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Designing for Belonging in Saudi Smart Cities and Megaprojects: Participatory and Behaviour-Informed Urban Design of Neighbourhoods and Public Spaces

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Abstract

Saudi Arabia is creating new cities, districts and destinations at a pace few countries have attempted, from NEOM and The Line to the redevelopment of Diriyah and a series of projects in Riyadh. Whether residents will feel that these places belong to them, and that they belong in them, is far less certain than their scale. Research shows that belonging rests on everyday contact between neighbours, accessible public space and a real voice in planning, yet participation in Saudi planning has been low, and megaproject design is largely top-down. This paper uses a research-through-design approach, anchored in a systematic, integrative appraisal of thirty refereed studies from the years 2020 to 2025, to propose a way of designing for belonging. The review covers place attachment and sense of place, public space and walkability in Saudi cities, megaprojects and smart cities in the Gulf, public participation, and digital tools for co-design and the observation of behaviour. It finds that belonging depends more on relationships than on facilities, that Saudi public spaces face shortfalls in shade, seating and access, and that recent reforms have opened modest channels for participation. The main contribution is a six-phase participatory, behaviour-informed design protocol linking participation levels, behavioural evidence and belonging indicators. Prototype neighbourhood, public-space and cultural placemaking schemes show how the protocol could shape design. The schemes are illustrative concepts that have not been surveyed or built, and a validation protocol for future fieldwork is set out.

1 Introduction

Few countries are reshaping their urban future as ambitiously as Saudi Arabia. Under Vision 2030, NEOM has been promoted as a net-zero carbon city and a testing ground for renewable energy and infrastructure (Yusuf and Abdulmohsen, 2022), and its best-known component, The Line, is planned as a linear city of about 170 km for some 9 million people (Prieto-Curiel and Kondor, 2023). In the capital, government-sponsored mega-destinations have been framed as catalysts for quality of life and investment (Klingmann, 2023), and Historic Diriyah, a World Heritage Site, has become a symbol of national identity and a model for large-scale heritage-led development (Bay et al., 2022). National developers are also building large new residential communities, such as those of ROSHN, which form part of the same transformation.

Scale does not guarantee attachment. Megaprojects across the Gulf have been criticised for cost overruns, misalignment with local priorities and socio-spatial disparities (Kashef, 2025), and master plans in Gulf cities, often prepared by Western consultants, have been found insensitive to local social and cultural patterns (Zaidan and Abulibdeh, 2021). In Riyadh, analysis of quality-of-life indicators found that strategic projects contribute strongly to tourism, culture and urban design, while southern

and eastern neighbourhoods remain deprived of cultural, recreational and green facilities (Mahboob, 2025). At the same time, research on community participation in Riyadh found that its level is low (Aldegheishem, 2023).

These findings raise a design question that is distinct from economic feasibility or technical performance: how can new and regenerated Saudi neighbourhoods be designed so that residents feel they belong? This paper approaches the question through design. It reviews what is known about belonging, public space, participation and behaviour, and it develops a protocol and a set of prototype schemes that translate that knowledge into neighbourhood and public-space design. It does not evaluate any megaproject, and it relies only on publicly reported facts about them.

2 Aim, objectives and research questions

This paper is intended to formulate a participatory, behaviour-informed design protocol for neighbourhoods and public spaces in Saudi smart cities and megaprojects, aimed at fostering belonging, and to demonstrate it through original prototype schemes. Four objectives support this purpose: first, to synthesise evidence on the determinants of belonging and place attachment at neighbourhood scale; second, to assess the condition of public space and the state of participation in Saudi planning, including megaprojects; third, to identify tools that allow residents to take part in design and that allow designers to observe and model behaviour; and fourth, to specify the protocol, illustrate it with prototype schemes and define how it should be validated.

Three questions are addressed. RQ1: What does current research identify as the main determinants of neighbourhood belonging, and how do they apply in Saudi cities? RQ2: How far do existing participation mechanisms and design tools allow residents to shape Saudi neighbourhoods and public spaces? RQ3: What design protocol and prototype schemes follow from the evidence, and how could their effect on belonging be tested?

