Community Participation
in Localising Expert-Led Neighbourhood
Sustainability Assessment Tools

Developing a Culturally Relevant Post-Occupancy Evaluation Framework for a
New Affordable Housing Neighbourhood in Muharraq, Bahrain

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Declaration

I confirm that this is my own work, and the use of all material from other sources has been

properly and fully acknowledged.

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Abstract

Expert-led Neighbourhood Sustainability Assessment Tools (NSATs) dominate local-scale sustainability assessments. However, criticisms highlight their exclusion of public participation and lack of social, cultural, and contextual sensitivity. My research proposes a novel approach to address these limitations by exploring the value of community participation in complementing and finetuning expert-led NSATs. It aims to examine how professionals can use community-led evaluation to adapt generic NSAT frameworks to the specific cultural contexts of new affordable housing neighbourhoods, focusing on the Middle Eastern context.

Building on the growing body of research around hybrid sustainability indicators, this study investigates the question: How can built environment professionals use community-led evaluation to adapt generic Neighbourhood Sustainability Assessment (NSA) frameworks to the needs of specific cultural contexts? To answer this question, I developed three objectives: 1) To identify the dimensions of neighbourhood sustainability assessment that are relevant to hybrid assessment approaches. 2) To develop a participatory post-occupancy evaluation (POE) framework specific to the context of affordable housing neighbourhoods. And 3) To examine the value of POE in adapting international NSATs to local contexts.

My research employed a case study of the Alsayah affordable housing neighbourhood in Muharraq, Bahrain. Adopting an inductive, grounded theory approach, I conducted qualitative open-ended interviews with residents to understand their interactions with their environment. I analysed the data using thematic coding and content analysis, facilitated by NVivo software. I discussed the findings in relation to the LEED-ND framework, which is a dominant expert-led NSAT. The findings show that sociological variables, particularly age and gender, significantly influence residents' evaluation of their neighbourhood's sustainability. Responses also show a strong interplay between the social and physical features of neighbourhoods, especially density and residential satisfaction. Overall, the findings suggest that community-led NSATs should not be seen as a replacement to expert-led tools, but rather as a complementary tool that could provide a more comprehensive and culturally sensitive assessment.

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GLOSSARY

NSA	Neighbourhood Sustainability Assessment
SDGs	Sustainable Development Goals
NSAFs	Neighbourhood Sustainability Assessment Frameworks
NSATs	Neighbourhood Sustainability Assessment Tools
POE	Post-Occupancy Evaluation
MHUP	Ministry of Housing and Urban Planning
UN	United Nations
AHRC	Arts and Humanities Research Council
RIBA	Royal institute of British Architects
NATs	neighbourhood audit tools
SVT	Social Value Toolkit
AAA	L'Atelier d'Architecture Autogérée
SVT	Social Value Toolkit
PST	Place Standard Tool
RAG	Red, Amber, Green
MESA	Mapping Echo Social Assets
SROI	Social return on investment

Introduction

An Overview of the State and Critiques of Neighbourhood Sustainability Assessment within the Urban Discipline

Neighbourhood Sustainability Assessment (NSA) is a commonly used tool to evaluate a specific neighbourhood's sustainability level in various themes related to its built environment (Sharifi & Murayama, 2013). NSA is primarily carried out through indicator-based assessment tools. Most of these tools, particularly the broadly implemented ones, are developed by experts to provide a framework that sets a standard for sustainable neighbourhoods worldwide (Dawodu et al., 2019). The theoretical foundation for those tools was developed following the Brundtland report (Opp, 2017), which defined sustainable development as *'development that meets the needs of the present without compromising the ability of future generations to meet their own needs'* (the United Nations, 1987, p. 15).

The focus on the neighbourhood scale increased with the announcement of the Sustainable Development Goals (SDGs), especially SDG 11 'Sustainable Cities and Communities', which aims to *"Make cities and human settlements inclusive, safe, resilient and sustainable"* (the United Nations, 2015a). As a result, the developed NSA frameworks revolved around three dimensions, known as sustainability pillars; those are environmental, social, and economic. But a closer investigation of these tools shows that they mainly focus on the environmental dimension (Howley et al., 2009). NSA Researchers attribute the environmental dominance over the social and economic pillars to theoretical justifications (e.g., the urgency of the environmental crisis), methodological reasons (e.g., relative ease of assessing quantitative environmental measures in comparison to qualitative social measures), or a combination of both (Shirazi & Keivani, 2018).

Assessing the themes of environmental sustainability rely mainly on scientific data. Therefore, experts familiar with such data are the primary developers of tools used to assess neighbourhoods' environmental sustainability. While researchers rarely contest the expert-led approach for evaluating the environmental pillar of sustainability, they increasingly challenge its success in evaluating sustainability's social and economic dimensions (Fraser et al., 2006). Expert-led tools (interchangeably referred to as top-down tools) provide standard frameworks that can be easily implemented and justified in terms of equity, as they set identical thresholds for environmental, economic, and social conduct. Those measures do not discriminate based on sociological or geographical differences. Developers of such frameworks hypothesise that their standardised measures would create a consistent impact on neighbourhoods in various contexts. Though the theoretical foundation for top-down NSA appears to be ethical, this approach is

criticised for overlooking the differences between the communities and the social constructs in which they occur (Dempsey et al., 2011). Researchers argue that the linear causation between environmental measures and impacts is far from realistic (Reed, 2008), or to the very least, not proved empirically (Rowe & Frewer, 2000).

Recent sustainability research, especially the studies couched within social sustainability literature, shows that the impact of the physical environment on its users is inconsistent and changes over place and time (Dempsey et al., 2012). This context-dependency highlights the importance of engaging the locals in NSA processes to understand the actual impacts of their local environment on their lived reality. Knowing how people feel and behave in response to their living environment eventually impacts the three dimensions of sustainability at the neighbourhood scale, in the sense that people's residential settings have to foster healthy, inclusive and equitable communities (social sustainability), provide a healthy physical environment that can be maintained for future generations (environmental sustainability), and be economically viable.

Recently, the ethical obligation of engaging local communities, coupled with its potential in enhancing the efficiency of sustainability frameworks made community participation receive increased attention in NSA (Baibarac & Petrescu, 2019). The advocates for this approach have two drivers, an ethical and an instrumental one (Bramley, 2009; Heritage & Dooris, 2009). Proponents of the ethical driver believe that the community should participate in making decisions related to their local environments as an obligation to democratise the decision-making process (Maginn, 2007). This means that the ethical approach believes that community participation is a standalone target, regardless of the specific outcome it creates or the impact of those outcomes. In comparison, the advocates of the instrumental driver believe that at the neighbourhood scale, the locals are more aware of their problems and needs than the politicians who represent them (Maginn, 2007). As a result, the instrumental view of community participation believes that bottom-up processes are essential for identifying needs and problems at the neighbourhood scale and suggesting meaningful measures to fulfil them.

