "Urban Commons" (UCs) [5]. UCs consider all stakeholders and processes within the food network, including visualisation, cultivation, harvest, storage, distribution, community kitchens and food councils.

From smart agricultural cities that Singapore is striving for to grassroot movements that use spare land for crops in L.A, these diverse projects highlight the global applicability of the EC themes identified in this research for social prescribing, social capital, shared knowledge and social value. Although this research and selected case studies are local to the UK, the findings are relevant to policymakers and practitioners worldwide. By recognising local lessons, this research aims to contribute to a global dialogue on sustainable urban food systems, aligning with SDG11 and offering scalable solutions for inclusive, resilient cities.

2.3. Edible City Implimentation and the Necessity for a New Framework

Increasing grassroot [58] bottom-up growing initiatives [39] are adapting to diversify their dietary options [59,60] and offer culturally tailored support to their neighbours through EC implementation. Proactive community-led practices such as "Brighton and Hove Food Partnership" and "Incredible Edible" [61–63] successfully foster the co-creation and co-production of food in public spaces [14], enabling a paradigm shift for social change and pro-environmental behaviour [64] while supporting local businesses [13,65]. Nevertheless, community growing also requires top-down support from their local authority, which provides a platform for cross-collaboration between community and governance [5]. However, due to the complexity of edible cities (EC), they lack scientific data [66], which places social and physical value on the human–nature connection (HNC) [40] to successfully execute integrated planning policies [43]. The current research gap fails to communicate how ECSs can benefit the community while alleviating local authority pressures. In other words, what are the cultural and socio-political motivations that steer a successful community growing group? Therefore, there is a necessity to create a new locally guided EC framework that connects specific community needs to their local authority policy. In September 2023,

Hull was the first city council to implement a "right to grow" motion that "shifts access to public land from a permission-based approach, to a rights-based system with an emphasis on meaningful and trusting engagement between community and authority" [67,68]. This emerging partnership between citizens and government begins to break down structural inequalities to construct just and inclusive societies for social change [65] within the broader context of global sustainable urban development.

2.4. Aims and Objectives

Considering these global, national and local challenges, this study synthesised what criteria make up a successful local growing community. The aim is to understand the links between tangible EC mechanisms and how they align with their local, cultural and geographical perspectives. The objective is to develop a concluding contextually relevant EC evaluation framework for Lincoln that manages outcomes and expectations for all stakeholders, especially local authority and its citizens. This research also addresses how ECs can contribute to the broader context of sustainable development research and how they can effectively alleviate urban challenges aligned with the United Nation's Sustainable Development Goal 11 for "Sustainable Cities and Communities" (SDG11) of becoming socially inclusive, environmentally safe and locally economically productive [12,46].

Firstly, this research introduces the theoretical grounding of the multi-dimensional EC concept. Secondly, it seeks a critical assessment of the role of ECs within different geographical locations in the UK (Hull, Beverley, Todmorden and Lincoln) using a critical cross-case study analysis approach addressing how ECs have responded to their environments with the benefits they provide. Thirdly, this research study undertook open-ended interviews with growing group leaders to explore personal experiences, lessons learned, successes, failures, barriers, enablers and challenges. This report investigates emerging EC themes and perceived drivers in the current UK socio-political climate. From this, it sought to synthesise the multifunctionality of ECs [14] with focus on multi-stakeholder cross-collaborative support to mainstream EC. Finally, this article creates a new locally driven EC framework to transform the City of Lincoln into a healthier, sustainable and resilient community. While this study focuses on Lincoln, the proposed EC framework was designed to be adaptable, addressing universal challenges like urban land scarcity, community engagement and food system resilience.

3. Materials and Methods

This research adopted a mixed methodology [69] that combines both qualitative and quantitative data for analysis. Mixed data contribute to the value of perceived EC social interpretations, helping in knowledge creation and cultivating ideas for future studies [70]. This study brings together the three methods of (i) qualitative critical cross-case study visits and observation, (ii) thematic investigation from in-person interviews and (iii) quantitative socio-demographical data analysis from national and governmental statistics. Online searches for statistical demographic quantitative data were used to support, validate and give reason to the qualitative observational and theoretical analysis. Employing different methods of data collection aims to strengthen the validity of this research by offering various perspectives [71] to a complex, multi-dimensional topic. However, Bell challenged the use of mixed methods because they can weaken and confuse the discussion. Therefore, the diagram based on Atif's triangulation strategy [72] seeks to clarify the research's mixed methodology and plan an effective implementation of its aims and objectives (Figure 3). All data were collected independently and concurrently within a 4-week period by the authors of this study to give each method equal priority so that one does not inform the other [72].

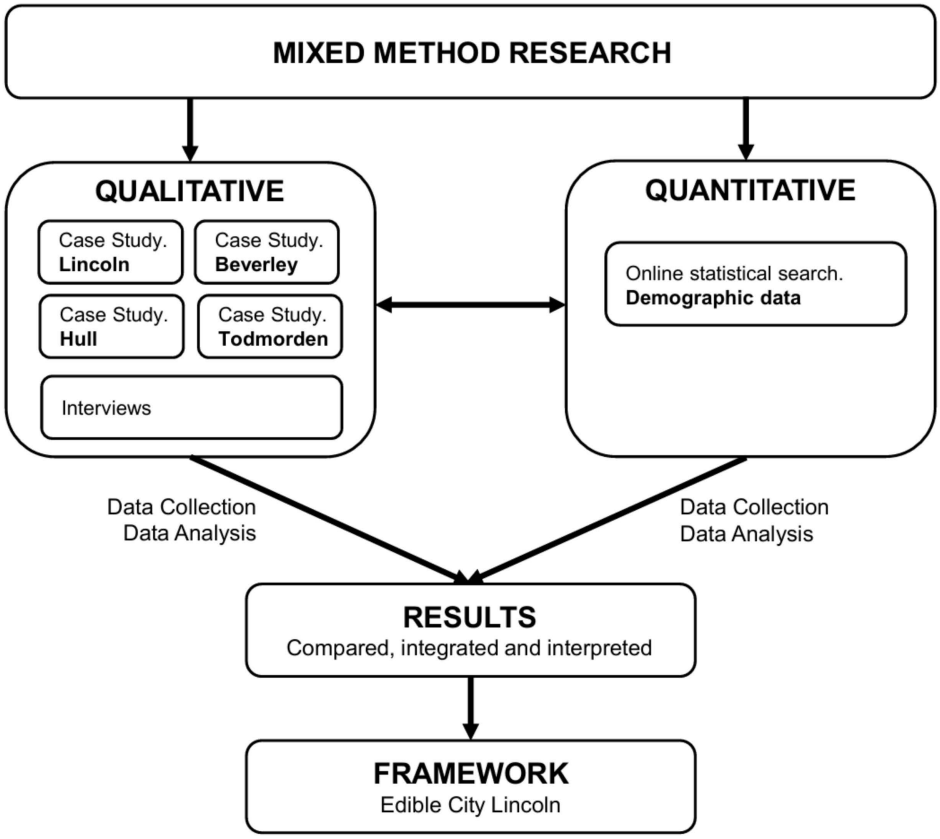

Figure 3. EC Mixed-Methods Research concurrent triangulation methodology (authors' own).

3.1. Cross-Case Study Analysis of Four Community Growing Groups

Due to this research's time constraints and accessibility [73], four regional urban growing projects were selected to investigate their various EC transformation processes (Figure 4). The focus of this study on four community growing groups in the UK may have limited the generalisation of the findings to other areas with different socio-cultural and environmental contexts. Four case study visits aimed to bring more robust outcomes to inductive theory building [74] than a single case study research. Multiple field visits across various geographical contexts aimed to test the validity of the general EC theoretical impacts on the social, economic and environmental aspects [75]. A series of email requests were sent by the authors to various growing groups within the midlands and northern region of the UK, and four sites were selected according to their immediate response and willingness to participate in the study. While each case study was situated within the locality, contrasting results were predicted [76] due to the case study's unique cultural background and their differing self-categorisations as a "community garden", "community allotment", "community farm" and "urban gardening". A case study in Lincoln is presented because the aim of this research was to create an EC framework for Lincoln. Particular focus lied within Kingston upon Hull to explore the effects of the "right to grow" policy [77]. Kingston upon Hull is also the second worst rated local authority, after Blackpool [29]. Beverley lies north of Hull and represents a contrasting higher socio-economic status yet similar geography due to its regionality. Finally, Todmorden is a pioneering group who began the Incredible Edible Network [11,45,47,61]; a grassroot growing community who made local food produce a vehicle for social regeneration [63]. In response to its success, which has inspired a global movement [78], Incredible Edible currently has over 170 UK growing communities and approximately 1000 international groups [61].

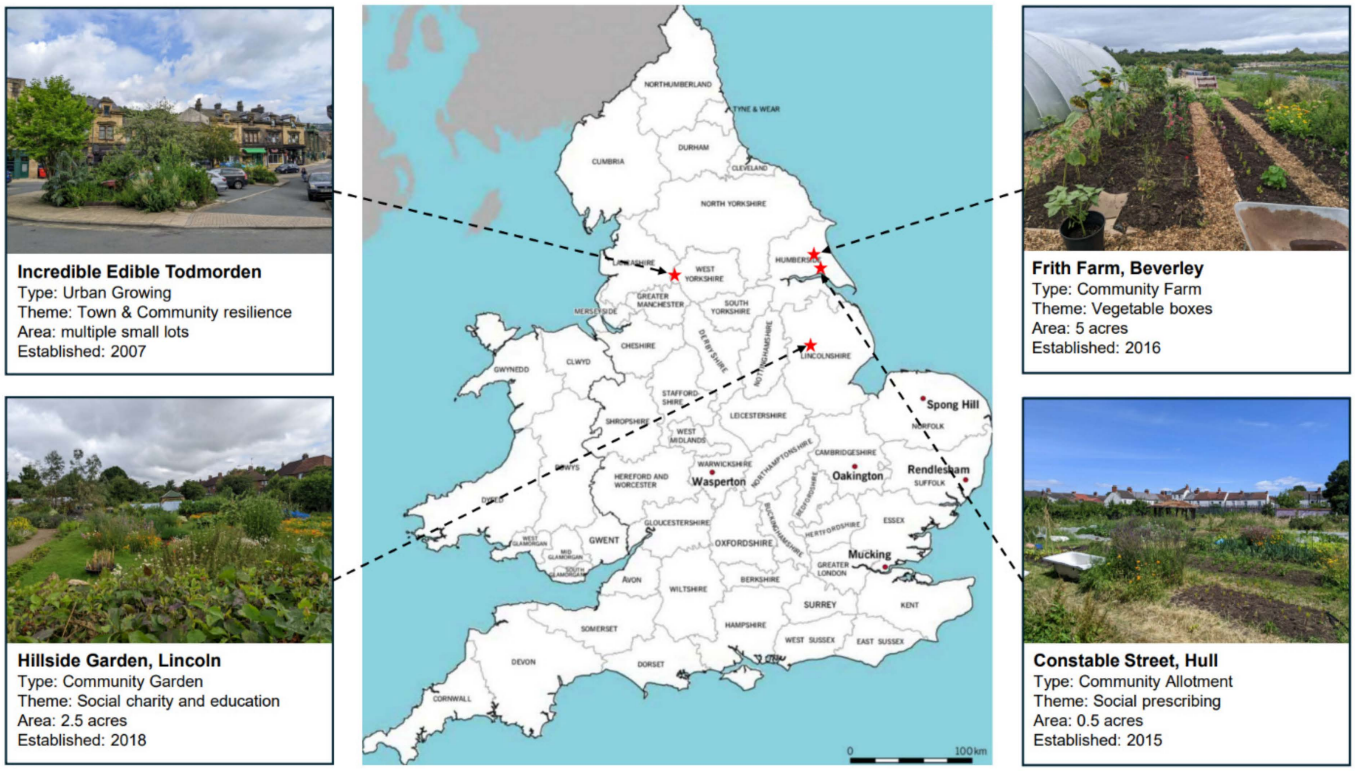

Figure 4. Map of England and Wales (adapted from [79]) with community growing case study locations and photos (author's own).

