

LOST IN TRANSLATION? REVISITING SUBARCTIC PRINCIPLES FOR SUSTAINABLE SOCIAL HOUSING IN BYKER, UNITED KINGDOM

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Abstract. The redevelopment of the Byker Estate in Newcastle upon Tyne (1969–82), designed by Ralph Erskine, is widely recognised for its serpentine wall and its participatory planning process. Yet it also deserves attention as a rare instance where architectural principles developed in the subarctic were translated into a British welfare-state context. This paper revisits Byker through the lens of Erskine's concept for designing climatic and social thresholds that mediate between exposure and comfort. Drawing on Erskine's own writings, comparative evidence from his other projects, and empirical evidence, the paper examines how strategies of sheltering mass, orientation, and thickened thresholds were adapted to Newcastle's temperate climate. The analysis combines architectural reading, archival interpretation, and resident perspectives derived from field observation, a door-to-door questionnaire (n = 45), and semi-structured interviews (n = 6). The findings show that Byker's wall-and-court morphology continues to temper wind, buffer noise, and create sunlit, sheltered spaces. At the same time, thresholds such as porches, balcony stairs, and coloured entrances remain legible and operable for residents. However, the results also suggest that comfort is often experienced at the household scale rather than communally; perceptions of warmth and quietness are closely tied to concerns about maintenance and governance. The transferable lesson is not the replication of details, but the adoption of principles: manufacture microclimate at the scale of plan and section, make protective edges readable and adjustable, and sustain their operability through participatory maintenance systems. Crucially, the protecting function today must be reinterpreted not only as a historical lesson but as a future-oriented strategy.

Keywords: Byker Estate, Ralph Erskine, subarctic architecture, welfare modernism, climate-responsive design, resident perspectives, sustainable housing.

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1. Introduction

The urgency of aligning climate adaptation with social equity has reanimated debates about the legacy of post-war housing. Across Europe, policymakers and scholars increasingly revisit welfare-state projects not only for their social ideals but also for their latent environmental intelligence (Pressman, 1996). In the United Kingdom, one of the most discussed examples is the Byker Estate Redevelopment in Newcastle upon Tyne (1969–82), designed by the British-Swedish architect Ralph Erskine. Byker is widely celebrated for its participatory planning process, which attempted to maintain community continuity during redevelopment (Abrams, 2003; Vall, 2012) and for the dramatic serpentine wall that reshaped the city's eastern edge (Roberts, 2010). Yet its international significance lies also in its role as a site where Erskine adapted architectural strategies originally conceived for Arctic and subarctic environments.

From the late 1940s through the 1960s, Erskine developed a distinctive “grammar” for building in northern climates, articulated in writings such as *Building in the Arctic*

(1960), *The subarctic Habitat* (1961), and *Architecture and Town Planning in the North* (1968) (Andersen, 2014). He refers to this grammar as “protecting function,” which is a climatic-social device that buffers exposure while enabling residents to modulate their relationship with the environment (Andersen, 2014). Erskine's long career in Sweden, including projects in Kiruna, Svappavaara, and an unbuilt plan for Resolute Bay in Canada, tested these principles before being re-interpreted at Byker. Newcastle's climate is milder than subarctic cities such as Kiruna, but it is characterised by driving rain, freeze–thaw cycles, and north-eastern winds off the North Sea. Hence, while Byker provided an opportunity to examine the adaptation of this grammar to a very different context, relatively little attention has been paid to its place in Erskine's broader subarctic trajectory in the British welfare-state context. This paper responds to that gap by examining how design strategies derived from extreme climates were translated into a temperate welfare-state context, and what implications this translation holds for contemporary sustainable housing.

Sustainability in housing is multidimensional, encompassing interrelated environmental, social, cultural, and economic dimensions at dwelling and neighbourhood scales (Chiu, 2004). Recent housing research identifies environmental or ecological, social, economic, cultural, institutional, governance, and material-technological dimensions, while emphasising that these dimensions may involve tensions and trade-offs rather than align automatically (Hemmersam, 2023; Tynkkynen et al., 2026). In this study, sustainable housing is used in a bounded sense to describe the capacity of housing design and management to sustain comfort, social interaction, and cultural belonging over time. Accordingly, the analysis focuses on these environmental, socio-cultural, and governance-related dimensions, while measured energy consumption, life-cycle environmental performance, and housing affordability fall outside its empirical scope. The aim of this study is therefore twofold:

- 1) To situate Byker within the lineage of Erskine's sub-Arctic architectural thought and practice, clarifying which principles were transferred and adapted in translation.
- 2) To assess, through desktop research and fieldwork, how these principles are associated with residents' sense of comfort, identity, and community more than five decades later.