One of the main critiques of the ethical view of community participation is that bottom-up (interchangeably called community-led) processes do not guarantee making good decisions for the community in the short or long term (Dempsey et al., 2011). Therefore, ethical commitment to community participation can be arguably seen as a utopian goal. Still, research shows that engaging the community members in the decision-making process could aid in approaching some critical concepts within sustainability regardless of the decisions that come out of this process. Community participation was found to aid in building social capital and empowerment

(Woodcraft, 2012); a sense of ownership (Centre for Social Justice and Community Action, 2011); and belonging to the community (Boström, 2012; Chan & Lee, 2008). Those features are believed to provide a strong foundation for a healthy, sustainable community (Kohon, 2018; ODPM, 2005). Documenting such advantages as a result of engaging the community in the decision-making process shows that the ethical commitment to community participation in NSA can still aid in approaching aspects of neighbourhood sustainability, regardless of the specific outcomes of thee participatory processes.

Despite the significance of those gains, the partial social advantages of community participation are not enough to fully justify relying on it to develop NSA frameworks because of environmental and practical issues. Community participation processes seem to focus on the social aspects of sustainability and overlook the environmental one (Cuthill, 2010), which could create an imbalanced framework for neighbourhood sustainability. Also, the bottom-up NSA is criticised for not being as rigorous, objective, and systematic as the top-down processes (Vaidya & Mayer, 2014). This critique makes community-led NSA be perceived as an impractical practice, with less robust and reliable outcomes than expert-led NSA.

The instrumental driver for community participation in NSA has a better response to the environmental and practical limitations of community-led NSA. This approach hypothesises that engaging community members can aid in defining and achieving sustainability aims in a manner that is feasible and suitable for the context in question. Advocates of this approach believe that the locals can better understand how their surrounding environments affect them and what problems and realities they face there (Maginn, 2007). Therefore, Maginn (2007) argues that involving the locals in decisions concerning their local environments is not only a democratic necessity, but an essential step towards effective collaborative planning. The hypothesis of the instrumental view of community participation entails that using it in the process of NSA would result in defining practical aims for sustainability and setting impactful measures to achieve them.

The urgent nature of the environmental problems in urban neighbourhoods requires developing immediately applicable actions to mitigate them. Unfortunately, neither environmental sensitivity nor feasibility are among the strengths of community participation. This process requires allocating a lot of resources to carry it out in terms of funds, time and personnel (Fraser et al., 2006; Niezabitowska, 2018). Its benefits are also found to be more evident in the social aspects of sustainability, mainly in the short run (Heritage & Dooris, 2009). This type of sustainability is known as intergenerational sustainability, which is defined as sustainability for different members within the existing community (Severson & Vos, 2018). Intragenerational sustainability, or sustainability for future generations (Severson & Vos, 2018), is believed to be

more feasible using top-down approaches. Vaidya and Mayer (2014) attribute this to the ability of those methods to channel experts' knowledge in various fields to produce a systematic, cohesive and long-term sustainability framework. With a clear trade-off between the scope, feasibility and inclusivity of top-down and bottom-up approaches to NSA, one thing remains common; both approaches share the theoretical aim of wanting to create better living environments for current and future generations at the neighbourhood scale.

Identifying the Gap in Neighbourhood Sustainability Assessment Literature and Positioning this Research

Based on the shared aim of top-down and bottom-up approaches to NSA, neighbourhood sustainability assessment frameworks (NSAFs) need to change how we create and interact with our neighbourhoods to make them more sustainable. Such change is likely to bring a level of discomfort or a divergence from the lifestyle users are accustomed to. For instance, individuals might be forced to leave the comfort and freedom of using their private cars and use public transportation to lower the CO_2 emissions of transportation. Or residents in highly populated cities will have to shrink their living spaces to accommodate the growing populations and minimise the environmental impact of the built environment. On the social aspects, the increasingly encouraged diversity of groups and individuals should not undermine neighbourhoods' cohesion. While equity is an undisputed concept within the sustainability discourse, diversity should be facilitated in a way to improve the life quality of all segments of the community, especially minorities. The complex and multi-faceted nature of sustainability makes it extremely difficult to operationalise it as a whole system. Therefore, it is essential to facilitate proper communication between the different pillars and concepts of sustainability and to be aware of the trade-offs between them.

Without unanimity on how to achieve this, researchers emphasise the urge to undertake more environmentally sustainable measures in the design of urban environments to cater for the needs of current and future generations. To create an impact in real life, those measures will need supportive social and behavioural practices to sustain them. While citizens are unlikely to contest to achieving such environmental and social gains, Owens (1996) notes that as consumers, residents are likely to resist lifestyle changes that they are uncomfortable with. Vallance et al. (2011) documented numerous cases in the literature where people found ways around imposed environmental measures to return to their preferred ways of living. In some cases, this even resulted in more damage than the original modified urban setting.

For instance, Clark (2005) reported a case in inner city malls where new parking fees when imposed to promote using public transportation. As a result, people resolved to travel further

distances to suburban malls, which did not implement this policy. Without considering potential residents' responses, a seemingly positive measure can end up causing more harm than the original situation. As for the segment of the community who cannot afford to find ways around those measures, they may have to endure change with a high level of distress. Therefore, it could be argued that overlooking how people feel and behave in a specific environment could create a neighbourhood that is neither sustainable nor equitable.

For this reason, I believe that community participation in NSA should not be viewed solely from an ethical stance. It needs to adapt an instrumental approach where the outcome of participation should bring about change in the built environment to approach sustainability holistically, being environmental, social, or economic. A minimum threshold of those benefits should be present in the short term for community members who are living now (intergenerational sustainability). And it also needs to build incremental gains where more sustainable measures are implemented for future generations (intragenerational sustainability). This research, therefore, does not view community participation as a target but as an instrumental approach to facilitate social, environmental, and economic gains in the short and long run.

As it is needed to create real-life change, incorporating community participation in NSA needs to be developed with a practical consideration for time, resources, and knowledge limitations. They should be designed in a way to influence the decision-making process while acknowledging how the neighbourhood scale should fit within the city, country, regional and international scale. The shortcomings of separating the top-down from the bottom-up practices of sustainability assessment show the need to find a way to make the two work together in real-life situations. For this reason, my research intends to strengthen the communication channels between expert-led NSA tools and community-led ones. This way, those tools could build upon the technical and practical benefits of the expert-led tools; while being able to tailor them to the needs and limitations of individual communities. Specifically, my research aims to examine the value of community participation in complementing international, expert-led Neighbourhood Sustainability Assessment Tools (NSATs) to help adapt them to the need and limitations of specific cultural contexts.

My research falls within the area of hybrid sustainability assessment. This approach is based on integrating top-down with bottom-up approaches to NSA (Reed et al., 2006). While hybrid sustainability assessment is discussed in the literature of NSA, research around it is still minimal and primarily theoretical. It is unclear how the data of both processes can be merged and how their recommendations should influence the decision-making process. The rationale for adopting a hybrid approach in my research is to respond to four needs in the context of

neighbourhood sustainability assessment: 1) the need to empower the community to influence the decisions related to their local environments and facilitate equity (the United Nations, 2015b); 2) the need of having neighbourhood sustainability assessment tools that are more sensitive to the local requirements (Sharifi & Murayama, 2013); 3) the need to do this feasibly (time and resource-efficient) (Dawodu et al., 2019) and finally 4) the need to have local sustainability visions aligned with larger-scale holistic sustainability agendas (environmental, economic, social).