3.2. *Qualitative Interpretation from Interviews*

In total, four qualitative one-to-one interviews were conducted by the author with each case study's associated leaders who responded to the request for the site visit and have aided in local efforts to maintain community gardens. Each participant from Constable Street, Frith Farm and Hillside Garden are project leaders, while the Incredible Edible interview was conducted with the trained tour guide leader. The semi-structured interviews used for this study offered the participants the flexibility and space to offer new insights beyond any predisposed questions [80]. All interviews explored singular perspective stakeholder experiences, viewpoints, attitudes and perceptions. This obtained a deeper understanding of the social reality of the area based on personal beliefs [81]. The individuals' experiences facilitate our ability to learn from past actions and take adaptive steps forward to ensure lessons identified become learned and institutionalised [81]. These user perceptions can produce useful information that can be integrated with decision-making process and planning policies [17].

Based on Sartison's and Scharf's "problem-centred interview" guidelines, the questions were structured in three parts: (i) an introduction question to generate storytelling, (ii) the main body that aims to explore the research question and (iii) a final open-ended question that offers the flexibility to elaborate and reflect on the following [5]:

- Interviewee's perceived role in urban sustainable development [5]. The impact of the growing community on the city.
- Constraints and barriers enabling EC transformation.
- Relevant pressures for competing land use [17].
- Relationship and level of collaboration or support from local authority [5].
- Any recommendations for future development.

There were no restrictions or objections to conducting the interviews (Supplementary Materials S3 [S.M.A.C]). There was no time limit to the interviews, and length varied from 1 to 2 h, depending on the scale of the project and the complexity of the challenges (S.M.A.B.1–4). The limitations on the interview methodology were that the qualitative data results relied heavily on the personal perspectives of community growing group leaders, which are interpretative and perceived by the researcher's own biases [5], which can limit the objectivity of the findings.

3.3. Quantitative Analysis of Socio-Demographic Data

Urban ecosystem services are an anthropocentric concept; therefore, socio-demographic data are fundamental when proposing to address city management policies [82]. Statistical generalisations [81] through online data searches were used to synthesise the demographical character of each case study location. The process of tabulating these public national data explores each project's unique environment through population, gender ratio [83], number of schools in the UK [84], food insecurity risk [85] and obesity rate [86]. The data aim to interpret what social factors influence the motivations and successes for enabling community growing groups. All other socio-demographic data were obtained from the Office for National Statistics (ONS) 2021 Census [87,88].

3.4. Ethical Consideration

This study was conducted in accordance with the guidelines of the Declaration of Helsinki and was approved by the University of Lincoln Ethics Committee. The research project titled Edible Cities' (Review ref: UoL2024_18198) received a favourable ethical opinion on the 7th of August 2024. Consent forms and project information sheets were developed and shared with participants prior to involvement in this study.

4. Site Visit Results

4.1. Defining Community Allotment

Allotment, by definition, is gardening on rented public space, away from home, that focuses on food production as well as forging relationships between the community and the land [89]. The community element highlights the collective and inclusive values of the allotment, where everything is co-designed, co-produced and shared. A community allotment aims to impact the neighbourhood and improve the immediate environment by regenerating neglected land for community development [37]. Food production is not the sole focus but physical activity, nutritional security, therapeutic and psychological services for volunteers and the wider area [37].

4.1.1. Introducing Constable Street Community Allotment, Kingston upon Hull

The Constable Street community allotment is situated 1 km north of the Humber Estuary yet lies within a low-risk flood zone (Figure 5). Once a thriving port city, the area received extensive damage during World War 2 Blitz and suffered further economic decline in the 1970s' post-industrial change in fishing policies (ref required). Constable Street community garden is located in a socially disadvantaged neighbourhood in the St Andrew's and Docklands ward within the local authority of Kingston upon Hull (S.M.A.A.7.1). The surrounding densely crowded streets are predominantly council-owned terraced housing and purpose-built flats [90]. The area faces many social and health problems linked to poverty, social exclusion, unemployment and welfare dependency (S.M.A.A.6.1). As a consequence, Kingston upon Hull has a high food insecurity risk [85].

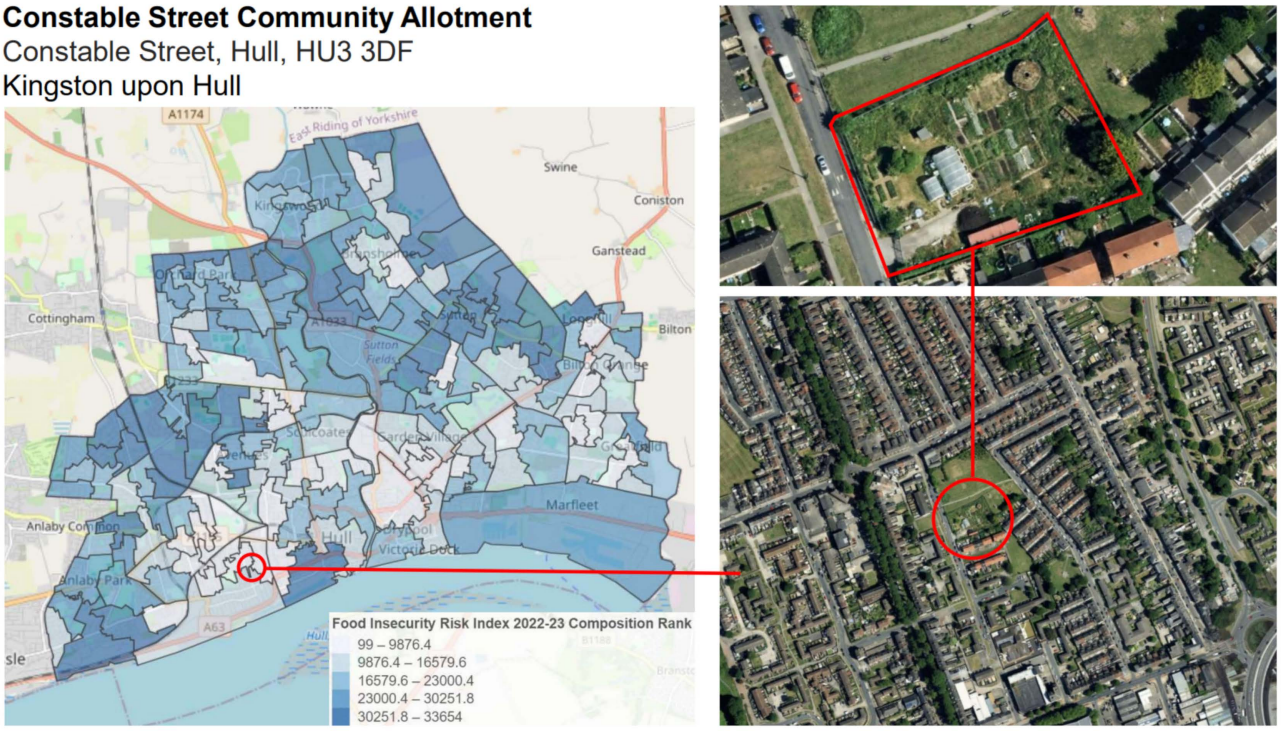

Figure 5. Map of Kingston upon Hull's food security risk index 2022-23 [85] and Constable Street community allotment location map (authors' own).

Kingston upon Hull is undergoing a process of EC transformation, with 55 community growing sites within the area [91]. The Hull Food Partnership acts as a hub that networks between businesses, organisations and individuals for support [92]. Their Hull Food Action Plan focuses on three principles of (i) collective action, (ii) changing food policy and (iii) local sustainable food [91]. In response to growing momentum, Hull city council passed the country's first "right to grow" motion in September 2023 (ref required). The aim is to create a simple process for local communities to secure free leases on public land [67] for crop cultivation or wildlife projects. This policy is still new, and therefore, there are no data on its outcomes; however, it has provided publicity, awareness and mounting national political support in the House of Lords [93].

4.1.2. Case Study 1: Site Visit Observation

The community allotment occupies disused city council land, previously a school and nursery (S.M.A.A.1). The overall site is divided into three sections, half is allocated grass parkland, and the other area is split between a children's playground and the community allotment. It is the only green public space within the immediate neighbourhood. The community allotment is purely grassroots, managed by one individual, who in 2015, because of continuous requests to the local authority, received occupation because there were no other development plans. The Constable Street allotment is located along a dead-end vehicular road and mostly gains awareness through pedestrians. The adjacent public park acts as a cut through between Hessle Road shops and the residential streets The site is completely enclosed by 10-foot metal fencing, preventing people from freely visiting, planting or picking produce for personal consumption. It is open twice a week for 3 h, and community participation is the biggest barrier for ES transition, citing time and scheduling as major constraints. The community allotment is run solely by the motivation and organisation of one participant. Its apparent lack of collective support has caused the project to become overrun. It is evident that this community garden, like other EC studies,

needs to scale up to reach more people and significant resources [13]. The few available volunteers tidy up the overgrown landscape and prepare for occasional community social events. There are no collaborative links to outside local businesses, which is a key economic and awareness strategy in German case studies, such as Andernach [13]. Vegetable boxes are available to the wider community via donation; however, upon visiting in June, there was no produce available. These observations suggest that their priorities focus less on producing food, and more on addressing issues connected to improving social inequalities, mental health and wellbeing through "social prescribing", which is a key theme.

4.2. Defining Community Farm

Community farming offers benefits to growers who want to practice sustainable agriculture and provide the community with fresh, seasonal, locally produced food. Peri-urban farmers provide consumers an alternative means for purchasing nutritional produce from farms, and thus, community members are able to invest directly into their food system [94]. This offers a synergy of social benefits, pro-environmental farming practices, local economic prosperity and a more robust transition to sustainable food systems [95]. Community farming is also often driven by a vision of transforming dietary health into a de-commodified, sustainable and democratic food system and seeks to build a community of participants who support this vision [96,97].