By combining the reading of physical design with published sources and resident perspectives, the paper describes how the protective function was materialised in the estate. The paper argument is built in four steps. First, a concise background is provided to reconstruct Erskine's northern grammar and place Byker in the context of the UK social housing movement. Second, the Methods locate our approach within architectural reading, comparative vignettes and a light triangulation with resident signals. Third, we describe how Byker's wall, courts and thresholds enact microclimate rules and present resident signals that align with (or complicate) the climatic reading. Fourth, the Discussion assesses the gains and limits of translation, and the conclusion extracts lessons for contemporary, low-carbon social housing. Accordingly, the article contributes to two overlapping debates: first, about the historiography of welfare housing, which often treats environmental strategies as secondary to social aims (Abrams, 2003; Roberts, 2010) and second, about climate-conscious urbanism, which is increasingly searching for low-energy, socially legible strategies rooted in morphology rather than technology (Luciani & Poma, 2023; Pressman, 1996).

2. Arctic principles and Byker Estate design

Researchers discussed approaches to social housing in the post-war UK in terms of two different periods, marked by shifts between social democratic and neoliberal ideologies in governance (Stevenson, 1991). Although these different periods are considered not to result in a distinguishable form of architectural language (Day, 1988), the contrasting political visions left a lasting imprint on the

development of social housing in the UK. The first phase was defined by the post-war rise of the welfare state and social democracy, exemplified by the Labour government's 1945–1951 housing policy. The second phase marked a decisive turn toward market-driven, consumer-oriented governance, emerging in the 1950s and reaching its height under Thatcherism (1979–1990). Accordingly, the first period marks the materialisation of social democratic ideology by constructing social housing through promoting civil democracy and citizen participation (Kefford, 2018). Also, the first period demonstrates the use of specific architectural language influenced by Swedish and Corbusian designs (Bullock, 1987), which is characterised by a mixed development that combines high-rise flats and low-rise maisonettes (Svenarson, 2014). Hence, in the first period, architecture emerged as a powerful tool for expressing social democratic ideals, which is hailed as the “golden age” of the welfare state (Stickells, 2016).

The Byker Estate Redevelopment (1969–82) by Ralph Erskine in Newcastle upon Tyne, UK belongs to this golden heritage. It is considered a bold architectural experiment (Bambó, 2018), and captures one of the first examples of co-participation in community-making (Pendlebury & Haley, 2021). Erskine was a British-born architect who established his practice in Sweden in 1939. He is considered one of the pioneering modern architects who introduced design strategies shaped by his experience in Arctic regions, where design is closely tied to survival and social cohesion in extreme climates (Ferrer Forés, 2021). Arctic sustainable design concerns addressing unique and harsh environmental challenges of Arctic regions, including extreme cold, high winds, unrelenting sunlight in summer, and remoteness (Hemmersam, 2016). In the hands of Erskine, this is translated into prioritising warmth, protection, and social vitality, embedding a sense of place and cultural identity into projects (Caldenby, 2014). Erskine describes this philosophy of design as placing “people in the climate” (Erskine, 1968), which, beyond making buildings climate responsive, foster social cohesion and a sense of “belonging” among occupants. The same concept is referred to as “climatically suited community” (Egelius, 1990). Nonetheless, integrating climate-responsive design to form sustainable communities is not limited to harsh arctic conditions. Erskine highlights that creating favourable microclimates and cultural continuity are universally applicable, making the approach valuable across diverse climates (Maudsley, 2020).

Across his writings and northern projects, four interlinked principles emerge (see Table 1 for the summary):

The protecting function and sheltering mass: This principle concerns the creation of protective forms that mediate between exposure and comfort. In his *Subarktisk Elementarbok* (1963), Erskine defined the *protecting function* as fundamental to life in the north (Andersen, 2014). This took the form of perimeter walls, dense building clusters, or terraced forms that broke the wind and created enclosed, warmer microclimates (Avango et al., 2022)

Table 1. Key sub-arctic principles in Erskine's architectural grammar

Principle	Definition	Architectural device
Protecting function / Sheltering mass	Mediation between exposure and comfort through dense forms that buffer wind and noise.	Inhabited walls, perimeter blocks, clustered terraces.
Orientation & microclimate	Maximise solar gain, avoid frost pockets, use slope/topography to temper climate.	South-facing terraces, staggered roofs, glazed balconies.
Seasonal adaptability	Spaces that contract in winter and expand in summer, accommodating seasonal extremes.	Indoor-outdoor transitions, balconies, seasonal courtyards.
Thresholds & social interfaces	Thresholds as climatic buffers and social nodes mediating between private and communal life.	Porches, galleries, balcony stairs, coloured entrances.

Orientation and microclimate: Erskine argued that northern settlements should “open like flowers to the sun of spring and summer but turn their backs on cold winds” (Erskine, 1968). Studies emphasise the importance of siting on south-facing slopes, avoiding frost-prone valleys, and shaping roofs and balconies to capture scarce light while shedding snow (Luciani & Poma, 2023; Poma, 2021).

Seasonal adaptability: Subarctic design must allow contraction to insulated, protected interiors in winter and expansion to outdoor or semi-sheltered spaces in summer. Erskine's diagrams show how spaces should be usable across changing conditions of snow, thaw, and continuous daylight (Andersen, 2014). Pressman generalises this in his “winter cities” framework, emphasising year-round usability of public spaces and the extension of the outdoor season despite long winters (Pressman, 1996).