3 Methodology

Research through design treats the act of designing as a way of producing knowledge, and design science asks that the resulting artefacts be grounded in existing knowledge and evaluated against stated criteria. This paper combines the two. A systematic integrative review provides the knowledge base; the artefacts are a design protocol and three prototype schemes; and evaluation is specified as a programme of future fieldwork because no surveys, workshops or observations were conducted for this study.

3.1 Review procedure

Retrieval of literature was completed in November 2026 through an open citation database, and each record was confirmed through its registration metadata. Search terms combined concepts of belonging (sense of belonging, place attachment, sense of place, social interaction, placemaking) with design and governance concepts (public space, neighbourhood design, walkability, public participation, co-design, smart city, megaproject, agent-based model, computer vision) and with regional terms (Saudi Arabia, Riyadh, NEOM, Diriyah, Gulf, GCC).

The inclusion criteria required English-language research articles in refereed journals, with a final publication date within 2020–2025, that addressed belonging or place attachment at neighbourhood or public-space scale, public space and street life in Saudi or Gulf cities, megaprojects or smart cities

in the Gulf, public participation in planning, or tools for co-design and behavioural analysis. Opinion pieces, conference papers and studies focused solely on transport engineering or real estate were excluded. Saudi and Gulf studies were preferred, and international studies were included to cover concepts and tools. Two studies anchored the review: the framework for citizen participation in Saudi smart sustainable cities by Alamoudi et al. (2023) and the analysis of neighbourhood belonging and social infrastructure by Dirksmeier (2025). The 30 included studies are grouped by theme in Table 1.

Table 1. Thematic grouping of the reviewed studies.

Theme	Studies	Representative studies	Role in the protocol
Belonging and place attachment	7	Dirksmeier (2025); Ng et al. (2022); Erfani (2022)	Belonging indicators and design principles
Public space in Saudi cities	6	Addas and Maghrabi (2020); Alkrides et al. (2025); Alghamdi and Alnaim (2025)	Comfort, inclusion and graded openness
Megaprojects and smart cities	8	Prieto-Curiel and Kondor (2023); Kashef (2025); Bay et al. (2022)	Context and scale of intervention
Participation in planning	5	Alamoudi et al. (2023); Aldegheishem (2023); Alasiri et al. (2025)	Participation levels and governance
Co-design and behaviour tools	4	Ng et al. (2024); Cheliotis (2020); van Ameijde et al. (2025)	Methods for phases 2 to 4

3.2 Protocol development and appraisal

Studies were coded for scale, context, method, the factors they linked to belonging, participation or behaviour, and their recommendations. The strength of evidence for each design principle was judged supportive, mixed or limited by weighing how many studies agreed, how consistent they were and how relevant they were to Saudi conditions. The protocol was then assembled phase by phase, so that each phase rests on identified evidence and tools, and the prototype schemes were drawn up as applications of the protocol to a hypothetical neighbourhood. These drawings serve to demonstrate the protocol only; no resident has reviewed them, and nothing has been constructed.

4 Synthesis of the evidence

Five strands of evidence inform the protocol: belonging and place attachment, public space in Saudi cities, megaprojects and smart cities, participation, and tools for co-design and behaviour.

4.1 Belonging and place attachment

Belonging is above all relational. In a regional study of German cities and villages, trust in neighbours and talking with them explained belonging far better than any other factor, and social infrastructure mattered much less, despite some relevance for individuals (Dirksmeier, 2025). The conceptual literature supports a relational view: Erfani (2022) proposed a framework that articulates the interrelationships between individual, community and place across the constructs of attachment, identity and satisfaction. In high-density Hong Kong, a survey of 814 residents found that place qualities predict sense of place, that public and community spaces are prominent predictors, that length of residence strengthens sense of place, and that a stronger sense of place accompanies greater well-being; the authors stressed the value of sociopetal spaces that draw people together (Ng et al., 2022).