4.2.1. Introducing Frith Farm, Beverley

Firth Farm is a five-acre peri-urban community farm located on the northeast outskirts of Beverley, a small affluent historical market town in the East Riding of Yorkshire civil parish (Figure 6). Situated 27 miles southeast of York and 9 miles northwest of Hull, it has a higher socio-economic status, where low-density residential settlements are intertwined with agricultural systems [98] (S.M.A.A.5). The site is historically farmland; its awkward triangulated shape enclosed by ditches has not been cultivated since 2006. In 2016, two full-time social entrepreneurs from Hull [13] took on a farm business tenancy agreement with the adjacent family-owned Molescroft Farm [99] under an environmental stewardship scheme. This offers incentives to farmers who deliver environmental management, protection and enhancement [100]. The area is surrounded by farmland and has a neighbouring community allotment. Firth Farm aligns with Community-Supported Agriculture (CSA), a network that promotes regenerative farming practices by supporting local farmers, strengthening communities and encouraging environmentally conscious food choices [101].

4.2.2. Case Study 2: Site Visit Observation

Located a mile outside the perimeter of Beverley, visitors to Frith Farm must travel down winding farm lanes by car (S.M.A.A.2). Hidden from public view, tucked behind other farmland and field bushes, Frith Farm it is hard to find. Its strategic location for larger-scale land suffers because community motivation and co-creation is higher when situated on their doorstep [102]. The five-acre farm uses no agricultural machinery, everything is carried out by hand by 2 full-time coordinators, 5 regular weekly volunteers and approximately 10 others. This traditional method of farming takes time and is unlikely to replace traditional methods of productive agriculture. Vegetable boxes are expensive and not as financially accessible as supermarket alternatives. Nicholls suggests that people would generally prefer to buy local but cannot afford it [103]. As a solution, a workshare and volunteer scheme provide payment with fresh healthy food and opportunity for social interaction. However, this is not a solution for those who do not have time or physically cannot participate.

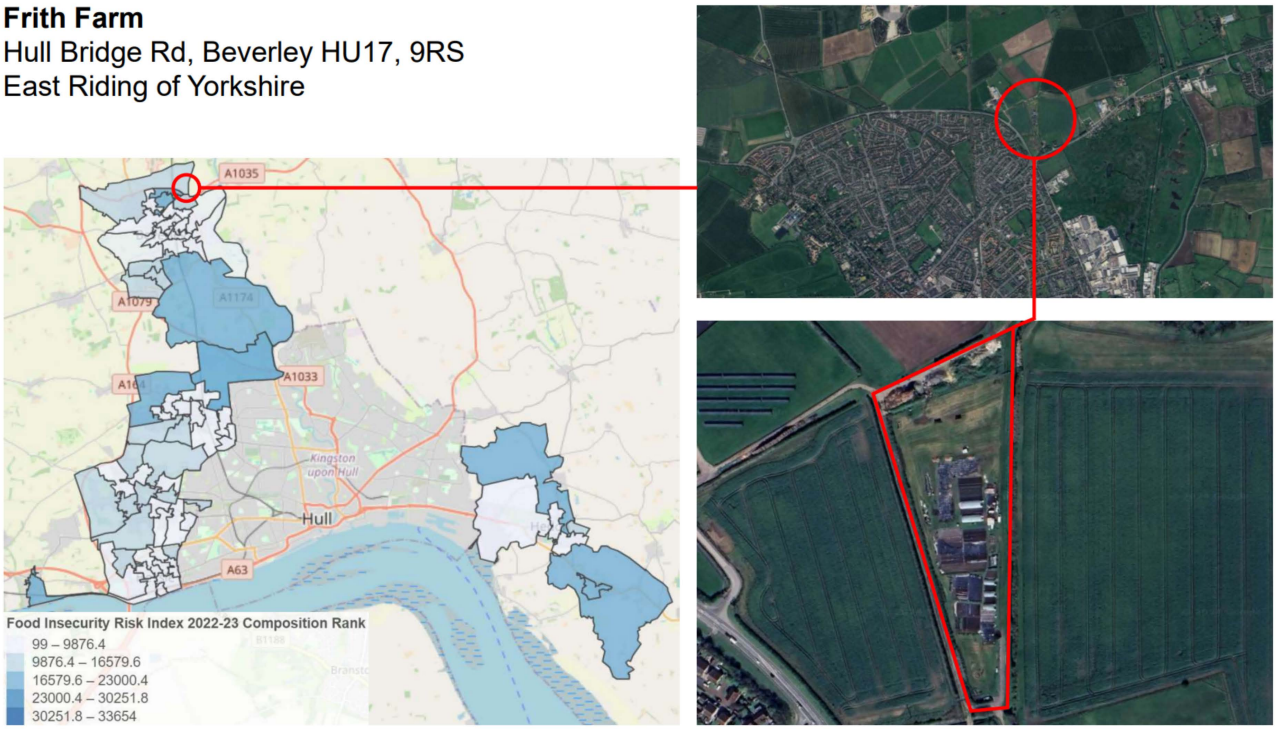

Figure 6. Map of East Riding of Yorkshire's food security risk index 2022-23 [85] and Frith Farm location map (authors' own).

This study highlights that "Frith Farm" develops their cultural and environmental values with the area's economic and social objectives by diversifying. The multifunctionality of growing groups has to be embraced to maximise adaptability that addresses diverse and changing residents' needs across generations [102]. Frith Farm's strategy provides some business partnerships with local restaurants and personal subscription vegetable boxes. Introducing farm animals to produce eggs, honey and wool helps the farm enhance their economic return and creates visitor interest. Underutilised green spaces within this community farm are transformed into social meeting places for eco-therapy, eco-tourism, cooking classes, BBQs, chef tasting events and education. According to Artmann, expanding farm functionality reaches a wider cultural network and further strengthens cognitive human–food connection (HFC) [39,40]. Studies have shown that relationships formed through scaling across local businesses and educational workshops can impact individual behavioural change, health and wellbeing [13].

4.3. Defining Community Gardens

A community garden refers to open spaces managed and operated collectively by members of the local community, cultivating food, flowers, trees and plants [104]. They also create a social dimension for community cohesion, education [37] and support services.

4.3.1. Introducing Hillside Community Garden, Lincoln

There are a total of nine community growing groups in the city of Lincoln [105], two are operated by a gardening and horticulture charity called Green Synergy [106]; their primary site is Hillside Garden. Established in 2017 on 2.5 acres of a former quarry, it was derelict, contaminated land between Lincoln County Hospital and the Tower estate. The site is owned by the United Lincolnshire Hospitals Trust and is leased and operated by Green Synergy [106]. The garden is situated in Tower estates, a neighbourhood that lies within the bottom 25% of socially deprived areas in the UK (S.M.A.A.5). Green Synergy occupies an office in the neighbourhood, which provides social support and other community

events [106]. In addition to the two community gardens, Green Synergy provides design and build services by sharing their knowledge and experience to create other community gardens within Lincolnshire. Knowledge, which is a key theme, provides new opportunities to directly collaborate in public growing spaces with local institutions for the benefit of local identity.

4.3.2. Case Study 3: Site Visit Observation

Hillside Garden is hidden from street view, wedged behind residential homes and the Lincoln County Hospital (Figure 7). Access to Hillside Garden is either along the west side through the hospital car park or from the south gate reached via a quiet narrow footpath, notorious for fly tipping. The garden is not enclosed and is accessible for people to use at any time. However, this creates challenges for anti-social behaviour, vandalism and rough sleeping; despite this, the garden is well maintained and neat and enhances the immediate area (S.M.A.A.3). There are various themed areas within the garden; generally, edible produce is not for personal picking; instead, it is used for educational school programmes and income generation for a local restaurant. A pizza oven is used for community events, and an apple orchard is also available for public use. The strategy is to function off the grid and off the land using what is already there. Harvested rainwater is extracted from the adjacent NHS building.

Figure 7. Map of City of Lincoln's food security risk index 2022-23 [85] and Hillside Garden location map (author's own).

4.4. Defining Urban Gardening

Urban gardening currently referrs to small plots of land cultivated as part of collective action initiatives or collective governance schemes [107]. This novel wave of "sustainability-driven" urban gardens embraces the same principles of traditional gardens but introduces emerging public concerns for urban lifestyles and sustainable food systems. Mostly led by grassroot bottom-up dynamics and inorganic collective action initiatives, they no longer represent national political initiatives to cope with food shortages [104].

4.4.1. Introducing Incredible Edible, Todmorden

Situated in Calderdale valley, its distinctive socio-cultural, political and geographical context [104] plays a vital role in its sustainability-related motivations (Figure 8). This community of 15,800 [88] has cultivated cohesive qualities borne from a historical sense of isolation and adversity that has given rise to a proactive community [47,62,78] (S.M.A.A.5). In 2007, a pioneering group of individuals concerned about the growing disconnect between people and the environment [78] set out to use edible landscapes to enrich their community (S.M.A.A.4.2). Planting food in underutilised public spaces around town has created a platform for kindness and produces positive impacts to overall local resilience. The mobilisation of local assets by harnessing an inclusive community spirit while supporting local businesses and community activities and championing ecological activism is forward-thinking and seen as the future of sustainable development in the field of edible urbanism [47]. Figure 9 shows Todmorden's successful three "spinning plates" EC framework and how they relate to Brundtland's pillars for sustainable development [62,108] (Figure 9):

1. Local community—fostering its grassroot community and engaging with local community with growing food in public places for consumption.
2. Business—championing local businesses.
3. Learning—providing education, training and skills.

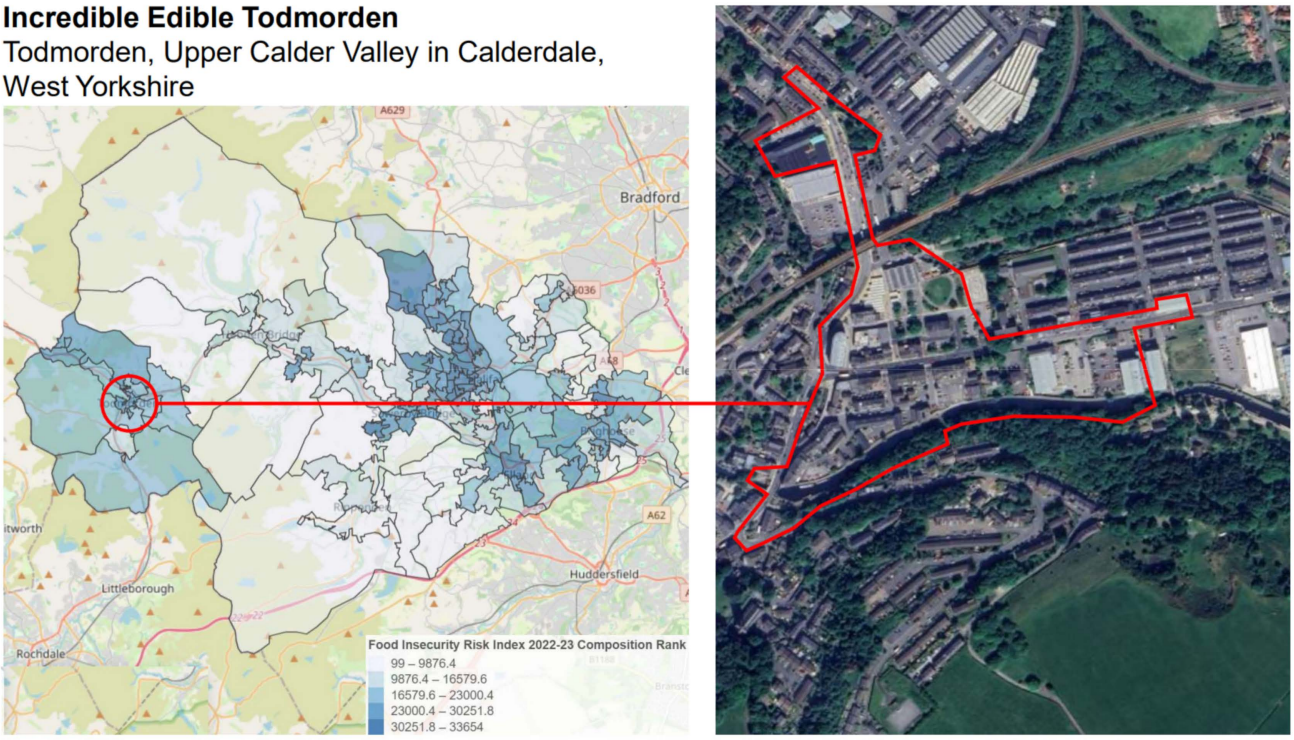

Figure 8. Map of Calderdale's food security risk index 2022-23 [85] and Incredible Edible, Todmorden, location map (author's own).