Thresholds and social interfaces: Fourth, Erskine stressed thresholds as architectural devices that mediate not only climate but also social interaction. Porches, galleries, balcony stairs, and semi-public entrances extend the domestic sphere into shared space, fostering what he called gathering and countering the risk of social isolation in harsh climates (Andersen, 2014). Luciani and Poma (2023) show how such thickened thresholds in Kiruna and Svappavaara served as both climatic buffers and places of casual encounter.

Looking back at the context of post-war social housing in the UK, Erskine's utopian vision stands out as a compelling response to the search for an architecture that embodies social democratic ideals. In the 1960s, Newcastle was experiencing a transformation from an industrial city to an administrative centre (Bambó, 2018), looking to symbolise the transition from a grey industrial town to a modern one for the whole Northeast (Egelius, 1990). Hence, the modern utopian vision particularly fitted the purpose. The Byker Estate project targeted an area of two-story terraced houses built in the 1880s for the workforce in the rapidly expanding shipbuilding and heavy engineering industry to improve the poor living conditions, while preserving the well-established community (Collymore, 1994). In his reappraisal of the initial report in 1970, Erskine outlined the project's objectives as creating an affordable and integrated living environment that values traditions, surroundings, and existing life patterns within a recognisable physical form (Erskine, 1970; Futagawa & Egelius, 1980).

The resulting design combined low-rise homes with high-rise buildings, revoking Swedish Modern representation through brightly painted woodwork, as characterised by the defining traits of the early welfare state housing era. However, in detail, the project reflects Erskine's principles of climatically suited communities.

The project's iconic roof forms, terraced layouts, and even the distinctive peripheral wall demonstrate Erskine's adaptive approach. While the Byker Wall is a horizontal structure, it remains the development's tallest architectural feature. Its horizontality is therefore more a function of scale than an absence of verticality. However, in adapting these ideas to the more temperate climate of Newcastle, features originally designed for subarctic survival now place greater emphasis on accommodating summer-time activities. For example, balconies in the Byker Wall are designed as communal spaces with amenities that encourage residents to spend time outdoors, as illustrated in Figure 1, shifting their function from seasonal storage in colder climates to active social spaces. Similarly, the sloped rooftops of the stairwell enclosures are no longer primarily intended to manage snow loads. Instead, painted in a light blue, they bring vibrancy to the building and create a striking visual contrast against Newcastle's skyline. Regarding the vertical envelope, the curvilinear wall-like flats around the Byker project were turned into an iconic structure, which was designed to make the most of the heat. At Byker, the wall is placed between the crest and hill, sheltering the south slope in front of it from the North Sea winds and opening it towards sunlight coming from the south. Additionally, with a new metro and a ring road being built, Erskine used the wall as an acoustic buffer to ensure quietness during the day and night. Creating quiet environments was the quality that Erskine especially followed in forming habitable communities (Collymore, 1994).

Accordingly, the Byker Wall Redevelopment project represents Erskine's adaptation of subarctic design principles to a milder climate, implemented within the framework of socially driven welfare housing. However, some scholars argued that the Wall physically and symbolically segregated the Byker community from the rest of the city, contributing to a loss of belonging, vandalism, and eventual gentrification (Abrams, 2003). While more recent research has questioned the extent to which architectural design can be linked to a sense of belonging (Yarker,



Figure 1. Adoption of the Arctic principle in Byker. Terraces, colours, and rooftops blend climatic resilience with community-focused design, supporting social use and environmental protection (source: authors)

2014), Erskine's underlying ideas and intentions behind the project have remained unexplored (Andersen, 2014). Most notably, Erskine's human-centred approach to climate sensitivity has remained a less emphasised aspect of his architectural vision. This paper examines how effectively these design principles, reimagined for subarctic conditions, have provided opportunities for a sustainable and unified community in Byker after more than half a century, in a context that has become more diverse and shelters vulnerable groups. The continuing relevance of this climatic approach is evident in Kiruna's relocated town centre, where Sjöholm (2026) identifies reduced solar access and reported wind discomfort after microclimatic priorities weakened between strategic planning and implementation.

3. Methods

This study employs a mixed-methods approach and incorporates methods of triangulation. Triangulation and mixed methods are defined as concepts that refer to the combination of quantitative and qualitative approaches, as well as methods of data collection (Bryman, 2006), which have developed further towards producing more and better insights in social science-related research (Flick, 2018). Accordingly, this study combines field observations, a structured survey, and semi-structured interviews. This approach ensures a more comprehensive examination of the spatial settings and lived experience of the tenants, aligning well with the research objectives of assessing the design's impact on community formation and environmental comfort.

3.1. Recruitment and data collection

Field observations examined connectivity, accessibility, entrance points, pathways, and their integration with the broader urban context. Spatial conditions are explored to evaluate spatially segregating organisational structures and social inclusion. In addition, a structured survey was conducted among residents of the Byker Wall Estate to capture their experiences and perceptions. The survey explored demographic information, the use of indoor and outdoor spaces, current and proposed alterations, emotional attachments to the project, and the significance of the estate for the respondents. The survey included both closed-ended and open-ended questions to capture quantitative data and qualitative insights. Invitations to complete the questionnaire were distributed door-to-door to 400 tenant households, with distribution spread across different parts of the estate and different housing typologies. Out of the invitations that were sent out, 45 residents accepted the invitation (response rate: ~11%), most of whom were social renters. Participants represented different age groups and household sizes, with 17 living in high-rise flats and 28 in low-rise buildings. A detailed demographic profile of the survey sample is provided in Table 2.