Physical design still matters, mainly by enabling encounters. In a historic neighbourhood in Iran, a survey of 300 residents found that architectural identity components such as symbols, ornament and old patterns were positively related to place attachment (Farhad et al., 2021). In a Chinese city, accessibility to public open space had a positive effect on place attachment (Zhang et al., 2024). Governance also shapes attachment: in central Shanghai, participation, collective action and co-governance in an urban park supported residents' sense of belonging and their right to the city (Liu et al., 2025). With respect to RQ1, support is strong for relational determinants, especially contact and trust between neighbours; supportive for accessible public and community spaces that enable such contact; mixed for the role of facilities in themselves; and supportive but limited in number for participation and co-governance. Saudi-specific evidence on belonging is scarce, so these determinants must be interpreted in the light of local social norms.

4.2 Public space and street life in Saudi cities

Saudi public spaces face well-documented shortfalls. A study of public open space in Riyadh, Dammam and Jeddah measured per capita area and accessibility, collected user preferences through interviews, observation and questionnaires, and concluded that the country needs its own planning approach based on users' desires, behaviours and social characteristics rather than standard international norms (Addas and Maghrabi, 2020). In central Riyadh's commercial districts, 302 respondents assessed 49 walkability indicators and expressed strong dissatisfaction with existing conditions, citing inadequate facilities, environmental discomfort, weak safety and a cultural preference for driving, and calling for shaded pathways, public toilets and better air quality (Alkrides et al., 2025). On Tahlia Street, sparse planting, poor provision for disabled users, congestion, too little seating and an absence of canopies were found to undermine liveability (Almatar, 2024).

Saudi cities have also produced instructive public spaces. Three Riyadh projects of the 1980s and early 1990s, including Kindy Plaza in the Diplomatic Quarter and the Qasr Al-Hukm District, introduced a measured permeability and hybrid kinds of public space that altered spatial behaviour, civic identity and connectivity (Alghamdi and Alnaim, 2025). In neighbourhood parks in the Dammam Metropolitan Area, an expert-based study found that residents' demographic characteristics, the physical characteristics of parks and social sustainability characteristics all influence social interaction, with the age of residents ranked as the most influential factor (Alnaim et al., 2025). Together, these studies suggest that shade, seating, safe walking routes, inclusive facilities and a carefully graded openness that respects privacy are preconditions for public space that supports belonging in Saudi cities.

4.3 Megaprojects and smart cities

The megaproject literature is critical but not dismissive. Yusuf and Abdulmohsen (2022) found that NEOM has attracted partners interested in testing renewable technologies, but that its viability depends on balancing economic benefits with risks and costs. Prieto-Curiel and Kondor (2023) analysed the linear form of The Line and argued that a compact circular form would serve a city of the same population better, pointing to the inconveniences of a prolonged urban form. Comparing Masdar City and The Line, Kashef (2025) argued that megaprojects are shaped by socio-spatial, political and capital accumulation dynamics as much as by economic logic. Examining five mega-destinations in Riyadh against the Quality of Life Program, Klingmann (2023) described how megaprojects are used to reconstruct urban territories according to standardised liveability indices. Mahboob (2025) showed that such projects can improve quality of life overall and yet deepen spatial

inequalities between districts. Diriyah offers a more positive model: Bay et al. (2022) concluded that Historic Diriyah can sustain a large development if visual integrity and authenticity are preserved.

Smart city thinking in the region is shifting towards smaller scales. A review of smart cities and communities in the Gulf found that projects at community level, where residents can co-design infrastructure and services, are emerging alongside top-down city development, and called for local governments, utilities and community-level developers to become more involved (Al-Saidi and Zaidan, 2024). A smart and sustainable neighbourhood framework built on urban computing, with people, prosperity and environment dimensions, was applied to a Saudi district to show how data can support better neighbourhood services (Binsaedan et al., 2023). The lesson for belonging is that the neighbourhood, not the city as a whole, is the scale at which smart and participatory design can be combined.