4.4.2. Case Study 4: Site Visit Observation

Site visit observations confirm that Incredible Edible in Todmorden has successfully pioneered the concept of "vegetable tourism" [78], also referred to as "agri-tourism" [98] or "food tourism" [62], by drawing economic development into the town and partnering with local businesses. Ninety-minute walking tours are available to book online for GBP 6 and are used as a vital source of income generation (S.M.A.A.4.1). Furthermore, it is a strategic way of attracting international recognition, hosting global visitors from as far as Japan and

Taiwan. Sharing knowledge and promoting their sustainability agenda receives positive media attention, which promotes the city's image, as supported in studies conducted in Andernach, Germany [39,40]. Visual stimuli extend beyond plants with various free book libraries, "kindness" signs and educational posters erected around town, which promote social cohesion, acceptance, empathy and sharing (S.M.A.A.4.3). Studies have proven that creating worldwide awareness with "propaganda gardening" [62] creates infectious behaviour, which is evident through individual actions and other growing groups forming within the town and afar. Todmorden Makery is a co-produced community organisation born from the town's growing group who host various sustainability repair workshops, creativity classes and a shared tool library (S.M.A.A.4.3). This affirms that a clear EC necessity is creativity; organisers nurture imagination, innovation and originality through trust-based relationships and events. Todmorden citizens collectively organise themselves with the aim to positively impact behavioural change, social integration and equity and develop a strong sense of pride. Consequently, Todmorden's co-creation of shared values and knowledge exchange has economic benefits for local businesses, eco-tourism and socially interactive therapy services.

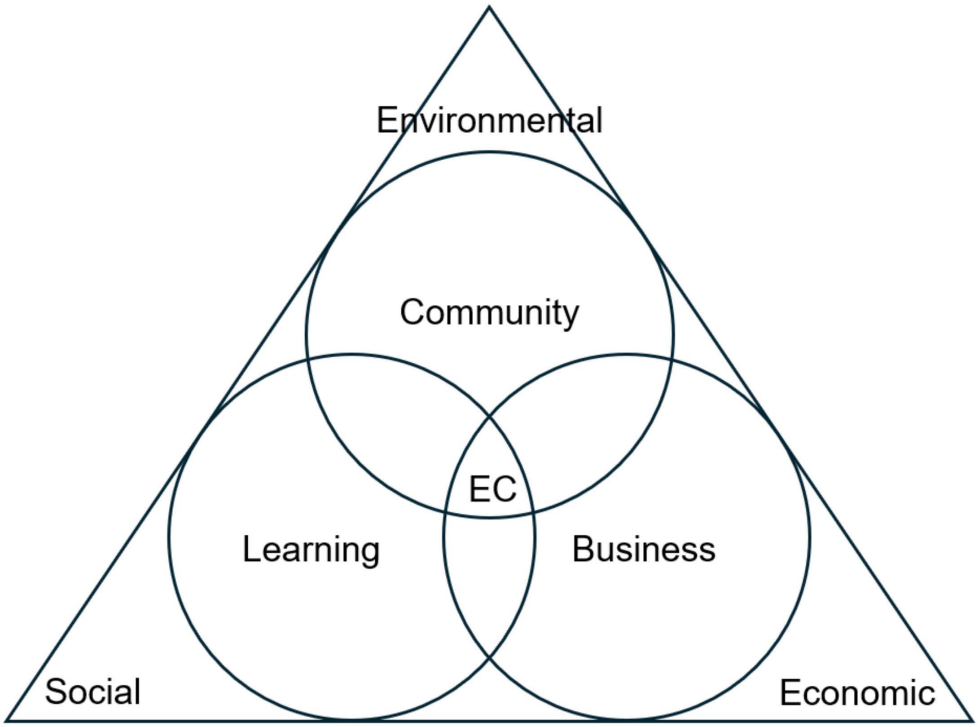

Figure 9. Sustainable development and EC "spinning plates" model (author's own).

Another observation suggests that the community does not pick many of the plants because most areas were full and lush and looked untouched. This aligns with Artmann's theory that citizens are not inclined to take public offerings because some think it should be left to those who have lower income [40]. Other research indicates that others may have concerns about environmental pollution [40], although contrary evidence alludes that pollution, even by the side of the road has little impact on food safety [109].

4.5. Interview Results

All interviews were transcribed (S.M.A.B) with key words and phrases from the interviews highlighted and tabulated (S.M.A.A.6.1 and 2). The aim was to dissect contextual problems and understand their contributing factors, while identifying EC opportunities. The transcribed words were captured and analysed utilising a word cloud [110] to un-

derline common themes (Figure 10). The results indicate that the most mentioned word is community (said 55 times), emphasising the importance of EC landscapes on social principles. All growing groups command bottom-up social entrepreneurship, creative innovation and adaptation through community inclusion and the empowerment of people.

Figure 10. Word cloud is based on the most frequently used key words during the four conducted interviews. Community (55), Social (25), Land (23), Veg (21), Plants (21), Local (20), Time (16), Kindness (14), Knowledge (11), Shared (8), Business (8), Creative (6), Difficult (6), Nature (6), Learn (6), Social Prescribing (5), Vandalism (5), Agriculture (3), Permaculture (3), Climate (3), Information (3), Cultures (2), Sanctuary (2), Wildlife (2), Retirees (2), Equal (1), Interact (1). Author's own.

An interesting observation to note is that all tours and interviews were conducted by lead female community growing coordinators. This thought validates other EC studies that highlight higher female EC participation, who embody a stronger connection to nature than males [14,40,111].

4.6. Cross-Case Study Analysis and Scoring Methods

Case study observations and interview interpretation were evaluated and scored according to 16 combined criteria that ECs can contribute, based on Artmann's 10 societal challenges of urbanisation [15] and Kate Raworth's 12 social foundations [112]. Artmann's societal challenges of urbanisation orbit the EC framework diagram discussed earlier (Figure 2). However, Artmann fails to consider the breadth of the social justice and political needs that ECs can potentially fulfil. Therefore, the scoring criteria integrate and overlap with Kate Raworth's 12 social boundaries, built as a social "floor" for the ecological "ceiling" of the planetary boundaries' framework [112,113]. Raworth's "Doughnut" model defines what mechanisms communities need in global sustainable development to fulfil social equity while keeping within the planetary boundaries [112,114].

The results are presented in a circular graph derived from the Edible Cities Network (EdiCitiNet) toolbox, an explorative environmental framework [115] that was established to compare the social and political processes in "Living Lab" case studies around the world [13]. The graphs aim to provide visual recognition by allowing the reader to understand how each EC project responds to its unique sustainability challenges and contrasts

any emerging themes or benefits. Understanding successes as well as failures is fundamental too, because the latter are potential benefits for mainstreaming strategies [39]. The limitations are that the criteria and grading system are based on the researcher's personal assessment of the case study visits and interviews as part of the quantitative study (S.M.A.A.7.1). However, the system is flexible and can be adapted to fit other criteria for future studies.

Cross-Case Study Scores

The circular graphs begin to reveal the case studies' differing EC strengths and their emerging themes (Figures 11–15). Frith Farm is focused on connecting local identity, food and income through social regenerative agriculture practices. Bridging the gap between farmers and consumers is important to promote Beverley's cultural identity (Figure 12). Hillside Garden responds to its socially deprived neighbourhood by creating human–nature connection and socialisation through social capital (Figure 13). While Constable Street benefits from social prescribing. It is interesting to note that it is the only community garden that falls under "right to grow" governmental support yet suffers the most from supporting networks and volunteers (Figure 11). The interview indicated that the "right to grow" policy has encouraged a flurry of other growing projects to appear, which dilutes the volunteer pool and skips vital knowledge transfer (S.M.A.A.6.1). Todmorden successfully encapsulates all sustainable development criteria utilising social capital, knowledge and partnerships with local businesses to create an overarching social value for the town despite no official local authority support (Figure 14).

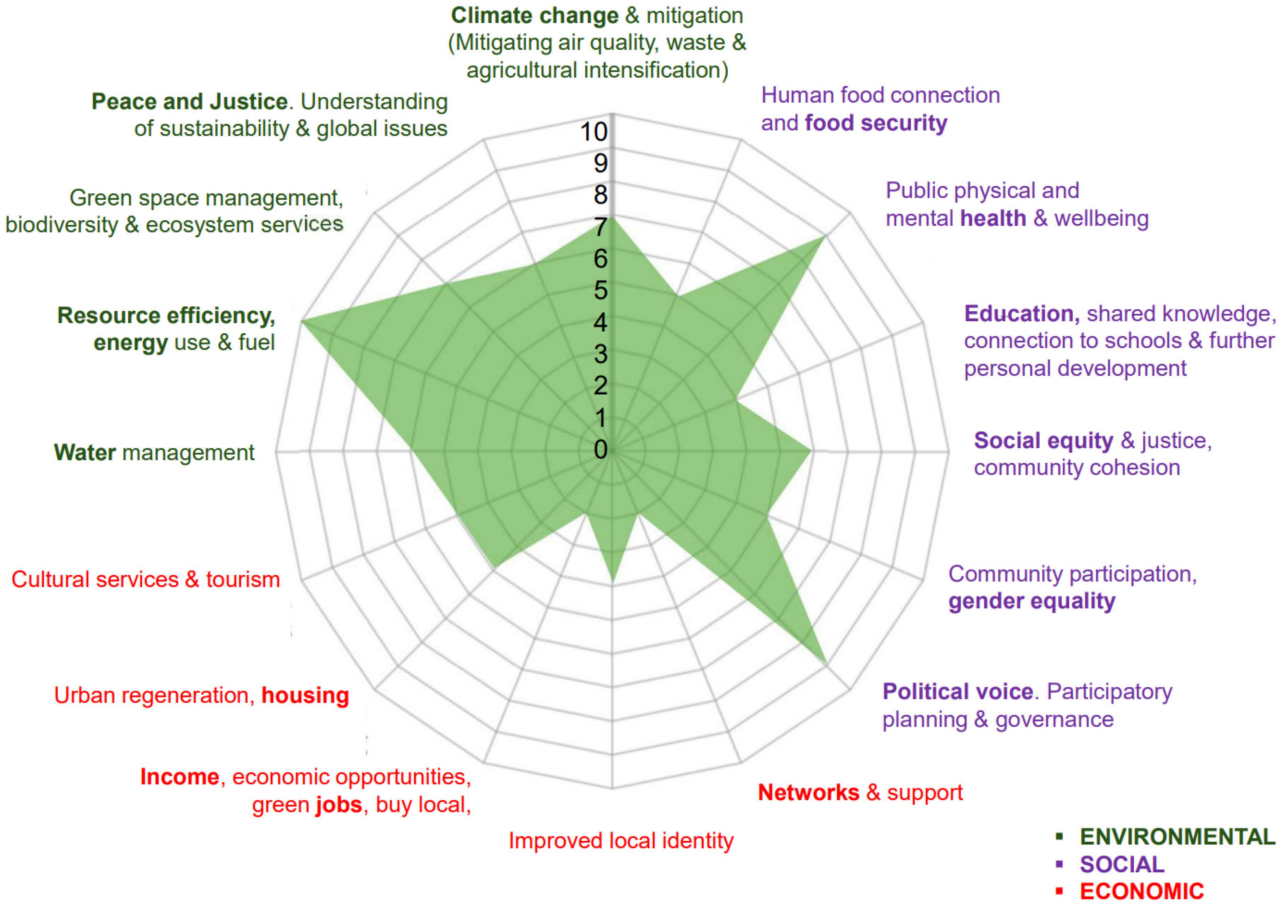

Figure 11. Constable Street Community Allotment, Hull, case study performance (authors' own).