To gain a richer understanding of residents' perspectives, participants were invited to an interview at the end of the survey. Interviews were more focused on exploring the everyday lives of residents and the meanings they associate with their living environment. Questionnaire respondents were invited at the end of the questionnaire to volunteer for a follow-up interview, resulting in six participants. Interviews followed a semi-structured guide

Table 2. Demographic characteristics of survey respondents

Total respondents (N)		45	100.0%
Characteristic	Category	n	%
Age group	18–24 years old	9	20.0%
	25–34 years old	10	22.2%
	35–45 years old	11	24.4%
	46–54 years old	5	11.1%
	Above 55	10	22.2%
Occupational status	Employed	23	51.1%
	Unemployed/ Homemaker	13	28.9%
	Retired/pensioner	3	6.7%
	Student	2	4.4%
	Not stated	4	8.9%
Length of residence	1–5 years	18	40.0%
	6–10 years	12	26.7%
	More than 10 years	15	33.3%
Household composition	Lives alone	22	48.9%
	Lives with others	23	51.1%
Tenure/ occupancy	Renting	40	88.9%
	Owner	5	11.1%
Housing typology	Low-rise house	28	62.2%
	High-rise house (Flat)	17	37.8%

exploring residents' everyday experiences of living in the estate. It included questions around relationships and interactions within the community, experiences of housing and environmental comfort, the connectivity, perceived meaning of the peripheral wall, and place attachment. Interviews began with broad questions in each area, followed by prompts that allowed participants to elaborate on issues they considered important. These areas structured data collection but were not treated as predetermined analytical themes; the themes reported below were developed through the subsequent thematic analysis.

All six participants were residents of the Byker Estate living in low-rise housing, although they lived in different parts of the development. The interviews were conducted between June and August 2024 by the authors. All interviews were in person and lasted approximately 45 minutes. With participants' permission, they were audio-recorded

and transcribed verbatim. Participants received information explaining the study's purpose before the interview and informed consent was obtained. Ethical approval was obtained from Northumbria University's Research Ethics Committee (reference 5346). Table 3 summarises the characteristics of the interview sample.

3.2. Analysis

The analysis combined quantitative and qualitative approaches. Exploratory Spearman rank-order correlations were calculated at the respondent level, using a maximum sample of 45 participants, to examine associations among age group, housing typology, use of outdoor spaces, and expressions of sense of community. Spearman's correlation coefficient was selected because the analysis involved ordinal measures and respondent-level coded indicators, and because the analysis concerned monotonic associations without assuming normally distributed variables (Dodge, 2008; Schober et al., 2018). Open-ended survey responses were thematically coded in Microsoft Excel. Each response was reviewed and assigned one or more thematic labels. Themes included expressions relating to sense of community, outdoor-space use, comfort, warmth, self-sufficiency and environmental concerns. For the correlation analyses, relevant themes were converted into respondent-level dichotomous indicators, coded as present (1) or absent (0).

For descriptive interpretation, coefficient magnitudes were classified as weak when $|r| < .30$, moderate when $.30 \leq |r| \leq .50$, and strong when $|r| > .50$. However, in light of the small sample size ($N = 45$), correlation coefficients may be sensitive to individual observations and provide imprecise as well as having limited capacity to identify weak or moderate associations reliably (Schönbrodt & Perugini, 2013). Consequently, a small coefficient should not be interpreted as evidence that no relationship exists, while an observed coefficient should not be treated as a precise estimate of an association within the wider Byker population. The correlations are therefore treated as descriptive and hypothesis-generating and are given interpretive weight only when they align with the interview findings, open-ended survey responses, or field observations.

Table 3. Demographic characteristics of interviewees (source: authors)

Participant number	Age group	Occupational status	Length of residence	Household composition	Tenure/ occupancy	Housing typology
1	35–45 years old	Employed	1–5 years	Lives with others	Tenant	Low-rise
2	35–45 years old	Employed	1–5 years	Lives alone	Tenant	Low-rise
3	46–54 years old	Employed	1–5 years	Lives with others	Tenant	Low-rise
4	Above 55	Homemaker	1–5 years	Lives with others	Tenant	Low-rise
5	25–34 years old	Employed	6–10 years	Lives with others	Tenant	Low-rise
6	18–24 years old	Student	6–10 years	Lives with others	Tenant	Low-rise

Interview transcripts were analysed separately from the quantitative survey dataset and were not included in the correlation calculations. Interview transcripts were analysed thematically. Relevant passages were assigned initial codes, and related codes were grouped into broader themes that were reviewed and refined to identify recurring patterns concerning community relationships, outdoor and communal spaces, housing experiences, environmental comfort, estate connectivity and attachment to the Byker Wall (Braun & Clarke, 2012). To enhance the trustworthiness of the qualitative analysis, an audit trail was maintained in Microsoft Excel linking relevant transcript extracts, initial codes and the resulting themes. Codes and themes were reviewed iteratively against the complete interview transcripts to ensure that they remained grounded in participants' accounts. Anonymised quotations are presented in the findings to demonstrate the connection between the interpretations and the underlying data. These procedures supported the credibility, dependability and transparency of the thematic analysis (Nowell et al., 2017).