4.4 Participation in Saudi planning

Participation has been weak but is changing. In Riyadh, low participation was linked to individuals' unwillingness to take part and to the limited ability of urban authorities' social media platforms to interact with residents (Aldegheishem, 2023). A Delphi study produced a public participation framework for Saudi Arabia that spans the levels and stages of planning, the methods of involvement, the pillars of sustainability and digital communication tools (Bouregh, 2022). Alamoudi et al. (2023), also using the Delphi method with 25 decision-makers, identified stakeholder management measures, citizens' participation level and citizens' participation recruitment as the three components needed for smart sustainable city outcomes. Following the reforms launched in 2016, the move to more localised planning has increased opportunities for participation through workshops and digital platforms, yet interviews with 20 planners and a survey of 453 participants also revealed limited public influence on final decisions, concerns about marginalised groups and displacement by megaprojects, and limited transparency (Alasiri et al., 2025). Internationally, social media and connected technologies can strengthen citizens' role in co-creating public value, provided that governments develop the capabilities needed for continuous participation (Cao and Kang, 2024). In the Saudi case, then, participation mechanisms exist but tend to remain consultative, with residents informed or asked for comments rather than involved in shaping designs.

4.5 Tools for co-Design and behavioural insight

Several tools could make participation more substantive. In a series of co-creation workshops, a custom digital game with a virtual reality environment enhanced participation and knowledge sharing and motivated engagement, especially across generations (Ng et al., 2024). Placemaking, which has long been used to shape public space, continues to evolve as a concept, method and planning tool (Keidar et al., 2024). Behaviour can be studied as well as discussed. A six-step framework developed from two European streets showed that tracking changes in how many people are present is essential to understanding the affective atmosphere of a street (Abusaada and Elshater, 2021). An agent-based model of individual activity in public spaces, including stationary activities and social interaction, reproduced spatial patterns observed in real spaces (Cheliotis, 2020). A computer vision method detected encountering, congregating, approaching and avoiding behaviours in video, with high agreement with human observers, and revealed how urban form influences social interaction hotspots (van Ameijde et al., 2025).

In answer to RQ2, existing Saudi mechanisms allow residents to be informed and consulted, but rarely to co-design neighbourhoods; megaprojects are mostly planned from the top down; and the

tools needed to deepen participation and to ground design in observed behaviour, including gamified co-design, agent-based simulation and automated observation, are available but have not been documented in Saudi neighbourhood design. These tools also raise questions about privacy and consent, which the protocol must address.

4.6 Inclusion and local social norms

Belonging is not experienced equally. In Riyadh, the sports domain of the quality-of-life programme was found to underperform because of limited accessibility for women, young people and residents of underserved districts (Mahboob, 2025), and concerns about the exclusion of marginalised communities appeared in the assessment of participatory reforms (Alasiri et al., 2025). In Dammam neighbourhood parks, residents' age was the factor rated most influential for social interaction (Alnaim et al., 2025), which suggests that spaces must be designed for different generations rather than for an average user. Cultural expectations of privacy and family life also shape how public space is used: Addas and Maghrabi (2020) stressed that provision should reflect the social characteristics of Saudi users, and Alkrides et al. (2025) identified a cultural preference for driving as one of the barriers to walking. A protocol for belonging must therefore ask who is included in each phase and whose patterns of use each space accommodates. Inclusion is treated here as a condition of belonging for the neighbourhood as a whole, not as an optional extra for particular groups.

5 The Belonging-by-Design protocol

The review leads to a six-phase protocol, named Belonging-by-Design and summarised in Figure 1 and Table 2. Each phase specifies a participation level, the behavioural evidence to be gathered or modelled, and the belonging indicators to be tracked. Participation levels follow a simple ladder from informing and consulting to co-designing and co-governing, and the protocol aims to reach co-design in phases 3 and 4 and co-governance in phase 6.