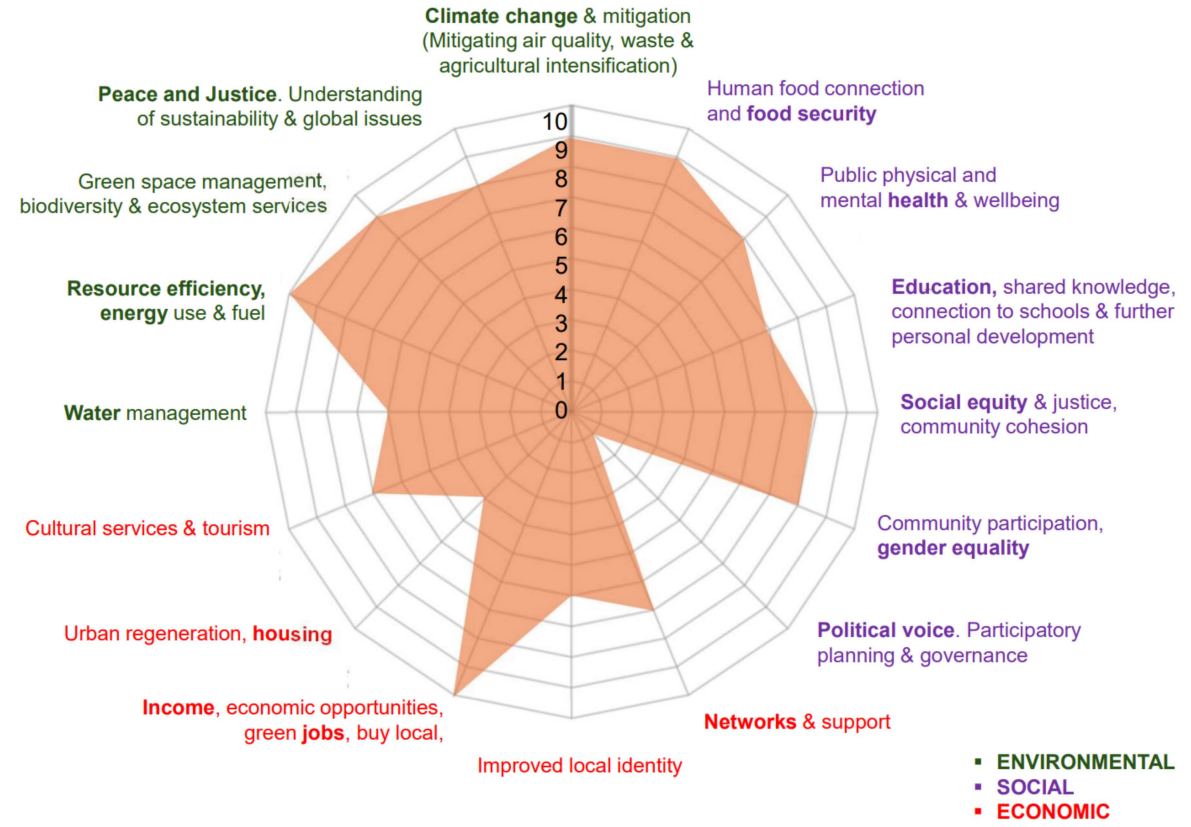

Figure 12. Frith Farm, Beverley, case study performance (authors' own).

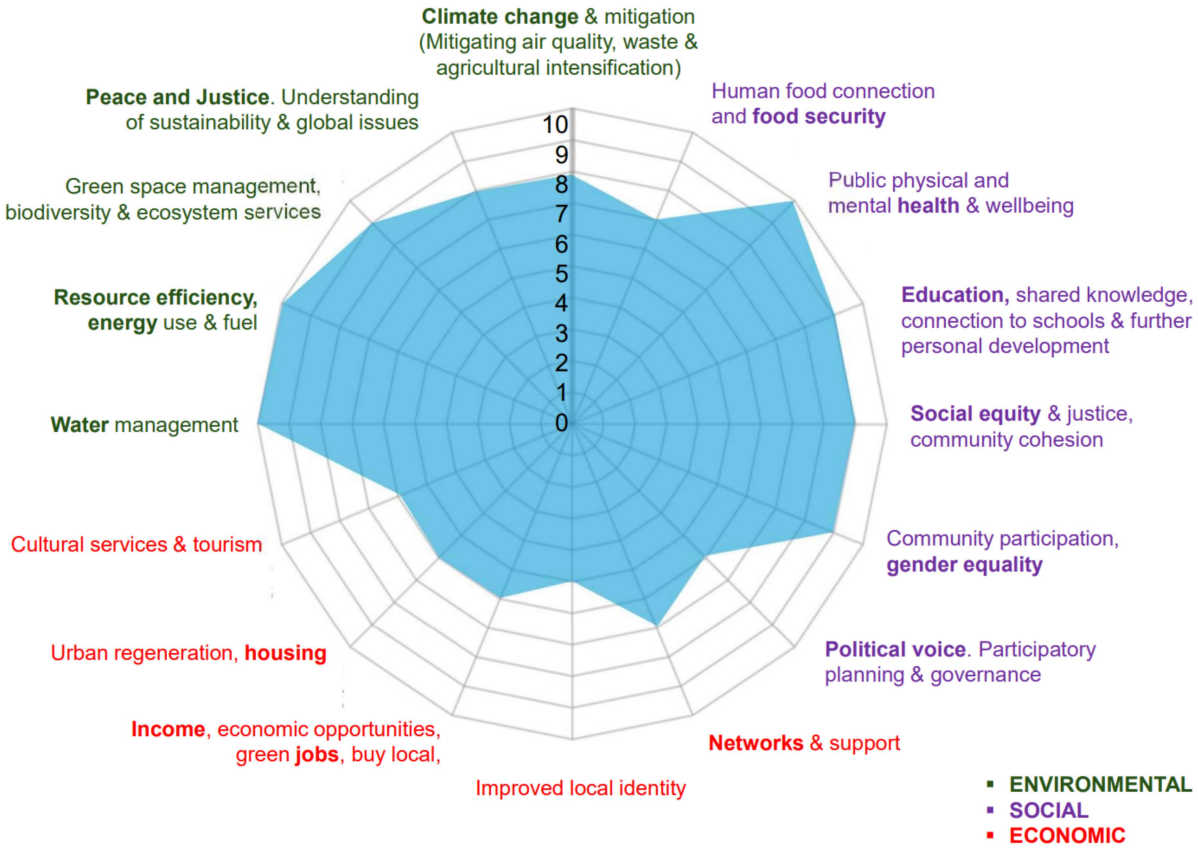

Figure 13. Hillside Garden, Lincoln, case study performance (authors' own).

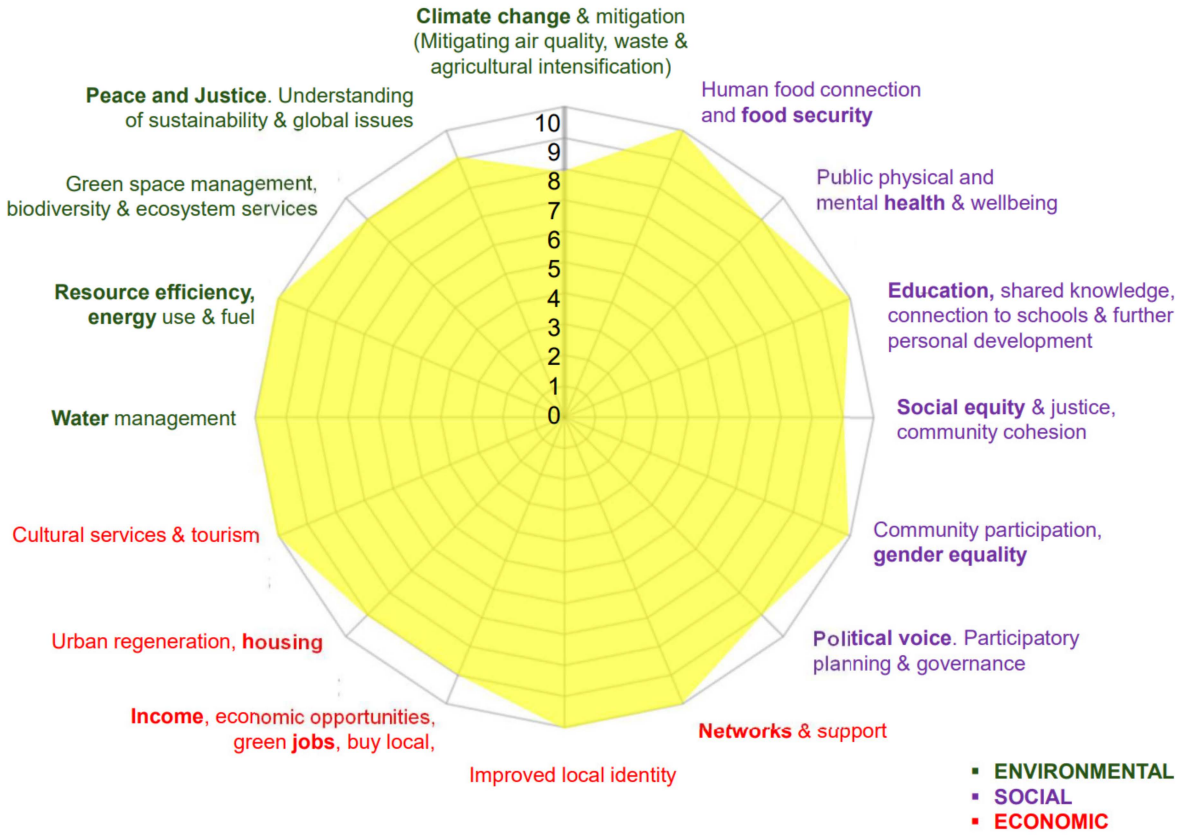

Figure 14. Incredible Edible, Todmorden, case study performance (authors' own).