Interview accounts were used to elaborate, contextualise or contrast patterns identified in the survey rather

than to provide statistical confirmation of the quantitative findings. Because the interview sample comprised only six self-selected survey respondents and was relatively homogeneous in housing typology and several demographic and residential characteristics, as shown in Table 3, the findings were treated as exploratory accounts providing contextual depth rather than as representative evidence of the experiences of all survey respondents or the wider Byker population.

4. Results

4.1. Field observations

Field observations suggested a clear contrast between the spatial qualities of the inner and outer peripheries of the Byker Wall. As shown in Figure 2, views facing the entrance to the estate appear carefully composed, with each access point featuring distinct focal elements and varying styles of low-rise housing. In contrast, views toward the estate's exits appear less defined and lack visual anchors. Aesthetic differences between the inner and outer façades were also

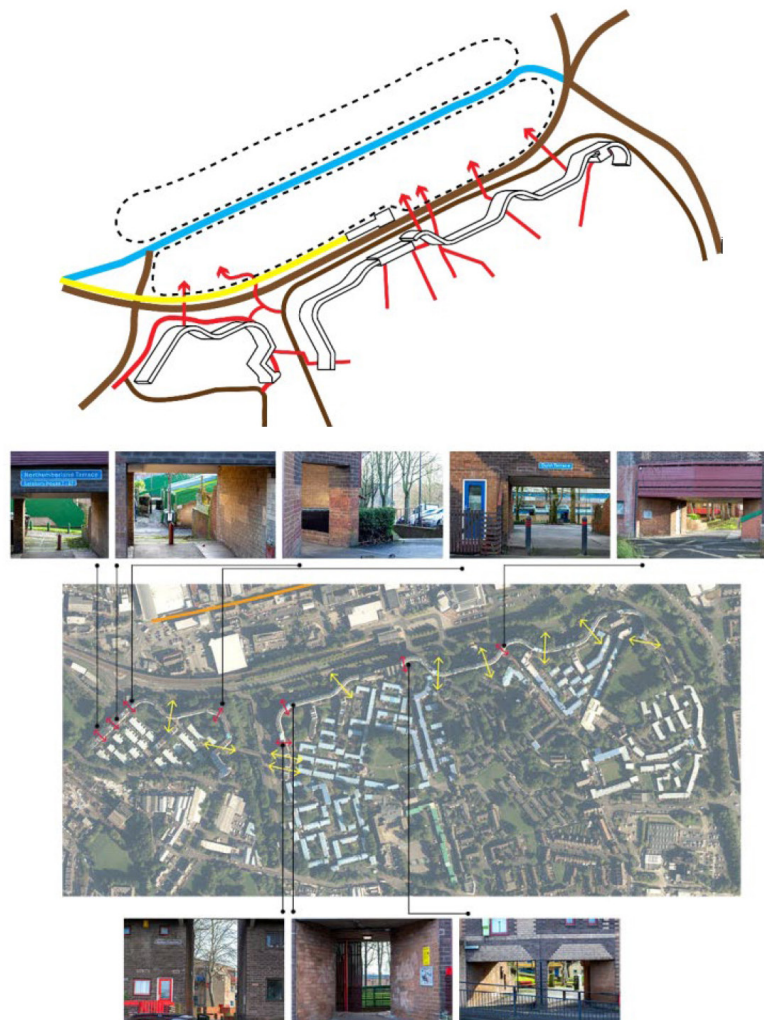


Figure 2. Wall connectivity. The map and accompanying image indicate pedestrian entrances (red arrows), vehicular streets (brown lines), the metro line (yellow), and amenity areas (black dashed lines), highlighting the site's integrated access and circulation (Original images by Gerda Gritenaite; reproduced with permission)

apparent. The inner façade is more vibrant and enriched with architectural detailing, such as balconies. Whilst the outer façade presents a more subdued colour palette and simpler design, with smaller windows and openings. However, despite these design contrasts, the spatial experience does not necessarily translate into a clear sense of separation between inner and outer areas.

The mapping fieldwork shows that inner walkways are well-connected to the surroundings through multiple entrances to the main connecting routes (Figure 2). Most entrances are wide enough to cross with another person or cyclist without the disruption of the immediate personal space. Erskine's drawings and planning show that although he restricted private car movement at the periphery of the complex, he imagined buses going in and out through these gateways, highlighting his conscious approach to linking the project to public transport. This intention is further reflected in the spatial layout itself. The main pedestrian walkway is aligned with Raby Street, the central thoroughfare of the old Byker estate, resulting in maintaining a historical axis while providing direct access to the Byker Metro station and surrounding amenities in North Byker.