Defining the Scope and the Context of The Study

The critiques around expert-led NSA make community engagement in those processes critical in any type of neighbourhood, but it is even more pressing in the context of affordable housing ones. Affordable housing neighbourhoods house a particularly vulnerable segment of the community with limited income. The members belonging to this socio-economic group typically have lower access to power (Gaber, 2019), which puts them at higher risk of being underrepresented in policy making. Sharifi and Murayama (2013) pointed out another issue that faces affordable housing neighbourhoods in existing NSATs. They noted that those tools either overlook this type of development or confuse the concept of affordability with issues of inclusivity and social housing. Szibbo (2016) reports that the number of affordable housing neighbourhoods assessed using existing international NSATs is very limited. This is not surprising, given that the accreditation process is primarily optional and quite expensive. This makes it tempting to use NSA as a marketing strategy for higher-end neighbourhoods. Unlike high revenue-generating projects, affordable housing neighbourhoods are developed at a much tighter budget and often as a social obligation towards the public. Between the underrepresentation of their users during the process of developing expert-led NSATs and the limited presence in the assessment practices, affordable housing neighbourhoods need to be more present in NSA literature.

This research uses a case study methodology for an affordable housing neighbourhood in the Muharraq governate, Bahrain. Bahrain, which lies in the Arabian Gulf, is a small developing country committed to attaining sustainable development goals by 2030 (Government of Bahrain, 2017). In 2011, Bahrain suffered from sectarian riots that disrupted and endangered daily life in key facilities and resulted in fatalities among civilians and law enforcement. In response, the Bahrain government instructed to commence an independent commission of inquiry to investigate and report the events that happened during the riots, the events that could have led to them, the consequences of the events, and recommendations on how to address the depicted issues (Bassiouni et al., 2011).

The commission of inquiry devoted a section in its report to issues around the affordable housing sector. It reported that the country seems to struggle with resident satisfaction with

affordable housing developments (Bassiouni et al., 2011). On the official governmental side, the National Information Committee (2018) reported increasing concerns around issues of equity and local identity in Bahraini communities. Such issues reported by more than one party require examining the efficiency of the adopted sustainability frameworks on the reality of affordable housing neighbourhoods and their ability to respond to the needs of the locals in Bahrain.

The significance of selecting Bahrain was based on ontological and methodological reasons. In terms of ontology, the Middle East relies on international expert-led tools in carrying out sustainability assessments for its buildings and larger-scale projects, even though numerous countries in the Middle East have developed their own tools (Issa & Al Abbar, 2015). According to Sharifi and Murayama (2013), none of the most implemented tools was created in this region, which makes us question the suitability of those frameworks to the cultural specificity of the Middle East of which Bahrain is a part.

As for methodological reasons, while this research's aim is valid for any other context, qualitative research of ethnographic nature is still underdeveloped in architecture (Niezabitowska, 2018), which makes the field need to borrow from the research techniques in the better-established literature of sociology, ethnographic research, as well as environmental psychology. In those fields, researchers' awareness of the particulars of the cultures can make them more perceptive to the collected data (Schensul et al., 2012). It also makes it easier for them to gain residents' trust and obtain larger, more detailed information (Pole & Lampard, 2002). This means that the researcher can benefit from being acquainted with, or recognised as belonging to the examined culture, which , in my case, is being Bahraini, Middle Eastern, Arab, and Muslim.

I adopted a Post Occupancy Evaluation (POE) method to investigate the ability to use community participation to adapt international expert-led NSATs to the needs of a specific cultural context, which in this case study research was focused on Bahrain. The rationale behind this is to balance between the use of NSAFs as a primary way to approach neighbourhood sustainability and the need for those frameworks to have an effect in reality. POE is the primary used tool for documenting the effect of the implemented planning and design decisions on the built environment (Turpin-Brooks & Viccars, 2006). This evidence-driven approach can be carried out for various scopes and using different research methods (Hay et al., 2016), which makes it brings great potential for investigative community-led research, which is likely to involve qualitative issues.

Research Aim, Question, and Objectives

The value of incorporating public participation in the conventional expert-led sustainability planning and assessment of urban developments has led to growing research around hybrid sustainability indicators (Tran, 2016). My study aims to add to this discussion by examining the value of community participation in complementing international, expert-led Neighbourhood Sustainability Assessment Tools to help adapt them to the context of new affordable housing neighbourhoods. Because of the fluid nature of the aim, I adopted an inductive grounded theory approach, carried out using a qualitative case study research method. My research asks the question of how can built environment professionals use community-led evaluation to adapt generic NSA frameworks to the needs of specific cultural contexts?

To answer this question, I developed the following objectives:

- To identify the dimensions of neighbourhood sustainability assessment that are relevant to hybrid assessment approaches.

- To develop a participatory POE framework specific to the context of affordable housing neighbourhoods.

- To examine the value of POE in adapting international NSATs to local contexts.

Thesis Structure

After the introduction, I present background information relevant to Bahrain and its urban neighbourhoods, with a focus on affordable housing ones. The main body of the thesis comprises seven chapters. The first three chapters constitute the literature review. In Chapter 1, I review neighbourhood sustainability assessment (NSA) literature and identify its relevant concepts and the traditions that govern its practice on a universal level. The chapter ends with identifying an area of concern within the prevailing top-down approaches to NSA, which appear to lack sensitivity and relevance to the needs and limitations of individual local cultural contexts. This concern leads to the second chapter, where I review bottom-up approaches to NSA, which constitutes the second, and less dominant approach to NSA. The chapter discusses the roles of community participation within architectural and urban literature and breaks down the concepts of community participation. From there, I discuss the two positions for promoting community participation within architectural and urban processes, which are ethical and instrumental. The review justifies why I adopt an instrumental approach for community participation, which calls for implementing those processes because of their impact on improving environmental and social qualities of environments, and not just for their political and ethical merit.

This discussion takes us to Chapter 3, where I explain the need to develop communication channels between top-down and bottom-up approaches to NSA, better known as hybrid NSA. In this chapter, I review available models for hybrid sustainability assessment and attempt to adapt them to the context of affordable housing neighbourhoods. The chapter ends with focusing on Post Occupancy Evaluation (POE) as a tool for facilitating hybrid NSA for affordable housing neighbourhoods. This informs my development in later chapters of a novel POE tool for conducting case study research on using community-led POE to localise expert-led NSATs. This takes us to Chapter 4, where I explain and detail a methodological approach for using community-led POE data to localise expert-led NSATs. This chapter describes the steps of my suggested methodological approach. It shows how I implemented them in the case study of Alsayah affordable housing neighbourhood in the Muharraq governate, Bahrain, where I attempted to use the community-led data to localize a universal LEED framework for evaluating the sustainability of neighbourhood developments (LEED-ND).