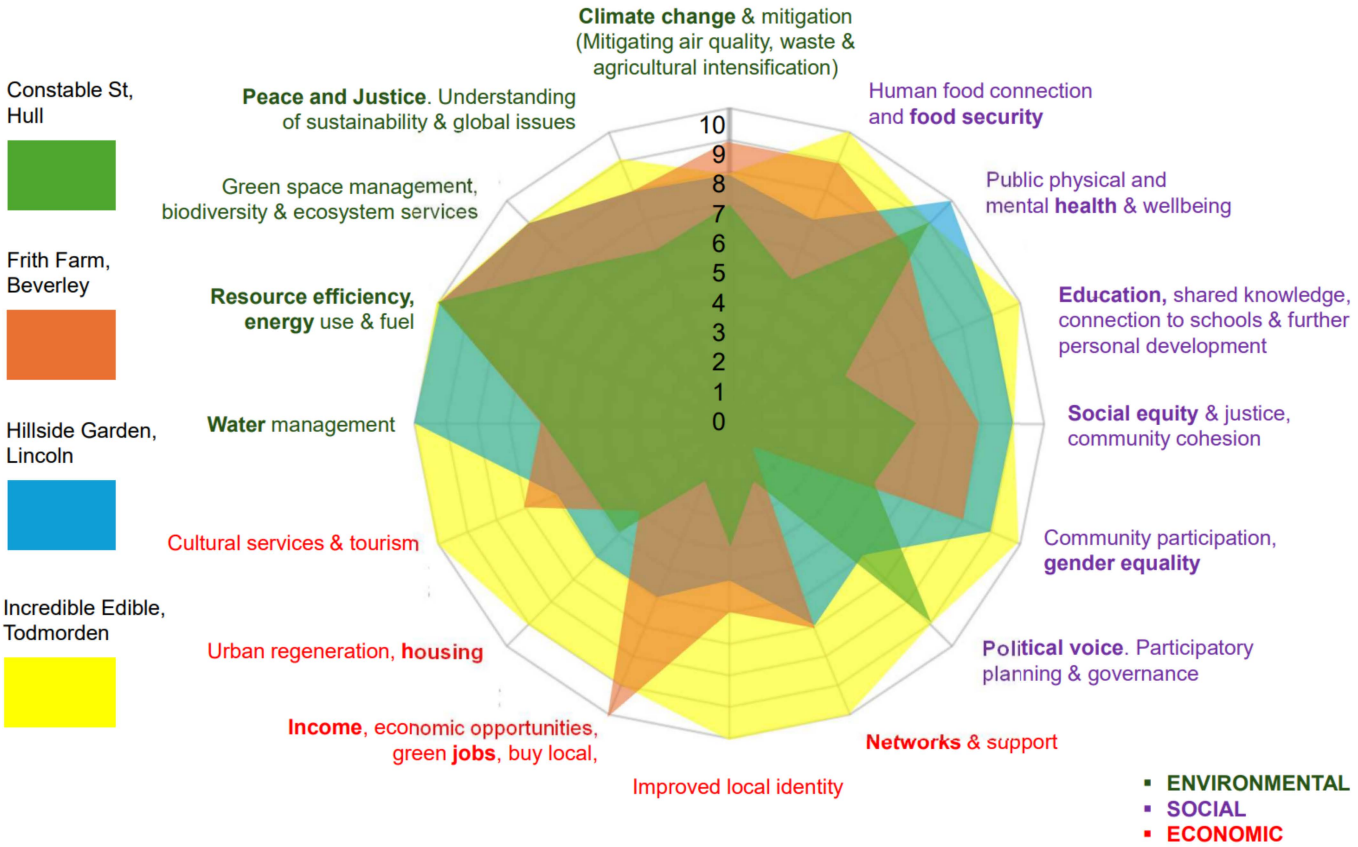

Figure 15. Cross-case study comparison of all four growing groups (authors' own).

4.7. Site Visit Summary

The empirical results identify that the overall significant benefit for ECs is community cohesion and social support (Figure 15). The evidence indicates that achieving food security has a lower priority than other socio-urban challenges. This is supported by Farrier, who suggests that in the global north, ECs have limited impact on food security and provision [78]. This could be a result of dominant competition from large supermarkets who offer cheap and convenient globalised food. EC food production is unlikely to compete with traditional forms of agriculture due to the challenges of land availability, accessibility and time constraints of busy lifestyles. Instead, ECs are focused on building resilient communities by fostering social justice, equity, bonding and place attachment [40] and improving community cohesion, physical, mental health and wellbeing [40] while addressing ecological responsibility. Each community garden addresses its unique, perceived critical issues, of which the most mentioned are social deprivation, a lack of social interaction and mental health (S.M.A.A.6.1 and 2). The most significant barriers for enabling EC transformation are attaining land and securing time from intergenerational volunteers; these challenges align with other EC studies [11,13,98]. In all cases, community growing can have the ability to influence pro-environmental [40] and societal behavioural change. In turn, this nurtures the HNFC, which benefits urban regeneration and health, because people take more pride in their environment and think twice about their food choices. The next section discusses emerging contextual themes enabling EC transformation that unfolded during case study analysis.

5. Discussion and Emerging Themes

5.1. Emerging Themes: Using Social Prescribing in ECs to Benefit the Community

All of the case study growing groups participate in green social prescribing (GSP) [116] by collaborating with their local GP or social service providers, and are frequently situated in deprived areas [117]. The case studies' social prescribing values align with the definition that therapeutic landscapes enable conventional health services to be supplemented by nature-based approaches as highlighted in case studies in London and Singapore [42,43]. Constable Street's dominant benefit and contribution to the community is through social prescribing. They create a safe space in a deprived area, allowing people the opportunity to chat, interact and provide meaningful participation through human–nature connection (HNC). Hillside Garden in Lincoln provides a higher level of non-medical care, rehabilitation and education to support the local community with mental health recovery or other related conditions. Frith Farm volunteers have social worker backgrounds, which is beneficial when they receive volunteers who are transitioning out of care facilities. Other groups, such as the Royal Horticultural Society (RHS) wellbeing programme, have also undertaken transformative social prescribing in nature-based spaces to heal, reconnect and improve confidence, self-esteem and wellbeing [117]. Since COVID-19, GSP is at an all-time high, it is proven that human health benefits significantly outweigh any current known risks, including urban soil pollution [116].

A challenge for making GSP effective is retaining volunteers. Constable Street struggles to provide task variation and often loses participation because "gardening isn't for everyone" (S.M.A.A.6.1). To increase participation, Hillside Garden tailors their projects to the motivations, skills and interests of the participants because "some people don't like gardening" (S.M.A.A.6.2). It seems a missed opportunity that Hillside Garden is adjacent to their landlord, Lincoln County Hospital, yet there are no GSP collaborations or partnership programmes. Furthermore, later this year, the hospital is taking land back from Hillside Garden to extend their car park, which will put the area's social health at further risk. More is needed to communicate the potential benefits of EC social support services on the

NHS, especially at a time of public health cuts under the UK government's austerity [43]. Schoen calculated that the social benefits of medium-sized community gardens provide an approximate health benefit of GBP 320 million, equivalent to 3% of the NHS's spending on mental health in England in 2019 [43].

5.2. Emerging Themes: Using Social Capital to Enable EC Transformation

All case studies reveal that community growing groups function on participation and cooperation from society, which is dependent on social capital. Social capital is described as "the glue that holds societies together and without which there can be no economic growth or human well-being" [118]. Social capital relies on strong citizen relationships to be able to share information, organise, mobilise, influence and create opportunity [96], which bears similarity to guerilla gardening activism in Los Angeles and Detroit [49,50,52]. Both Hillside Garden and Todmorden successfully foster a network of social bonds through shared values. This enables grassroot co-creation, which in turn anchors the community. This affirms Scharf's study of Berlin, which concluded that a collaborative community is a key actor to EC success [5]. EC social capital reconnects people through accessible green space activity; studies have shown that it creates opportunities for preserving cultural knowledge, sharing new knowledge and providing a sense of belonging, self-identity, social support and wellbeing [2,37,98,119].

Glennie discussed that social capital for deprived areas, such as Hillside Garden, is fundamental to the health of communities who have relatively low levels of other forms of capital [66], such as natural, human and economic [120]. Hillside Garden offers a variety of areas for the community to interact or have private therapeutic moments: offering free picking in their orchard, hosting free public events and community BBQs and providing knowledge exchanges to neighbourhood participants and schools. Residents in Todmorden get along and work together in community gardens, which improves the social sustainability of the area. Glennie's research concludes that when people discover their neighbourhoods, the social capital of the community increases because there is greater communication, activity, trust and stability and habitants find life fulfilment [66]. Social capital has also been recognised as a driver of economic growth, resulting in greater economic prosperity for the area [121]. As a result of social capital, Todmorden is a safe, attractive environment to be in and ensures the sustainability of the community itself. This is supported by Glennie, who concluded that governments responsible for urban development need to place value on the social sustainability of ECs; otherwise, they will continue to undervalue them [66].

5.2.1. Accessibility Through Social Media

One of the biggest challenges for Frith Farm is that is it not easily accessible without a car. Constable Street has no online presence and restrictive opening hours; its low-income area has a diverse community that "does not mix" or have the time to participate due to job-seeking commitments (S.M.A.A.6.1). This is contrary to the evidence that suggest community gardens successfully integrate cultural and social boundaries [14]. Both claim securing intergenerational volunteers is a challenge; therefore, Glennie recommends communicating with the community through multimedia [66]. Other research has shown that if ECs could use technology to analyse activity and network to a younger generation, the multifunctionality of the gardens could increase [98] by targeting relevant interests of the community [122]. Incredible Edible enhances their social capital through social media and web presence, which elevates its marketing strategy, breaks down barriers for participation and inevitably brings new innovations and ideas from around the world. This aligns with peri-urban farmers in Italy who were interviewed, and it was concluded that

the improvement of communication strategies provided successful networking and citizen cooperation [98].

5.2.2. Social Control to Reduce Crime

Studies have linked green spaces and social capital to a reduction in crime, furthering the capacity for social control [2,66,121]. Social control acts as a neighbourhood institution where communities watch out for each other. Incredible Edible Todmorden experiences less vandalism by benefiting from online neighbourhood watch forums and, volunteers continually have eyes on the streets to help discourage anti-social behaviour. Planting gardens around the town, including the police station, breaks down social divides between authority and citizens. Breaking structural inequalities to construct just and inclusive societies for sustainable urban development was discussed earlier in Section 2.3. In turn, Todmorden's sense of civic pride has seen a reduction in crime, which supports the literature in that the environment is closely linked to environmental urban justice, as discussed earlier [2,5,14]. It also reduces associated policing costs [123]. Contrary to this, with gardens that are visually hidden or tucked away, as seen in Constable Street and Hillside Garden, vandalism and anti-social behaviour remain a big challenge.