4.2. Survey

The survey findings indicate a notable presence of community sentiment among residents, with 25 out of 45 participants (56%) articulating expressions that reflect a sense of community. Their descriptions included references to "people", "support", and "friendliness", suggesting that everyday social relationships were important to how respondents understood community life within the estate. A weak positive coefficient was observed between age and expressions of sense of community ($p \approx .25$), with a similarly weak pattern for respondents in the "above 55" age group ($p \approx .26$). These coefficients suggest a possible age-related pattern within this sample. In contrast, the analysis revealed no statistically significant correlations between sense of community and other demographic variables, including occupation, household size, or duration of residence within the Byker Estate.

Exploratory comparisons also indicated a possible relationship between outdoor-space use and expressions of

community. Residents living in terraced or other low-rise housing demonstrated a weak positive coefficient with sense of community ($p \approx .25$). This connection suggests that housing types that facilitate easier access to outdoor areas may encourage interaction and engagement among neighbours. Notably, this connection becomes particularly pronounced in its absence. A weak negative correlation of -0.24 was found between expressions of community and the absence or lack of use of outdoor spaces. In other words, participants who neither utilise nor attribute positive meaning to outdoor environments are significantly less likely to express a sense of community.

The peripheral wall itself was rarely described as a source of exclusion. Only one respondent compared the design to a "prison". More commonly, respondents associated the estate with quietness, self-sufficiency (referring here to the residents' ability to meet daily needs within the development), and warmth, all of which concern comfortable living within the development. The analysis produced a moderate positive coefficient between household size and mentions of these comfort-related qualities ($p \approx .45$). This exploratory pattern suggests that comfort-related qualities may be particularly salient to respondents from larger households, although it does not establish that household size determines perceptions of comfort. These responses nevertheless indicate that features associated with Erskine's subarctic principles remain relevant to some residents' experiences of domestic comfort. However, this enhanced performance does not necessarily translate into shaping a community, as Erskine envisioned.

The correlation between comfort-related mentions and sense of community is -0.23 , indicating a weak negative relationship. Heating and warmth also demonstrated a weak positive coefficient, rather than a moderate correlation, with appreciation of the estate's self-sufficient qualities ($p \approx .27$). This pattern is consistent with some respondents valuing both thermal comfort and the practical independence provided by the estate, but its magnitude is insufficient to support a broader population-level conclusion. Overall, the responses point to a possible distinction between residents' individual experiences of comfort and their collective experiences of community.

Table 4. Exploratory respondent-level correlations in the survey sample

Variables examined	Variable coding	p	Interpretation
Age group $\times$ sense of community	Age coded ordinally from 1 = 18–24 to 5 = above 55; community 1 = present, 0 = absent	.25	Weak positive
Low-rise housing $\times$ sense of community	Low-rise 1, flat 0; community 1 = present, 0 = absent	.25	Weak positive
Non-use of outdoor space $\times$ sense of community	Non-use 1, reported use 0; community 1 = present, 0 = absent	-.24	Weak negative
Household size $\times$ comfort-related mentions	Reported household size; comfort 1 = present, 0 = absent	.45	Moderate positive
Comfort-related mentions $\times$ sense of community	Both coded 1 = present, 0 = absent	-.23	Weak negative
Warmth/heating $\times$ self-sufficiency	Both coded 1 = present, 0 = absent	.27	Weak positive
Warmth/heating $\times$ environmental concerns	Both coded 1 = present, 0 = absent	.47	Moderate positive

The survey also captured participants' concerns about their living environment, including waste management and anti-social behaviour. A moderate positive coefficient was observed between mentions of warmth and wider environmental concerns ($\rho \approx .47$). This coefficient indicates that these themes sometimes occurred together within the participating sample and does not demonstrate that concerns about environmental management were caused by perceptions of warmth or climatic performance. Considered alongside the open-ended responses and field observations, the pattern suggests that residents' appreciation of the estate's environmental qualities may coexist with concerns about maintenance and service provision. The findings therefore indicate that the continuing social and environmental performance of the estate depends not only on its architectural design but also on its ongoing management and care.

These findings should be interpreted in light of the small sample size. With a maximum of 45 observations, individual responses can materially affect the direction and magnitude of the coefficients, and weak associations are likely to be unstable. Table 4 presents the respondent-level exploratory correlations.

4.3. Interviews

Findings from the interviews further emphasise the human-centred design approach underpinning the Byker Wall redevelopment. Echoing insights from the survey, interviewees consistently highlighted the people within the estate as its defining feature. One participant described people in Byker Wall as "kinder and more supportive" than the rest of the city, while another participant found people in the estate "easy to talk to". A more direct perceived relationship with design appeared when participants identified particular spatial features and explained how they used or experienced them. In particular, interviewees frequently pointed to the estate's outdoor spaces as key enablers of informal encounters and social bonds. As with the findings of the survey, these narratives illustrate how design features, especially green, semi-public spaces, play a subtle yet meaningful role in fostering a sense of community. For example, one of the tenants explains how "green spaces" bring a "sense of togetherness" and encourage them to "socialise", as reflected in the following statement:

"It feels like every section is like a green space to connect everyone who lives around that area. It feels like no matter which part of Byker you live in, there's always some way you could go to socialise with others. It encourages you to go out and talk with everyone".