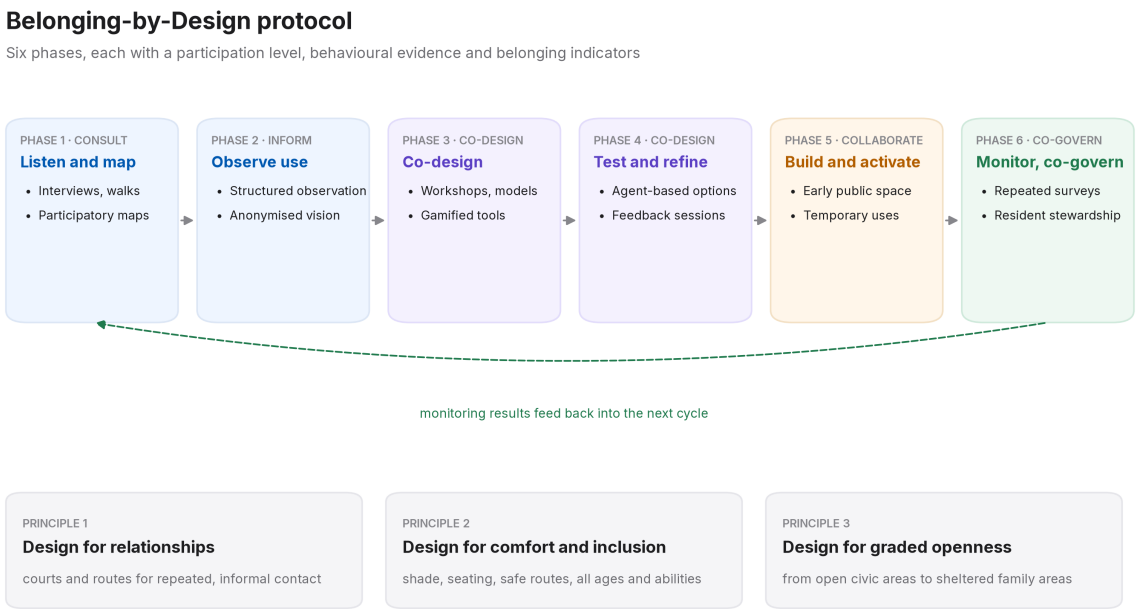


Figure 1. The six phases and three cross-cutting principles of the Belonging-by-Design protocol.

Phase 1, listen and map, builds a shared picture of the site and its future residents. For a new community without residents, it draws on nearby neighbourhoods and on representatives of the groups expected to move in, including families, young people, older residents, women and workers. Methods include interviews, walking tours and participatory mapping, building on the user-based approach recommended by Addas and Maghrabi (2020). Phase 2, observe behaviour, records how people use comparable streets, parks and plazas through structured observation and, where consent and privacy safeguards allow, anonymised computer vision (van Ameijde et al., 2025). The aim is to identify where people meet, linger and avoid, and which conditions such as shade, seating and enclosure support these behaviours.

Phase 3, co-design, brings residents, designers and officials together in workshops supported by physical models and gamified digital environments (Ng et al., 2024). Participants work on the structure of the neighbourhood, the location and character of public spaces and the programme of cultural uses. Phase 4, test and refine, uses agent-based simulation (Cheliotis, 2020) to explore how alternative layouts might distribute activity and encounters, and returns the results to participants for discussion. Simulation is used to compare options, not to predict exact behaviour.

Phase 5, build and activate, delivers public spaces early in the development, with temporary and low-cost interventions used to test uses before permanent works, in line with placemaking practice (Keidar et al., 2024). Cultural programming and community events begin as soon as residents arrive. Phase 6, monitor and co-govern, tracks belonging indicators over time and hands defined responsibilities for parks, courts and community facilities to resident groups, following evidence that co-governance supports belonging (Liu et al., 2025). The protocol therefore extends beyond design completion, in recognition that belonging grows with length of residence (Ng et al., 2022).