In Chapter 5, I display the case study results in terms of how locals evaluate their neighbourhood setting, the causes they give for those evaluations, and the variables that affected those evaluations. I use those results to structure Chapter 6, where I discuss the significance of the findings and relate them to the LEED-ND framework. I discuss nuances where community-led findings differed or agreed with experts' recommendations and expectations set within LEED ND. I use those to identify practical ways to finetune the LEED-ND framework to the context of affordable housing neighbourhoods in Muharraq, Bahrain. Then, I discuss the case study findings in relation to the broader literature of NSA to identify the value of using community-led POE in localising expert-led NSAT for specific contexts. I also use the results to refine my suggested methodological approach for using community-led POE to localise expert-led NSATs. Chapter 7 presents the thesis conclusion, summarising the rationale behind conducting this research, the adopted methodology, and the significance of the findings. I also summarise the research limitations and suggest areas for future research. The thesis ends with relevant appendices I used to prepare this document.

Background Information

Neighbourhood Sustainability Assessment in the Middle Eastern Context

The high cost and voluntary nature of NSATs make them rarely used for evaluating affordable housing neighbourhoods (Szibbo, 2016). In the gulf cooperative council (GCC) countries (which includes KSA, UAE, Qatar, Bahrain, Kuwait and Oman), only three communities were assessed using NSATs. These are KAPSARK in KSA which is a LEED-ND certified exclusive research community; Msheireb downtown regeneration project in Qatar, LEED-ND certified (LEED, 2020); and Alzahia in UAE, a middle to high-income gated community certified by BREEAM communities (BREEAM, 2020). These figures show a clear gap in using NSATs for evaluating affordable housing developments. LEED is the most implemented sustainability assessment tool in the Middle East, with 4221 certified projects, 22 of them located in Bahrain (LEED, 2020). Only 14 of the 4221 accredited projects follow the LEED-ND scheme, and none are in Bahrain (LEED, 2020). This widespread use of LEED in the Middle East necessitates devising ways to adapt the tool to local requirements, especially in affordable housing neighbourhoods. LEED, which embraces equity in its philosophy, allocates only three optional points for affordable housing out of the possible 110 points (Szibbo, 2016), making its equity claims highly questionable and in need of reassessment.

Bahrain: Sustainable Development Goals and The Unclarity of a Pathway

Bahrain is an archipelago in the Arabian Gulf with a small geographical area of 778.4 km^2 (Information & eGovernment Authority, 2017). Oil was discovered in Bahrain in 1932 and led to an economic boom. The country has witnessed rapid urban development since the early 70s (Hamouche, 2004). Currently, it is experiencing a housing crisis that is attributed to the country's limited land availability and very high population growth rate of 7.4% (National Information Commission, 2016). The population in Bahrain has increased six times since the early 70s and is now estimated at 1,424,000 compared to only 621,000 in 1999 (Ministry of Information Affairs, 2020). This figure is anticipated to exceed 2 million by 2030 (Information & eGovernment Authority, 2017).

In 2011, thousands of people rioted in Bahrain and caused injuries and a few fatalities among civilians and police officers (Bassiouni et al., 2011). An independent commission of inquiry investigated the riots and listed the factors that contributed to them. Among those factors was the housing crisis which was marked by noticeable residents' dissatisfaction with affordable housing services and some concerns across certain groups around the equity in providing those services (Bassiouni et al., 2011). The public's dissatisfaction comes despite various housing projects

completed by the Ministry of Housing and Urban Planning (MHUP) in Bahrain. The MHUP has carried 128,415 services for low-income people since its establishment in 1960, ranging from the provision of free plots, affordable housing and flats units, social loans and subsidised rent for limited-income citizens as depicted in figure 1 (Ministry of Housing, 2018a). The MHUP's mission is 'to enhance the quality of life of all Bahraini citizens by delivering superior housing services through an innovative and sustainable housing system that strengthens both Bahrain's society and its economy' (Ministry of Housing, 2018b). This mission comes as a part of the commitment to SDGs. However, it is unclear how the official bodies evaluate the progress towards sustainability.
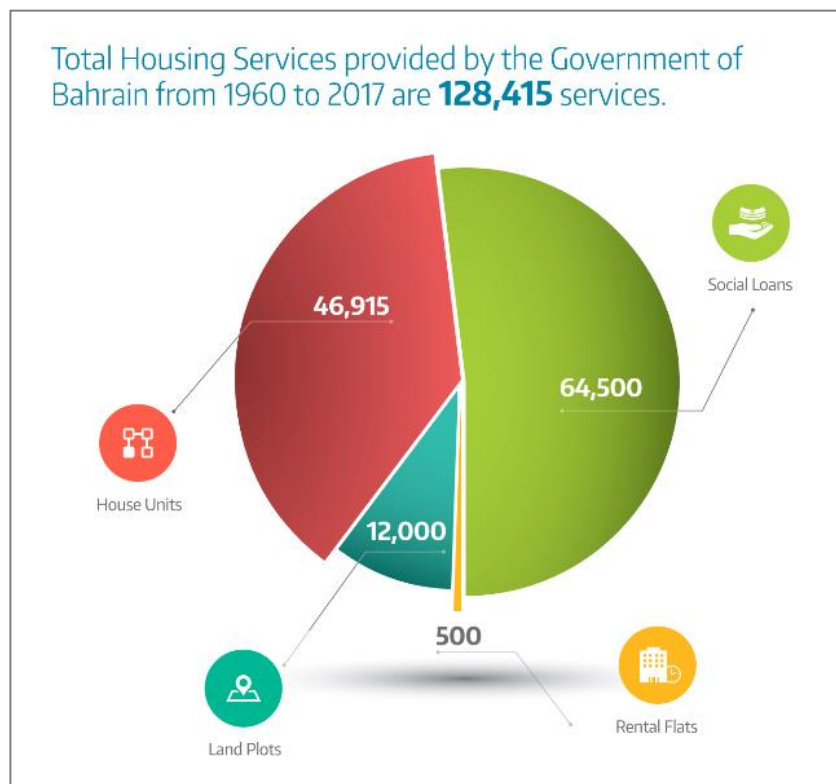
Figure 1. Ministry of Housing achievements in Bahrain (Ministry of Housing, 2018, p. 22)

In 2018, Bahrain issued its first voluntary national review on implementing Bahrain's 2030 agenda for sustainable development and SDGs (National Information Committee, 2018). The agenda had several priorities, including enabling the locals to contribute to improving their living standards and developing urban policies to achieve sustainable, affordable housing. The report identified a need to establish a transparent, evidence-based measure for monitoring the progress towards SDGs. The report used the absence of slums and homelessness as an indicator of fulfilling affordable housing needs, which treats housing provision as an environmental need and neglects its social dimension.

This approach contradicts the report's aims, which define community cohesion and local identity as challenges in Bahraini neighbourhoods. A pivotal study on neighbourhood social sustainability literature by Dempsey et al. (2011) identified social networks and community pride as key measures of neighbourhoods' social sustainability. Given the challenge of community cohesion and local identity reported in parts of Bahrain, researchers and government officials need to be sensitive to several issues, such as: how to address social sustainability concerns that are specific to Bahrain. How to develop locally relevant measures for approaching the sustainability of new affordable housing neighbourhoods? And how to expand the value of housing from the mere provision of space to adding social value?