As previously discussed, in adapting sub-arctic design principles to the milder climate of Newcastle upon Tyne, Erskine anticipated the increased potential for summer activities and outdoor social life. Testimonies similar to the previous statement illustrate how this strategy continues to serve its intended purpose. Interestingly, some other participants also note that while these green spaces bring a "compact community," they provide opportunities for separation, making these spaces look 'less crowded:

"It feels like a very compact community, because everywhere it goes is like lots of trees around, so it looks very beautiful, and nowhere looks too crowded".

Additionally, the interview findings reiterate survey results in showing that the peripheral wall does not seclude the community from its surroundings. In fact, the well-connectedness of Byker Wall with amenities and city attraction points such as are widely acknowledged by participants in the interviews, as explained by one of the participants:

"It's not like you need a pass to be able to use any of the amenities within the Byker Wall. It is free to all. [The wall] just allows you to be able to have fun just within your space. Have a good space to relax and enjoy, and if you decide to go outside your immediate space, you also have that. [...] I do not think it excludes anybody or stops anyone from enjoying the Byker Wall".

Participants in the interviews reiterated that what makes "outsiders" consider the wall intimidating is their perception of the Byker Wall as a dangerous place and its architectural departure from conventional UK housing forms. Indeed, in contrast with outsiders, for the tenants the unusual architecture of the wall is an iconic representation of their community through noticeable in Newcastle. Rather than viewing it as isolating, residents framed the wall as an iconic and defining feature of their community; something that visually marks and protects Byker while reinforcing a sense of continuity. As one tenant remarked:

"I think that is what makes it better. It is for the Byker. It is what makes the Byker. I like it personally. It makes a bit of continuity".

As mentioned earlier, Erskine embedded community identity through colourful presentation of the internal spaces and sloped roofs. This intentional design strategy finds clear resonance in participants' responses. Several tenants described how these visual elements foster both emotional attachment and spatial orientation. As one resident noted:

"I love it! I admire it every day when I walk back to Byker Wall. Because wherever I travel around Newcastle, sometimes very far, I can still see the blue roofs. I feel like inside the home!"

With the estate now accommodating a more internationally diverse population, these colourful visual cues appear to play an expanded role – not only as architectural identity markers but also as facilitators of cultural belonging and shared social space. As one participant reflected:

"Anytime you come out is always colourful and vibrant. You see people of different races, different colours, different ethnicities. You can actually interact if you're the social type. If you do want to socialise, mixing with people is a good place. I have met people from my country that I didn't know before, but once they heard that I speak their language, we all started exchanging greetings".

The evidence presented above illustrates that the surrounding wall, far from acting as a barrier, contributes to a sense of community by reinforcing a shared identity and supporting the integration of a diverse population within the estate. These dynamics, particularly the symbolic and

emotional significance of the wall and the communal value of colourful architectural elements, were not fully captured in the survey data but became evident through qualitative interviews. These findings suggest that Erskine's concept of remoteness and community formation takes on renewed meaning in the contemporary, multicultural context of the Byker Wall Estate. Further exploration of this evolving interpretation can benefit from more targeted research into the lived experiences of migrant residents.

5. Discussion

Across three data sets (field observation, survey, and interviews), a nuanced picture emerges. Findings demonstrate that the Wall's subarctic design features continue to deliver the physical benefits Erskine intended. The result shows that the Wall's perimeter does not separate Byker from the city. Multiple wide gateways align with bus routes and the historic axis of Raby Street, maintaining porosity. Interviewees stress that "nothing excludes anybody" and those amenities are "free to all". Also, The Wall's defensive stance against harsh winds has evolved into a psychological buffer that many residents interpret as protective rather than exclusionary. The results show that the peripheral wall in the Byker Estate, beyond merely serving as climatic shielding, denotes a locally controlled, recognisable edge that gives residents agency to shape their environment and social connections without foreclosing urban connectivity.

In line with Wall's design features extending its underlying principles, Erskine's approach to accentuating collective identity links to embracing cross-cultural identity. Participants celebrate the Wall as an emblem of pride and continuity. Residents cite the Wall's curving form, serrated roofscape, and saturated colours as visual anchors; features that "make Byker what it is" and allow residents to spot their home from distant city vantage points. For a tenant base that has become increasingly international, these architectural cues now function as culturally neutral identity markers, supporting inclusive belonging. Colourful façades, in particular, appear to mediate cross-cultural sociality. Participants describe greeting neighbours in their native language precisely because the vibrancy of shared space elevates the chance of informal interaction. Here, Erskine's human-centred design resonates with contemporary theories of relational urbanism, in which aesthetic legibility and sensory richness act as social catalysts.