Three principles run through all phases. First, design for relationships: because contact and trust between neighbours are the strongest determinants of belonging (Dirksmeier, 2025), the protocol prioritises spaces where repeated, informal encounters occur over prestige facilities. Second, design for comfort and inclusion: shade, seating, safe routes and facilities for disabled people, women, children and older residents respond directly to the shortfalls documented in Riyadh (Alkrides et al., 2025; Almatar, 2024). Third, design for graded openness: public spaces should offer a sequence from open civic areas to more sheltered family areas, reflecting the controlled permeability that worked in earlier Riyadh projects (Alghamdi and Alnaim, 2025).

Table 2. Phases of the Belonging-by-Design protocol.

Phase	Participation level	Methods and evidence	Belonging indicators
1. Listen and map	Consult	Interviews, walking tours, participatory mapping	Baseline trust, attachment, priorities
2. Observe behaviour	Inform and consult	Structured observation; anonymised computer vision	Locations of encounter and lingering
3. Co-design	Co-design	Workshops with models and gamified digital tools	Range and influence of participants
4. Test and refine	Co-design	Agent-based simulation of options; feedback sessions	Expected encounter zones; consensus
5. Build and activate	Collaborate	Early public spaces, temporary uses, events	Use, dwell time, event participation

Phase	Participation level	Methods and evidence	Belonging indicators
6. Monitor and co-govern	Co-govern	Repeated surveys and observation; resident stewardship	Change in belonging and neighbourly trust

5.1 Indicators and data safeguards

Belonging-by-Design tracks three families of indicator. Relational indicators capture the determinants that the evidence ranks highest: the number of neighbours a resident knows by name, the frequency of conversations with them and the degree of trust placed in them (Dirksmeier, 2025). Place indicators capture attachment, identity and satisfaction, following the individual, community and place framework of Erfani (2022), together with perceived quality of public and community spaces (Ng et al., 2022). Use indicators record what people actually do: how many stay in public spaces and for how long, the mix of users by age and gender and the occurrence of encounters and gatherings (van Ameijde et al., 2025). Participation itself is monitored through records of who attended each phase, which proposals were adopted and how residents judged their influence, responding to the concern that participation in Saudi planning has had limited effect on final decisions (Alasiri et al., 2025).

Data safeguards are part of the protocol, not an afterthought. Video-based observation would be used only in public spaces, with visible notices, automatic anonymisation at source and deletion of raw footage after processing. Survey data would be collected with informed consent and stored separately from identifying information. Digital participation would always be paired with in-person options, so that residents with limited access to technology or limited confidence in using it are not excluded, a concern raised by evidence that authorities' online channels have struggled to engage residents (Aldegheishem, 2023). Residents' representatives would be given a role in deciding which data are collected and how they are reported.

6 Prototype schemes

Three original prototype schemes illustrate the protocol for a hypothetical new neighbourhood of medium density on the edge of a large Saudi city. Figure 2 presents them schematically and labels them as an illustrative concept, not simulated or surveyed. The schemes assume that phases 1 to 3 have identified typical priorities reported in the reviewed studies, such as shade, walkability and family-friendly spaces; they do not report actual workshop results.