Housing context in Bahrain

Bahrain's housing reality reflects a complex interplay of economic, social, and political dynamics characteristic in many on the Gulf Cooperation Council (GCC) countries. A key aspect of this context is the government's role in housing provision. Similar to its GCC neighbours, Bahrain has historically provided substantial housing subsidies and services to its citizens (Mohammad Noor Al-Nabi, 2012). However, Bahrain faces a unique challenge because of its very limited geographic area, combined with its rapid population growth (Ansari, 2009). Those two factors strained housing availability and affordability (Ansari, 2009) leading to a general dissatisfaction with the housing condition in Bahrain, especially by the lower-income groups (Bassiouni et al., 2011).

The Bahraini government has initiated various housing projects and policies aimed at addressing these challenges. Efforts to diversify housing finance options and the involvement of the private sector as developers are notable trends (National Information Commission, 2016). Such measures aim to increase housing availability and affordability while reducing the fiscal burden on the government, though researchers argue the effectiveness of this approach (Hamouche, 2008). While state-led housing provision remains a cornerstone, evolving economic realities and land scarcity are driving shifts towards more diversified housing strategies.

In addition to changing housing policies and strategies, the architectural solution for the Bahraini house changed significantly around two periods of time, the first was in the 1970's following the country's independence, and the second a few decades after following the urban and population growth (Fuccaro, 2000). In the traditional Bahraini housing paradigm, the central courtyard served as a pivotal element, reflecting deep-rooted cultural value of preserving the privacy of the house residents (Saravia et al., 2017). In addition to its cultural significance, the courtyard acted as an ingenious response to Bahrain's hot climate, with the central open space acting as a natural cooling mechanism for the surrounding spaces. This housing typology

underwent a significant transformation post-independence in 1971, propelled by the economic boom, fuelled by oil revenues (Fuccaro, 2000). This period marked a rapid urban expansion and a consequential shift in the residential architecture. Traditional courtyards were increasingly replaced by front yards, altering housing layouts from introverted to extroverted designs. Additionally, modern Bahraini houses began to include a 'majlis' space – a formal gathering area with a separate entrance (Saravia et al., 2017). This space was added to host guests, predominantly males, without compromising the privacy of the residents.

This evolution in housing, while aligning with resident preferences, raised sustainability concerns, especially considering Bahrain's limited land area and its growing population. Those conditions required densifying the urban neighbourhoods, which led to the downsizing of residential units (Remali et al., 2016). The downsizing often came at the cost of losing the private outdoor spaces and the majlis (Saravia et al., 2017). Saravia et al. (2017), suggest that reducing these spaces may have undermined the traditional social dynamics. This challenges modern housing's ability to support the customary Bahraini lifestyle, leading to greater residential dissatisfaction. Such dissatisfaction is likely to be more evident by lower-income people who are more compelled to downsize. This analysis of the changing landscape of Bahraini housing underscores the need for a more sustainable and culturally sensitive approach to urban planning and architectural design in the region, especially for affordable housing neighbourhoods.

Relevant Practices of the Ministry of Housing and Urban Planning in Bahrain Concerning Their Developed Affordable Housing Neighbourhood Projects

Affordable housing is a term that is widely used in the urban literature. However, the term does not have a unanimous definition within the field (Johnson et al., 2019). Pullen et al. (2010) state that one of the most common definitions of affordable housing is housing whose cost and maintenance expenses do not exceed 30% of the household income. In Bahrain, providing affordable housing is considered the government's obligation towards the low-income citizens as evident in Article 9, paragraph f, of the Constitution, "The State shall endeavour to provide housing to citizens with limited income" (Government of the Kingdom of Bahrain, 2002). The Ministry of Housing and Urban Planning (MHUP) is the body responsible for providing affordable housing services in Bahrain. The Ministry's mission, as stated on its website, is to: "provide the best types of housing services suitable for citizens with low incomes to ensure their stability and achieve a decent livelihood" (Ministry of Housing and Urban Planning, 2018).

The range of services provided by the MHUP are listed on its website (Ministry of Housing and Urban Planning, 2022) and comprise mainly subsidized services (e.g., very low interest mortgages for houses built by a range of approved public and private sector developers), or a

single grant of a plot with residential classification, ranging from approximately 200 to 350 m2. Despite the obligation of the MHUP towards providing affordable housing, the Ministry does not have a clear definition of what constitutes affordable housing. Instead, it focuses on defining the proportion of low-income people who are eligible for public housing support schemes. I reviewed the services provided by the MHUP based on the monetary values of the subsidized services and the eligibility criteria set for the beneficiaries. From there, the ministry seems to define affordable housing as housing that does not cost more than 60,000 to 120,000 Bahraini Dinars (approximately £120,000 to £240,000) with the condition that this cost does not exceed 25% of the household income.

Each Bahraini family of limited income who does not own property is entitled once to an affordable housing service. The MHUP defines more than one eligible type of family and defines the main beneficiary as the person(s) entitled to affordable housing service based on the following categories (Ministry of Housing and Urban Planning, 2022a): married couple; one parent with a minor child; an adult child with dependent parents; orphaned adult sibling with minor dependent sibling(s); divorced, abandoned or widowed single women. The definition of limited income differs based on the service applied for, as shown in Table 1. Families are entitled to one of the following services depending on their structure and income (Table 1). The Ministry provides seven services (Ministry of Housing and Urban Planning, 2022b), which are: 1) Provision of a housing unit with easy finance; 2) Provision of free land; 3) Apartment ownership; 4) *Mazaya* (advantages scheme for purchasing affordable houses and apartments, provided in collaboration with the private sector); 5) Purchase financing; 6)temporary housing; and 7) *Masaken* (habitats) program services for abused women. All the services used to be provided by the public sector, represented by the MHUP and the housing bank. However, recently more services were provided in collaboration with the private sector including the purchase of houses or apartments (as shown in table 1).

Table 1. A breakdown of the services provided by the Ministry of Housing in Bahrain (Ministry of Housing and Urban Planning, 2022b)

Service	Service description	Income conditions on the beneficiary	Services Provider
1. Housing Units	Receive a villa unit for long finance with low instalment	Monthly salary must not exceed £1800 and not exceed £2400 upon allocation	Public sector only – MHUP
2. Land	Receive a free land provided by the MHUP, to be built at the expense of the beneficiary as a	When applying and upon appropriation, monthly income should be less than £1600 and no more than £3000.	Public sector only – MHUP

	family house within four years (otherwise, it gets confiscated)		
3. Apartment Ownership	Receive a villa unit for long finance with low instalment	Monthly income when applying should not exceed £1800 and not exceed £2400 upon allocation	Public sector only – MHUP
4. Mazaya (Advantages-affordable houses and apartements)	Buy a house or an apartment of approved specifications by the MHUP for long finance with low instalments (not exceeding a quarter of the beneficiary's salary at any time)	Monthly income when submitting the application and disbursing the financing from the participating bank must not be less than $1200 and not more than £2400	Finance is provided by approved banks from the private sector. Housing units provided by approved private sector developers
5. Purchase Financing	Reconstruction Financing, Construction Financing, or Purchase Financing	When applying and upon appropriation, monthly income should be less than £640 and no more than £2400.	Housing Bank – Public sector
6. Temporary housing	This service allows the citizen to apply for temporary housing	The Housing Committee must approve requests	
7. Masaken (habitat) Program Services	Residential buildings used to house emergency cases, especially those related to widows and divorced women, two residential buildings in each of the five governorates of the Kingdom, providing a total of 60 apartments	_____	MHUP, in collaboration with the Supreme Council for Women and developers from the private sector