5.3. Emerging Themes: Using Case Study Findings to Co-Create ECs

All case studies mention a general lack of food literacy or basic awareness of fresh food processes. As discussed in Section 4.2.2 with Frith Farm, it is increasingly difficult to compete with the convenience of large supermarket chains. Understanding EC technicalities is time consuming, and as shown in Section 4.1.2. Constable Street cited that time constraint is a significant barrier for EC transformation (S.M.A.A.6.1). Yet, studies have shown that people investing time to gain EC knowledge has significant and positive correlation with pro-environmental food consumption [40].

Frith Farm's full-time coordinators can freely experiment and learn through trial by error (S.M.A.A.6.1); however, not all participants have such time availability. While Constable Street's coordinator has a lifetime of permaculture experience (S.M.A.A.6.1), there is a struggle to transfer these skills to local participants; the lack of motivation for volunteers could be linked to lack of knowledge and awareness. Therefore, a feasible approach would be for the local authority to provide freely open spaces to experiment, while affording growing groups the platform to teach. However, Hull's top-down "right to grow" policy has provided this opportunity for land yet failed to manage any transferring of skills or knowledge. Hence, a policy without a clear structure for the implementation of transferring skills is not a successful or complete approach. The Constable Street interview suggests that rapidly creating multiple EC projects without a teaching platform could risk diluting the volunteer pool and vital experience transfer, which would be an EC disservice (S.M.A.A.6.1).

Therefore, resource hubs [124] are part of a crucial network strategy to obtain knowledge, experience and insight from lessons learned and mistakes within existing growing groups to be able to implement them elsewhere. This reflects findings from Urban Commons in Berlin that consider all stakeholders and shared cross-collaborative processes essential for EC attainment [5]. The Incredible Edible Network was created from the success of Todmorden; their aim was to promote shared education and learning to strengthen replication to other EC projects, both regionally and globally. Knowledge is power [125]; the facilitation of knowledge exchange, transferable skills and raising visibility also brings collective empowerment to lobby for recognition within city governance.

Another example of this network strategy is the European EdiCitiNet Living labs, which were created as meeting spaces for learning, testing and experimenting with

ECSs [13,115]. These network hubs support the research that education is an important social driver for growing groups [39]; Świąder states it has the potential to impact the whole community by providing basic life skills for a more sustainable future and reconnection with nature [11].

Todmorden has created educational areas and walks by installing informative signage throughout the town. This information involves encouraging people to pick the produce, informing people of what to do with it, volunteer information, pro-environmental thoughts and future ambitions for the town. Todmorden also successfully ties community and local business through a myriad of inclusive activities to suit a range of interests, such as gardening, creative workshops, lunches and many more. Mobilising different organisational skills increases the town's productivity and provides citizen empowerment through self-governance structures [17]. Expanding the knowledge field though collective infrastructure is based on the UN's global city network initiative to make cities resilient (MCR2030) [126].

Utilising Schools to Instil Behavioural Change

As mentioned previously in this article, knowledge, time and intergenerational participation are EC constraints. Therefore, a new generation of schoolchildren and higher education students are a demographic group that could mitigate these barriers. The Frith Farm and Hillside Garden interviews revealed that there is an increasing interest in reaching out to alternative food networks such as schools as a strategy to mainstream growing (S.M.A.A.6.1–2). Both engage in nonprofit social activities by engaging in school trips and educational programmes to manage a broader territory in sustainable development.

All case studies revealed that land availability is a crucial challenge for ECs; therefore, there is another opportunity to use school grounds as growing areas. Washingborough Academy in Lincoln utilises their playing fields for growing food, which is used for seasonal school lunches and sold on market days to the local neighbourhood [127,128]. Teaching children how to grow their own food, has also been successfully adopted in living lab case studies in Andernach, Germany, showing how it fosters environmental and health education of future generations across different socio-economic groups and creates environmental equity in urban areas [13]. In 2012, "Sprouting Oslo" was established to transform the urban food system, and as a result, an increase in the number of "green educational arenas" in schools and kindergartens has been seen [129]. Oslo's aims to be a "collaborative city of knowledge" encouraging new ideas, entrepreneurship and multi-stakeholder participation have helped subsidise initiatives and professionalise urban agriculture [13]. Additionally, more outdoor summer jobs for young people have been established [13]. Thus, public procurement between schools, kindergartens and universities has the potential to provide income opportunities for growing groups and improve the sustainability of the regional food system. Reaching out to a wider network is also supported by Sartison and Gullino, who both claim that a participatory approach of including academic institutions could potentially help strengthen and validate discussions with the local authority to encourage more sustainable development programmes for urban regeneration acceleration [39,98].

5.4. Incorporating EC Themes into Social Value

Social value encompasses the previously discussed emerging themes of (i) social prescribing, (ii) social capital and (iii) knowledge to the lives of EC stakeholders. This study emphasises the value of merging these three themes with local authority social values, as a method for communicating EC benefits for urban regeneration.

There are varying global definitions for the relatively new concept of social value, from being a vehicle to achieving the 17 SDGs [130] to improving quality life [131], wellbeing [132], equity, inclusion and environmental justice [133]. In general, the UK

government's "Public Services (Social Value) Act 2012" [134] requires local authorities to consider the economic, social and environmental wellbeing in connection with all public service decisions and contracts. The aim is to go beyond money as the main indicator of value, putting emphasis on a "people-led" perspective as a driver for positive change instead [131,135]. As all the case studies revealed, community growing groups have differing motivations and priorities considering their geographical location. Thus, this study concludes that social value depends on a project's unique and context-specific needs. Hull City Council was the first city council to align their social value policy with community growing groups by passing the "right to grow" motion. Their objective is to create transformational partnerships with the community and provide the opportunity for residents to grow nutritious food and make their money go further [136].

The City of Lincoln's social value policy is defined as a process that "benefits all residents by improving the quality of life, life chances and enhancing civic pride" [137]. This includes engaging in local community groups and undertaking community projects to tackle poverty and provide accessible green space [137], which is by definition an EC. Lincoln City Council's Vision 2020 strategy encompasses four principles (which are aligned with an ECS): (i) foster economic growth (buy local), (ii) reduce inequality (community cohesion), (iii) deliver quality housing (urban regeneration) and (iv) enhance our remarkable place (local identity). The case study themes have shown that they could contribute to these main policy areas. The circular framework diagram in Figure 16 aims to tailor ECSs through social value in Lincoln by addressing its specific local needs with focus on becoming a healthier city in accordance with ONS health index scores [29] (S.M.A.A.5.1), as discussed in the Introduction. The three sections summarise the emerging themes and how they support regional sustainable development and align with Lincoln City Council's social value policy objectives. Similarly to Incredible Edible's model of three spinning plates [62], a growing project can launch with one strong section; subsequently, it can then focus on activating the other two sections to enable successful EC transformation.

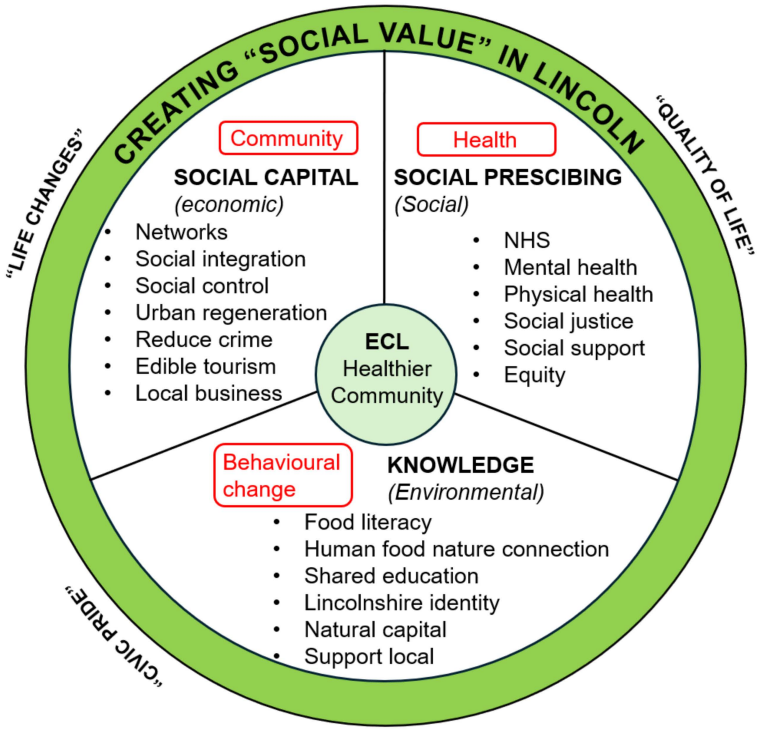

Figure 16. Edible City Lincoln (ECL), creating social value through community growing spaces (authors' own).

This article confirms that adding social value to the community through ECs can contribute to positive effects on quality of life (social), urban regeneration (environmental) and the local economy (economic). However, other research suggests that there can be undesired effects of green gentrification [14,62]. The Todmorden interview revealed that many young people are moving to an upcoming commuter town to become involved in the growing activities (S.M.A.A.6.2); therefore, ECs have the capacity to act as a social disservice to lower income citizens. Mitigating the risk of displacing lower income households requires a holistic ECS approach. ECSs must provide a direct relationship between local authority, citizens and the immediate area to foster a strong involvement with the entire community, which is supported by Säumel's studies on social resilience [14]. In the next section, a holistic framework for EC transformation, inclusive for all stakeholders, is presented.

5.5. Edible City Lincoln (ECL) Framework

The interviews revealed that community growing groups often require local authority support for land access and administrative or financial assistance (S.M.A.A.6.1–2). Therefore, top-down governmental cooperation is necessary for successful EC mainstreaming. This is supported by Russo [47], who highlights that green city stakeholders with differing agendas require a top-down governmental platform to organise, manage, and provide empowerment for change. In September 2023 and April 2024, the Hull and Runnymede Councils recognised the importance of community growing and "right to grow" motion as an integral part of urban and social regeneration [17]. The local action policy aims to eliminate some of the barriers and administrative legal challenges to aid smooth EC transformation. However, Artmann studied growing groups in Germany and concluded that low EC engagement is linked to a lack of interest due to a dominant top-down organisational approach [40]. Furthermore, Constable Street struggles with a single-actor bottom-up initiative, which suggests that shared responsibility is required to achieve transformative change. Therefore, a mixed method of bottom-up community initiatives and top-down governance is essential for implementing the ECL with a clear structure for implementation and knowledge sharing. This supports Diehl's findings in hi-tech farming in Singapore that calls for collaborative cross-agency development [57]. The EC stakeholder map (Figure 17) identifies relationships and aims to strengthen communication between all parties. The new EC framework (Figure 18) will focus on the integration and inclusion of all high-interest groups, whether they have high or low power.