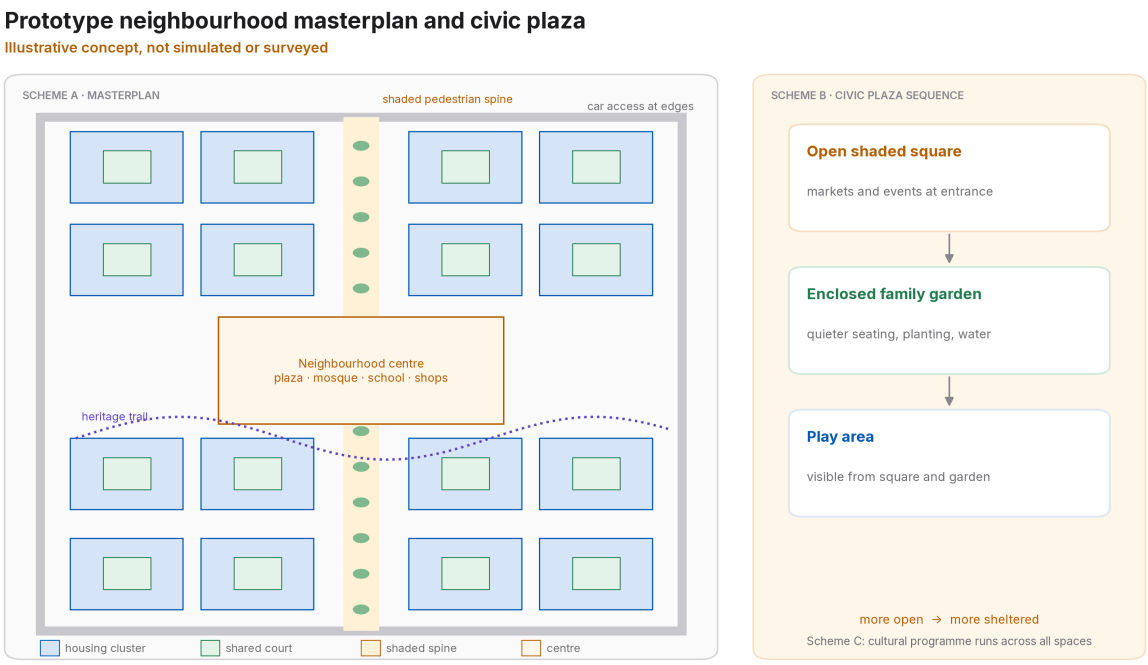


Figure 2. Prototype neighbourhood masterplan, civic plaza and cultural placemaking scheme (illustrative concept, not simulated or surveyed).

Scheme A, the neighbourhood masterplan, organises housing into clusters of a few dozen homes, each around a shared court or pocket garden that is overlooked by front doors and is small enough for neighbours to recognise one another. Clusters are linked by a continuous shaded pedestrian spine that leads to a neighbourhood centre, so that daily trips to school, mosque and shops can be made on foot. A light layer of smart infrastructure supports, rather than replaces, these physical arrangements: environmental sensors along the spine report shade and heat conditions, a neighbourhood platform allows residents to book the community hall and report faults, and anonymised counts of pedestrian movement inform maintenance. These elements follow the people, prosperity and environment dimensions of the neighbourhood framework proposed by Binsaedan et al. (2023), and every data stream is subject to the safeguards set out in the description of the protocol.1. Car access is kept to the edges of clusters. Streets are narrow and planted, and building edges provide shade, responding to the dissatisfaction with walking conditions documented in Riyadh (Alkrides et al., 2025). The plan deliberately concentrates everyday destinations to multiply chance encounters.

Scheme B, the civic plaza, forms the heart of the neighbourhood centre. It is arranged as a sequence of spaces: an open, shaded square for markets and events at the main entrance; a quieter, enclosed garden with family seating; and a children's play area visible from both. Colonnades, canopies and trees provide shade, water features and planting moderate the microclimate, and seating is distributed so that groups of different sizes can gather. The sequence realises the principle of graded openness and draws on the hybrid public typologies identified in Riyadh (Alghamdi and Alnaim, 2025). The plaza is bordered by a community hall, a library and cafés so that it remains active through the day and evening.

Scheme C, cultural placemaking, is a programme rather than a single space. It includes a heritage trail that links the neighbourhood to local history through paving, markers and small exhibits; workshops where residents contribute crafts, stories and designs for public art; and a calendar of seasonal

events, from Ramadan evenings to winter markets. Where a development is close to heritage, as in Diriyah, the programme would draw on documented heritage values while respecting visual integrity and authenticity (Bay et al., 2022). Elements of architectural identity, such as motifs and traditional patterns, are included because they have been linked to place attachment elsewhere (Farhad et al., 2021).