Furthermore, the findings show that community sentiment is also anchored in everyday social interactions enabled by green, semi-public outdoor spaces. Survey results suggest that the formation of a sense of community in Byker Wall arises independently of shared socio-cultural values, time spent in the area, or familial structures. Instead, both the survey and the interviews point to outdoor space as a subtle yet consistent driver of communal life. Residents repeatedly describe courtyards, pocket parks, and tree-lined walkways as "places to meet", "less crowded", and "encouraging you to talk with everyone". Likewise, field observations confirm that these spaces are well

aligned with historic footpaths, generous in width, and shielded from through-traffic, design qualities that foster casual encounters. However, problems with managing these spaces have eroded the intended synergy between the climate-conscious and socially responsive design.

Comparable relationships between communal-space design and social interaction have been reported in other housing and public-space settings. Previous studies found that accessibility, mixed uses, greenery, and other physical characteristics may facilitate social interaction and cohesion, but that their effects are conditioned by demographic characteristics, perceptions of safety, place attachment, and the wider social context (Mellen & Short, 2023; Qi et al., 2024). Byker is therefore not presented here as uniquely producing friendliness, support, comfort, or protection. Its case-specific significance lies instead in the way some residents explicitly associate these experiences with the estate's particular architectural repertoire, including sheltered green courts, a protective yet permeable wall, coloured thresholds, and a highly legible roofscape.

Survey responses demonstrate warmth and tranquility, while strongly valued at the household level, show only a weak and sometimes inverse relationship with expressions of collective belonging. The negative weak correlation between comfort-related mentions and sense of community ($p \approx -0.23$) suggests that physical well-being and social cohesion do not automatically align. Residents who mentioned warmth and independence experience the estate primarily as a well-performing piece of domestic infrastructure rather than as a shared social project. The results, therefore, underscore the limits of architectural determinism, demonstrating that design by itself cannot generate the climatic social ties Erskine hoped would flourish. Rather, spatial affordance must be matched by ongoing management to translate environmental potential into social reality. A similar point was raised previously (Roberts, 2010), highlighting the change of social organisation of city life in Britain at large as a reason that negated the positive effects of Erskine's redevelopment philosophy.

These findings also clarify the conditions under which Erskine's climatic principles can be transferred. The relocated town centre of Kiruna demonstrates how their intended benefits may be weakened when site selection and subsequent planning decisions compromise solar access and protection from cold winds (Sjöholm, 2026). Read alongside Byker, this experience suggests that transferability lies not in reproducing particular architectural forms, but in preserving their underlying climatic purpose throughout planning, implementation, and long-term stewardship.

6. Limitations

It is worth noting that two main limitations temper the findings and scope of this study. First, the survey had a modest response rate (~11%) and a relatively small sample size, which limits the generalisability of the quantitative results. Second, the interview sample did not fully represent the diversity of residents across the estate. For example,

high-rise tenants were underrepresented, and the survey sample could not achieve a balanced distribution across housing typologies or geographic areas within Byker. These factors constrain the study's ability to reflect the full spectrum of resident experiences. Future research would benefit from employing stratified sampling methods or ethnographic approaches to capture a broader and more diverse range of perspectives, including those of migrant communities, younger cohorts, and residents from different housing typologies.

Additionally, because this is a cross-sectional study of a single estate, the research design does not permit causal attribution or establish whether residents' experiences are distinctive to Byker. Therefore, these findings should be understood as evidence of perceived architectural affordance rather than causation or distinctiveness. Future research could address this limitation through matched case comparison using standardised measures of place attachment, perceived comfort, and sense of community, combined with behavioural mapping and environmental measurements.

7. Conclusions

This study revisited the Byker Wall Estate to explore how spatial design and environmental principles are associated with residents' sense of community, more than five decades after Ralph Erskine's original plan. Drawing on a combination of field observation, survey data, and in-depth interviews, the research reveals that while the estate's physical comfort, particularly warmth, quietness, and protection from harsh weather, remains a valued outcome of its sub-arctic design principles, these features alone do not account for the emergence of social cohesion. Instead, the most meaningful contributors to a sense of community are found in the estate's shared outdoor spaces and the symbolic power of its architectural identity.

Whereas semi-public green areas enable everyday social interactions, the iconic wall functions as a marker of place attachment, orientation, and collective belonging, particularly within the increasingly multicultural population of the estate. Yet, the research reveals that design alone is insufficient and highlights the critical role of environmental maintenance in sustaining the ties in the concept of the climatically suited communities. In this sense, the unrealised aspects of Erskine's vision may lie less in the design's limitations than in the fragility of the systems responsible for its ongoing care. Nevertheless, this study suggests that the Byker Wall Estate remains a relevant and instructive model for contemporary housing.

This study does not call for revoking Erskine's universal design grammar, but to understand the application of his incisive, pioneering modern approach for better translation into existing contexts. The Byker Wall case demonstrates that climate-sensitive, human-centred architecture can endure as a framework for sustainable and socially cohesive housing. In the face of today's fuel-poverty and housing crises, revisiting welfare-state precedents like Byker offers

tangible lessons: environmental comfort must be paired with participatory stewardship if the promise of 'climatically suited communities' is to be realised.

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Author contributions

Habib Ghasemi was responsible for drafting the manuscript, data collection, and analysis. Kyung Wook Seo conceived and managed the research, directed the data analysis, and reviewed and edited the draft.

Disclosure statement

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