The type of service this research focused on was the housing unit (private villa) provided by the MHUP. This type of service was the primary service responsible for creating affordable housing neighbourhoods in Bahrain until recently, as shown in figure 1 (Ministry of Housing and Urban Planning, 2018) when new services were introduced in 2022. The provided houses are units within whole neighbourhoods developed entirely by the MHUP, known as affordable housing neighbourhoods. The Ministry develops affordable housing neighbourhoods and allocates plots for relevant public or semi-public services (e.g. schools, shops, mosques, green open spaces, etc.) to be developed later by concerned parties (e.g. Ministry of Education, Ministry of works and municipalities, etc.). The Ministry fully develops the neighbourhoods and housing units without any involvement from the community. The units are provided on a conditional deed and fully transferred to the beneficiary after paying low instalments over 25 years to the Housing Bank.

Affordable housing neighbourhoods in Bahrain are designed as villas or apartment buildings, with an overwhelming majority of villas over apartments. This proportion is now shifting in favour of flats because of the increased population and land and resource limitations. However, this shift is resisted by the public. For both affordable residential units, the MHUP designs identical housing units without involvement from the community and then allocates them to the beneficiaries based on the precedence of their application and the place of their residence upon applying for the service. Figure 2 shows one of the prototypes of an affordable housing apartment building (Ministry of Housing and Urban Planning, 2012), while figure 3 shows one of the housing prototypes adopted by the Ministry of Housing in Bahrain (Ministry of Housing and Urban Planning, 2019). Applicants must have a Monthly salary that does not exceed £1800 upon requiring the service and does not exceed £2400 upon receiving it (table 1). Once allocated their units, recipients pay a monthly instalment of approximately £400 over 25 years to own the house and the plot. As a common practice, the ministry tries to allocate residents to neighbourhoods near their residence address upon their application; therefore, most of the residents of any project have likely been living in the same governate where the housing project is located.

AJ Apartment buildings prototype

- 6 floors
- 2 apartments per floor
- Each apartement has 3 bedrooms
- Area of each flat = 146m2

Master BR 4200 x 5000

Kitchen 4900x3000

Store 2000x2480

Living room 5600x4700

Bedroom 2 3800x3600

Bedroom 3 3600x3400

Typical Floor Plan

0 .5 1   2   3   6 M

Figure 2. A sample affordable housing apartment building prototype adopted by the Ministry of Housing, Bahrain,
(Ministry of Housing and Urban Planning, 2012)

D5 Residential unit prototype

189m² total built-up area

2 floors

3 bedrooms

Figure 3. A sample affordable housing villa prototype adopted by the Ministry of Housing, Bahrain, designed in a traditional architectural style (Ministry of Housing and Urban Planning, 2019)

The Urban Growth in Bahrain

Until 2014, Bahrain used to have five governates: Capital, Muharraq, Northern Southern and Central Governate. In 2014, the Central Governate merged with the Southern Governate (Kingdom of Bahrain, 2022), keeping four total, as mapped in figure 4 (Information & eGovernment Authority, 2017). Because of this change, there was a changing reference to four or five governates throughout the thesis and the used figures, depending on the time represented by the data. Bahrain relies on waterfront reclamation more than densification as a policy for urban growth (Fuccaro, 2000). Figure 5 shows the change in Bahrain's waterfront over the past decades. The governate of Muharraq has the highest urban growth rate, as seen in the map of Bahrain governates (figure 5). Muharraq, the historic capital of Bahrain, holds the country's largest number of new affordable housing projects (Ministry of Housing, 2018a). Below, I detail a comparison between the governates, which shows why Muharraq features a more equitable and diverse housing typology and resident profile regarding mixed ethnicities, family size and gender distribution (Information & eGovernment Authority, 2010). I used these sustainable features to select the city of Muharraq as a case study for this research, where I examine the use of POE as a tool for localising LEED-ND in the context of affordable housing in Bahrain.
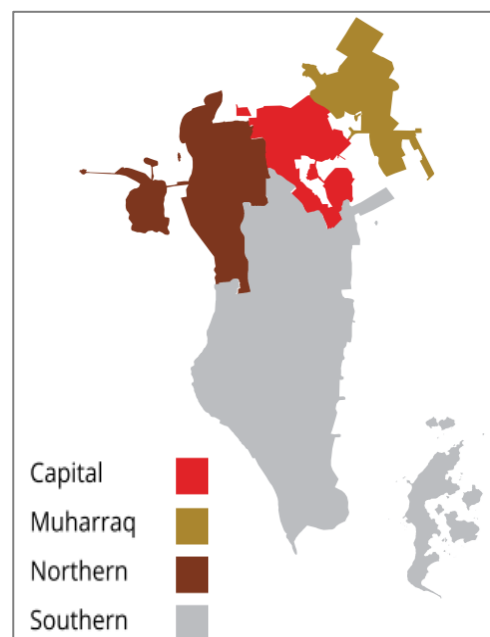
Figure 4. Bahrain's governates (Information & eGovernment Authority, 2017, p. 18)
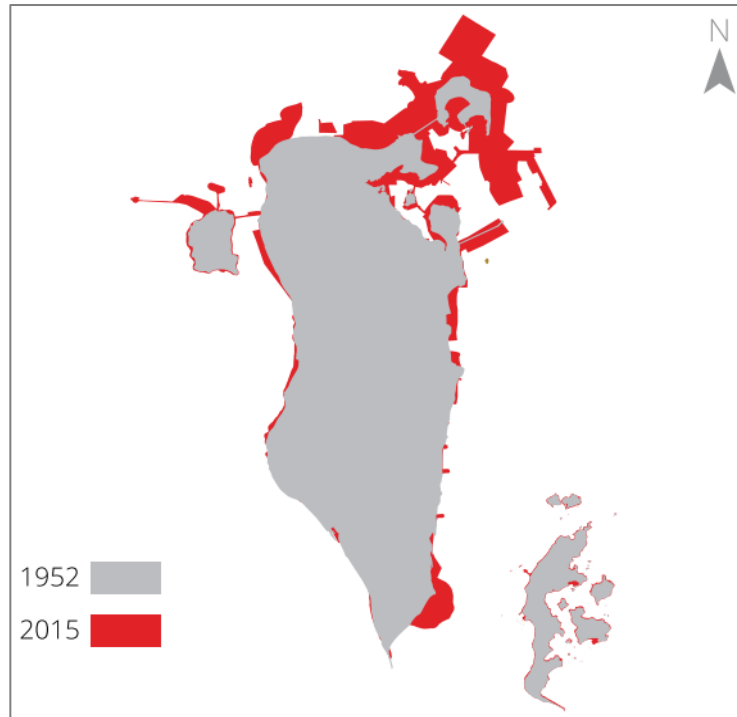
Figure 5. Waterfront reclamation in Bahrain between 1952-2015
(Information & eGovernment Authority, 2017, p. 19)