In answer to RQ3, the protocol and schemes show how evidence on belonging can be built into the structure of a neighbourhood: clusters and courts for neighbourly contact, a walkable shaded spine for daily encounters, a graded civic plaza for community life and a cultural programme for shared identity, all shaped and later managed with residents.

7 Validation protocol

Testing the protocol and schemes is future work. A staged design is proposed. First, the protocol would be piloted in at least two Saudi neighbourhoods, one new and one undergoing regeneration, with full documentation of who took part, at what level and with what influence on the final design. Second, belonging would be measured before and after delivery using validated scales of sense of belonging, place attachment and neighbourly trust adapted to Saudi contexts, with attention to differences by gender, age, nationality and tenure. Third, behaviour in public spaces would be observed at regular intervals using structured observation and, with ethical approval and anonymisation, computer vision, to test whether designed spaces generate the encounters intended. Fourth, agent-based simulations prepared in phase 4 would be compared with observed patterns to assess their usefulness for design. Fifth, comparable neighbourhoods designed without the protocol would serve as controls. Results would be published regardless of outcome, and the protocol revised accordingly.

8 Discussion, implications and limitations

The study points to a shift in how Saudi urban development might define success. Megaprojects are usually judged by investment, visitor numbers or technical innovation, but the evidence reviewed here suggests that residents' belonging depends on ordinary conditions: neighbours who know each other, comfortable streets and spaces close to home, and a voice in decisions. These conditions are not incompatible with ambitious projects, but they require attention at the scale of the neighbourhood and a planning process that continues after construction.

Urban form at the largest scale also matters for belonging. The argument of Prieto-Curiel and Kondor (2023) that a very long linear city imposes inconveniences compared with a compact form can be read in social as well as functional terms: distances shape how often people meet, and the evidence that contact between neighbours drives belonging implies that every large project, whatever its overall form, needs walkable neighbourhood units with their own centres. The protocol is designed to operate within such units, which is why it can apply to a linear city, a heritage-led district or a conventional suburban extension alike. Equally, Diriyah shows that heritage can give a new development a shared identity when its integrity is protected (Bay et al., 2022), and the cultural placemaking scheme is intended to extend that identity to the everyday life of residents rather than reserving it for visitors.

The implications differ by actor. For megaproject authorities and national developers, the protocol offers a method to complement master plans with neighbourhood-level co-design, addressing

concerns about top-down planning and insensitivity to local patterns (Zaidan and Abulibdeh, 2021; Kashef, 2025). For municipalities, it suggests ways of turning existing consultative channels into genuine co-design and co-governance, in line with the reforms described by Alasiri et al. (2025). It also asks designers to treat observed and simulated behaviour as inputs to form. For smart city programmes, it indicates that digital tools should serve participation and community life, not only service efficiency (Al-Saidi and Zaidan, 2024). Ethical safeguards are essential, since behavioural observation and digital participation can intrude on privacy and may exclude residents with limited digital access.

The study is limited in several ways. Saudi-specific evidence on belonging is sparse, and key concepts are drawn from studies in Germany, Hong Kong, China and Iran, whose social contexts differ. Facts about megaprojects are limited to those reported in the reviewed literature and public sources; ROSHN, in particular, is mentioned only as public context, without a supporting peer-reviewed source. The review includes 30 journal articles and omits grey literature, official plans and non-English sources. The protocol and schemes are conceptual; they have not been piloted, surveyed or built, and no claim is made about their effect on belonging. Appraisal and design were carried out by one author.

9 Conclusion

Saudi smart cities and megaprojects will succeed socially only if residents come to feel at home in them. This paper has reviewed evidence showing that belonging rests on relationships between neighbours, accessible and comfortable public space, and meaningful participation, and that Saudi practice has gaps in all three. It has proposed the Belonging-by-Design protocol, which links participation levels, behavioural evidence and belonging indicators across six phases, and has illustrated it with prototype schemes for a neighbourhood masterplan, a civic plaza and a cultural placemaking programme. Piloting and evaluation in real Saudi neighbourhoods are the priority for further work.

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