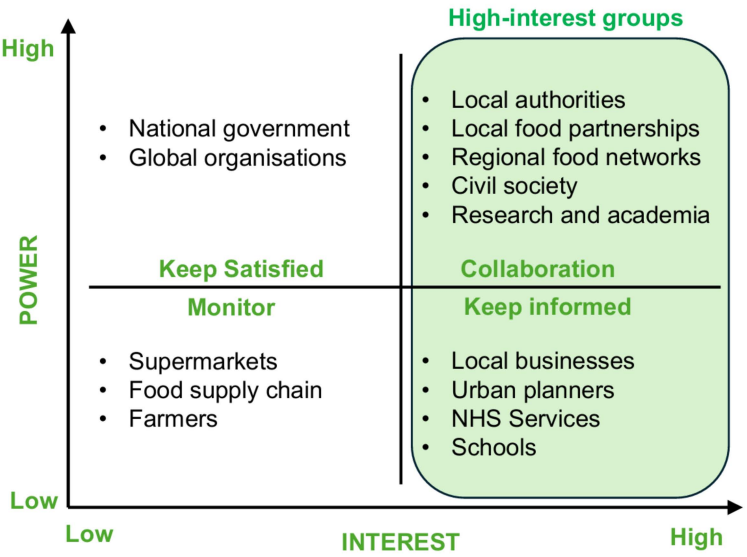

Figure 17. EC multi-stakeholder map (authors' own).

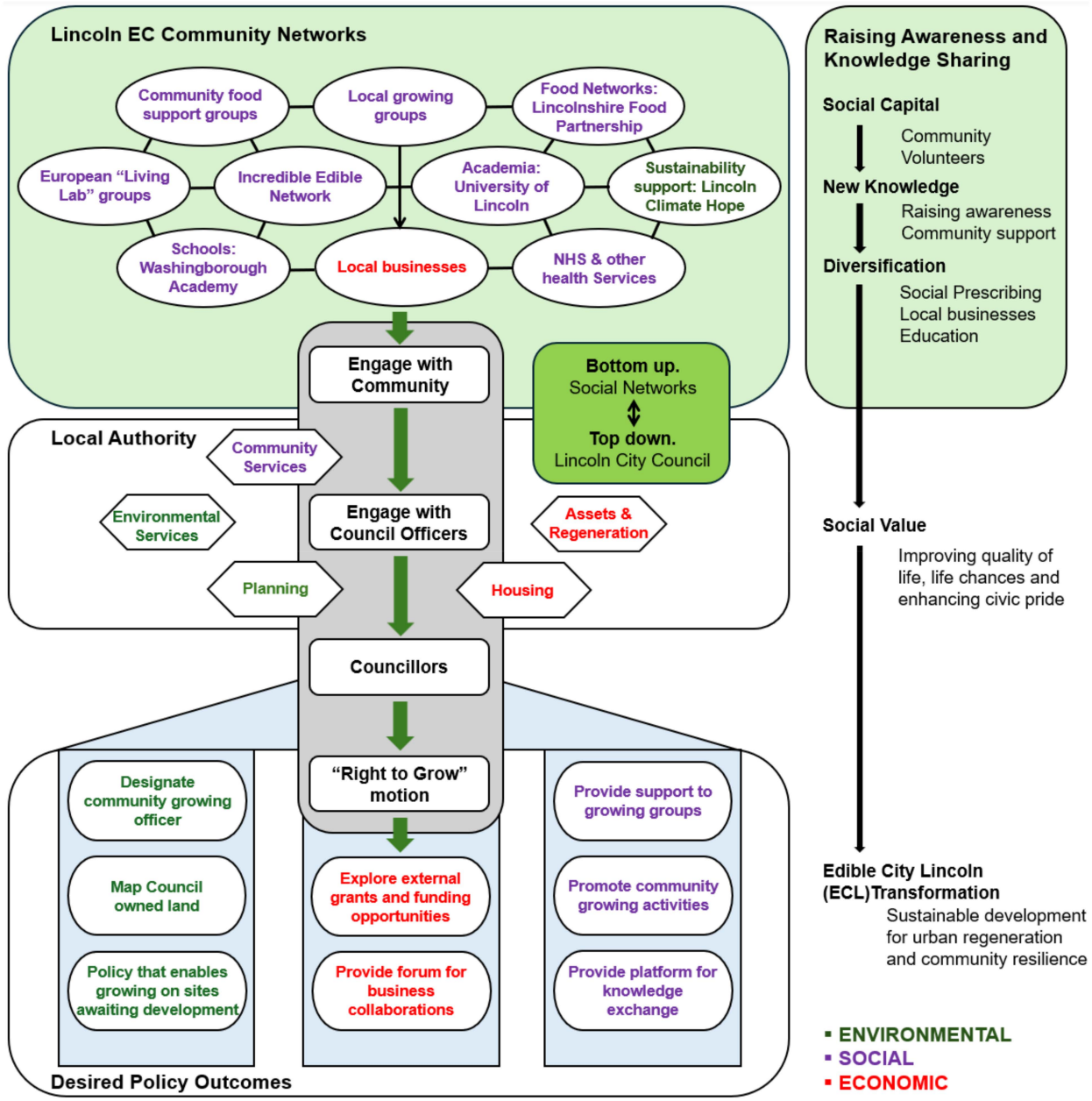

Figure 18. Edible City Lincoln (ECL) framework (author's own).

The case studies and interviews presented in this paper reveal that ECs can alleviate some of Lincoln's problems of declining health, poverty, government austerity and wider global geo-political challenges, as described in Section 1.1 (Figure 1). This research indicates that ECs also have the potential to positively contribute to Lincoln's social value strategy and future development for a sustainable and resilient city (Figure 16). It is therefore fundamental to effectively communicate the context-specific benefits of community growing to the local authority for successful EC mainstreaming. The new EC framework (Figure 18) aims to achieve "right to grow" within Lincoln's urban redevelopment process and suggests avenues of strategic networking support to enable EC transformation within a clear structure for implementation and avenues for knowledge sharing. The framework captures this empirical study's findings and is supported with the practicalities and political challenges associated with achieving "right to grow" with Runnymede Borough Council 2024 [138]. The transferability of the proposed framework aims to be flexible and easily adapted across global contexts, to meet varied cultural, environmental and geographical conditions.

As discussed in Section 4.3, collective community groups are a vital stimulus for sharing knowledge, which is a key theme. The framework encapsulates an interdisciplinary network approach that utilises social capital with existing knowledge and a range of resources to break down barriers for motivation, which provides empowerment for action. Studies have shown that collective participation can effectively gather momentum to enable strong top-down leadership support from the local authority [11,40]. This can begin the governing process of ensuring that there is available land and policies to allow for the ad hoc activation of EC groups.

6. Conclusions and Recommendations

This study provides a critical cross-case study analysis of edible city (EC) initiatives across four community growing groups in the UK, examining the unique socio-geographical challenges they face and their collective benefits to community wellbeing and sustainability. The findings indicate that EC activation is inherently responsive to their cultural and environmental factors; therefore, their function, mission, vision and values often diverge or overlap. This explains why initiatives like Incredible Edible Todmorden are challenging to replicate directly. While the findings indicate that ECs are multi-dimensional, the case studies capture four broad common themes across the EC groups: (1) social prescribing, (2) social capital, (3) knowledge sharing and (4) social value. These insights are captured into a locally adaptable EC framework for Lincoln, UK. This framework provides a guideline for diverse stakeholders to achieve "right to grow" policy and structure, enabling EC activation and transformation.

Each EC initiative benefits from an in-depth understanding of its community's cultural, social and environmental landscape, which informs local agendas, resources and policies. The proposed EC Lincoln (ECL) framework is thus designed to be flexible and adaptive, accommodating the unique needs of individual neighbourhoods within a broader context, who perceive different solutions of urban sustainable development.

This study highlights the universal relevance of the key themes identified—social prescribing, social capital, shared knowledge and social value—as critical global needs. The challenges of mental health, food security and social cohesion are not confined to the local contexts explored here but are pervasive issues across urbanised areas worldwide. These challenges are closely aligned with the broader trends of global urbanisation and the objectives of the United Nations Sustainable Development Goals (SDGs), particularly SDG 11, which advocates for inclusive, safe, resilient and sustainable cities.

Social prescribing, recognised as an emerging global practice, has gained significant traction in countries such as Canada, the UK and Australia, where it serves as a non-clinical intervention for improving health and wellbeing through community engagement. Similarly, shared knowledge and the fostering of social value have been instrumental in building resilience in diverse urban contexts. From community-led gardening projects in densely populated cities to innovative uses of indoor and outdoor public spaces, such initiatives reflect a broader need for scalable strategies that enhance urban food systems and strengthen social infrastructure.

Addressing these universal concerns, the findings of this paper offer a transferable framework that is adaptable to global contexts, providing a foundation for sustainable urban regeneration and resilience beyond the UK.

Top-down: Checklist policy recommendations for Lincoln City Council

- Green Social Prescribing: Provide a gateway to incorporate EC initiatives into green social prescribing programmes promoting collaborations and partnership opportunities between Lincoln County Hospital, NHS GPs and other social health services.

- Educational Integration: Encourage edible education within schools, integrating EC activities into curricula to foster practical experience and long-term behavioural shifts toward sustainability.
- Community Building: Support community cohesion through accessible green spaces and networking platforms that empower local growing groups.
- Awareness and Engagement: Launch and promote "Edible City Lincoln" through targeted campaigns through signage, multimedia and eco-tourism to bring awareness, activity and knowledge and broaden public engagement.
- Civic Pride and Resilience: Strengthen connections between city authorities and EC groups to encourage inclusivity and active participation across all community sectors. This will break down social divides and structural inequalities to construct a just and an inclusive society for sustainable urban development that aligns with UN SDG11.
- Public Procurement Policy: Implement an EC public food procurement policy that prioritises locally grown produce to provide more opportunities for growing groups and improve the sustainability and cultural identity of the Lincolnshire agri-food system.
- Bottom-up: Checklist recommendations for community action in Lincoln:
- Expanding EC Functionality: Explore innovative solutions that expand EC multifunctionality and increase social capital; reaching out to a more diversified community interest expands the volunteer pool and inclusivity and provides economic opportunities.
- Partnership Development: Enhance partnerships and collaboration with other networks via local resource hubs, such as the Lincolnshire Food Partnership. This is a crucial collective strategy to build a robust support network that can advocate policy support from local authorities.
- Academic Engagement: In pursuit of further research, a participatory approach of local academic institutions such as the University of Lincoln to help strengthen and validate discussions with the local authority is encouraged for more sustainable development programmes in the broader context of urban regeneration.

Recommendations for future research would be to conduct further studies to quantify how EC social support services can contribute to healthy urban environments and complement NHS health services, as well as conduct further examination of the long-term impacts of the "right to grow" policies on urban spaces, governance, community and volunteer resources with longitudinal data. This could be useful for understanding the long-term sustainability and impact of EC initiatives on community resilience, food security and urban revitalisation. As edible cities expand and more edible produce is consumed, future studies on urban pollution entering the food chain should also be required. Finally, further research into measuring how ECs can enhance a city's social value and social sustainability with quantitative data that measure the economic impact of the edible city initiative through cost savings, job creation and the stimulation of the local economy.

This study's findings, based on four case studies, offer valuable insights but should be interpreted with caution regarding broader applicability across the UK. Nonetheless, the framework and themes presented provide a transferable model that can guide sustainable urban regeneration and community resilience efforts in diverse contexts nationally and globally. By fostering inclusive and ecologically mindful practices, edible cities contribute significantly to sustainable development, supporting cities worldwide in meeting SDG11 objectives.

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