Population and Housing Characteristics Across the Governates of Bahrain

I reviewed the available statistics about the residential units and residents' profiles in Bahrain. I aimed to select a case study that approaches as many of the reviewed neighbourhood sustainability indicators as possible. I focused on indicators that are believed to affect the social dimension of sustainability (both: physical such as compactness, different residential typologies, and tenure type, and nonphysical: such as inclusiveness and diversity of the residents, affordability, and cohesion). I based this decision on a case study research by Pinfield (1997), where he found that the locals were only interested in indicators they could understand from their perspective; this makes social factors more relevant for consideration as a starting point in participatory sustainability assessment. The outbreak of Covid made it hard to contact formal authorities to enquire about unpublished information or to generate primary physical data personally. This made me rely on readily available data only. First, I reviewed several statistical variables for each governate in Bahrain to determine the governate from which I will select a case study neighbourhood. Restricted by data availability, I reviewed the following factors which could affect the inclusiveness, diversity, and equity in the examined contexts:

1)   Gender representation:

To select a context with an equivalent gender representation, I reviewed the available statistics on residents' gender distribution by governate and nationality. Table 2, which I adapted from Bahrain's 2010 census (Information & eGovernment Authority, 2010), shows the distribution of Bahrain's residents in each governate based on their sex and nationality. I used these data to generate figure 6, which shows the ratio of both genders in each governate. I separated the gender representation ratios based on nationality to correctly interpret the data since Bahrainis have an even ratio of male to female residents. At the same time, the non-Bahraini population is male-dominated (Information & eGovernment Authority, 2017). Figure 6 shows an equivalent distribution of male and female citizens across all governates based on those ratios. This means that equivalent gender distribution wasn't a significant factor in selecting a governate with a more equitable residents' profile.

Table 2. Population by Governorate, Nationality and Sex - 2010 Census - Source: (Information & eGovernment Authority, 2010)

	Non-Bahraini		Bahraini	
	Female	Male	Female	Male
Capital	71,037	190,884	33,442	34,147
Muharraq	29,722	57,148	50,538	51,706
Northern	30,186	52,701	96,229	97,833
Central	36,015	118,717	85,205	86,368
Southern	16,202	52,323	15,746	17,185
Not Stated	1,835	9,402		
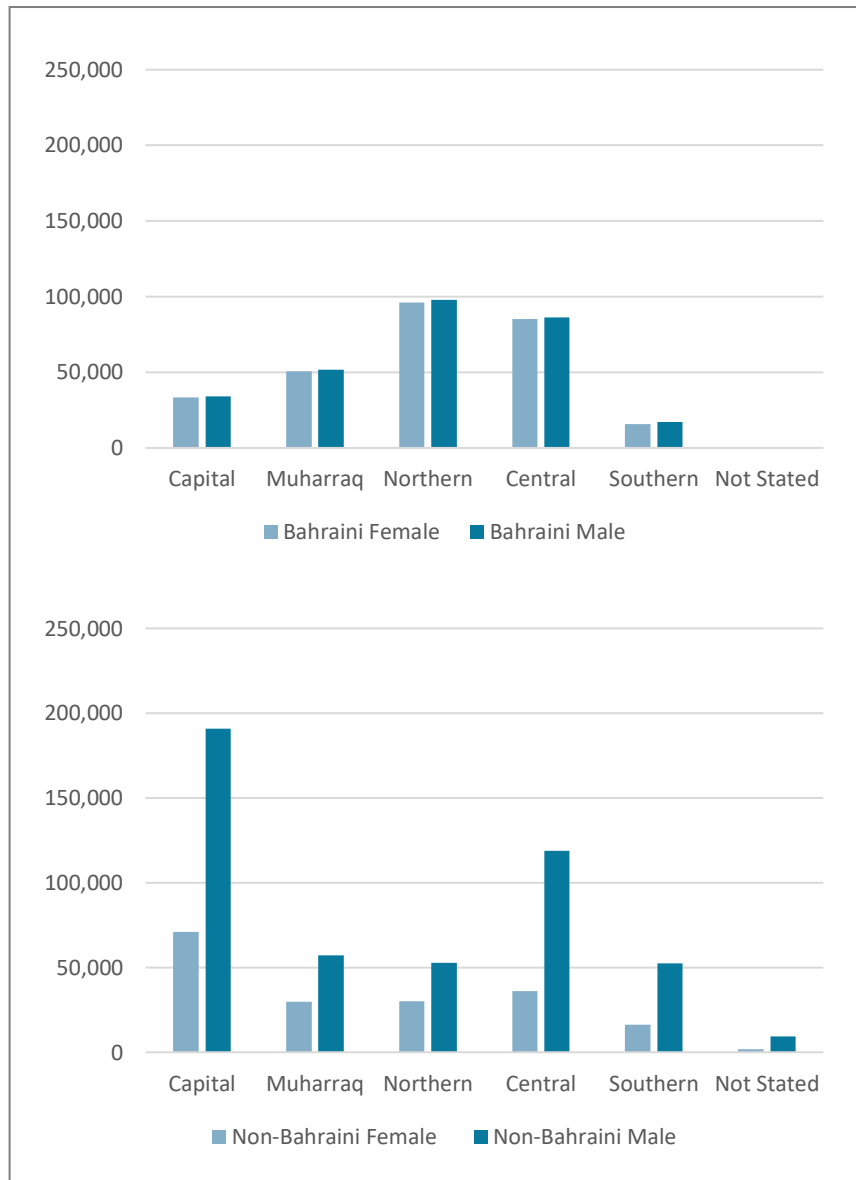
Figure 6. Population by Governorate, Nationality and Sex - 2010 Census - Source: (Information & eGovernment Authority, 2010)

2) Ethnic diversity:

Using table 2 again, I generated a chart to show the ratios between Bahrainis and non-Bahrainis in all governates (figure 7). The most equivalent distribution appears to be in Muharraq governate, making it have a more diverse resident profile. This gives Muharraq governate of more contextual value for learning the impact of adopting more sustainable measures on the residents' evaluation of their neighbourhoods.
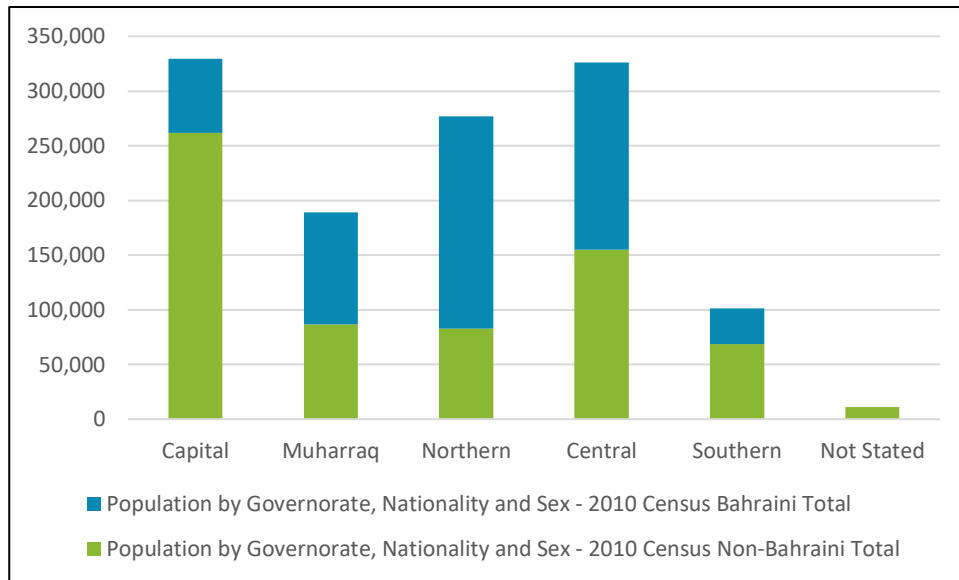
Figure 7. Ratios of Bahraini to non-Bahraini population in each governate

3) Housing type diversity:

Table 3 details the private households in Bahrain based on housing type. It breaks those figures down for Bahrainis and non-Bahrainis in each of the five governates of Bahrain[1]. I used the statistics below to understand housing types in Bahrain, along with the diversity of housing typologies and the diversity and inclusiveness of residents' profiles in each community. The figures show that Bahraini households are dominated by a majority of 43% private villas, followed by 40.8% flats. Affordable housing villas represent 7.1% of the total private households in Bahrain. It is worth mentioning that only Bahraini citizens can benefit from the affordable housing scheme provided by the government of Bahrain. Those figures date back to 2010 and with the limited land availability in Bahrain (National Information Commission, 2016), those figures have probably shifted more towards flats nowadays. Nevertheless, an overview of the local newspapers, social media and parliament sessions shows that the locals prefer private villas over flats. Given their statistical dominance and residents' preference, neighbourhoods with private villas set seemed like a more valuable option for the POE case study. POE would provide valuable data to understand the qualities that resulted in this preference and whether those can be attributed to specific physical features.

I used colour coding in table 3 to show each governate's distribution of housing typologies. The darkest colour represents the highest total units, and lighter shades represent the lower number. Of the five governates of Bahrain, Muharraq has the most balanced distribution of housing typologies. It also has the most balanced ratio of private villas to flats, with a ratio of 1: 1.001, and the most balanced ratio of Bahraini flat residents to non-Bahraini flat residents, with

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[1] Those became only four now after Central governate with the Southern and Capital governates in 2014.

a ratio of 1: 1.03. This balance reflects a more diverse and inclusive community, making affordable housing neighbourhoods in this governates more worthy of analysis for research focusing on sustainability. The second governate with a relatively balanced ratio of flats to villas is the Southern governate, with a ratio of 1:1.08. While this ratio also shows an equivalent distribution of housing typologies, the total number of housing units in the Southern governate is significantly lower than in Muharraq. This makes Muharraq governate statistically more significant as a case study. In addition, the Southern governate has a lower ratio of Bahraini to non-Bahraini flat residents with a ratio of 1:1.3. Those numbers make Muharraq a more viable case study for understanding the evaluation of the locals for the urban context of neighbourhoods which adapt more sustainable measures.

Table 3. Private Households by Housing type and Governate – 2010 Census Housing

		Governate				
		Southern	Central	Northern	Muharraq	Capital
Flat	Total	3148	10346	680	9299	27745
	Bahraini	1369	7071	4580	4710	5825
	Non-Bahraini	1779	3275	2224	4589	21920
Private Villa	Total	3419	19108	22048	9283	6474
	Bahraini	2603	18289	20629	8511	4951
	Non-Bahraini	816	819	1419	772	1523
Garden Villa	Total	56	183	1375	80	258
	Bahraini	33	93	336	46	85
	Non-Bahraini	23	90	1039	34	173
Conventional house/ Housing Villa	Total	588	1856	1984	3082	2480
	Bahraini	401	1654	1812	2551	1972
	Non-Bahraini	187	202	172	531	508
Traditional House	Total	260	472	836	2662	395
	Bahraini	166	417	753	2060	266
	Non-Bahraini	94	55	83	602	129
Annex	Total	4	41	60	46	18
	Bahraini	2	12	9	8	3
	Non-Bahraini	2	29	51	38	15
Others	Total	354	1433	1036	1007	1967
	Bahraini	109	735	588	468	536
	Non-Bahraini	245	698	448	539	1431
Total		7829	33439	34143	25459	39337

4) Diverse household profile:

Table 4 represents the household size (number of residents within the residential unit) and its breakdown by nationality and governate. I used this table to understand the characteristics of household size in Bahrain. The majority of the households in Bahrain (13.4%) have a single resident. This figure is followed by households with five members, with a ratio of 11.5% of the population. Those figures are closely followed by 4 and 6 residents, which likely means that the average Bahraini family consists of 5 members comprising two parents and three children. The ratio drops significantly for households of 8, 9, 10 and 11 residents per residential unit but then jumps again to 8.6% for households with 12+ members. The 12+ residents could mean an extended family living in the same housing unit since it's a common practice in Bahrain for married family members to live on a separate floor level within the same house with their parents.

I used the data in table 4 to generate the charts in figure 8. This figure shows the distribution of household size by governate and nationality. The statistics show that all governates display a similar distribution pattern of household size. While those figures provide a better understanding of the structure of the household distribution pattern in Bahrain, they also mean that this factor has no significance in selecting the case study context.

Table 4. Private Households by Governorate, Nationality and Households size – 2010 Census

		Households size											
		12+	11	10	9	8	7	6	5	4	3	2	1
Capital	Total	1641	400	1036	1336	1801	2388	3049	4086	5163	4808	4116	9513
	Bahraini	1641	400	520	682	906	1207	1467	1660	1386	1175	1193	1401
	Non-Bahraini	0	0	516	654	895	1181	1582	2426	3777	3633	2923	8112
Muharraq	Total	1912	636	992	1384	1957	2581	3070	3160	2694	2117	2182	2774
	Bahraini	1912	636	831	1163	1676	2158	2466	2284	1706	1299	1190	1033
	Non-Bahraini	0	0	161	221	281	423	604	876	988	818	992	1741
Northern	Total	3827	998	1374	1985	2857	3942	4541	4227	3330	2419	2125	2518
	Bahraini	3827	998	1304	1866	2706	3678	4176	3592	2518	1668	1355	1019
	Non-Bahraini	0	0	70	119	151	264	365	635	812	751	770	1499
Central	Total	3676	973	1401	1879	2672	3531	4047	3982	3398	2652	2200	3028
	Bahraini	3676	973	1285	1758	2485	3291	3698	3497	2780	2052	1537	1239
	Non-Bahraini	0	0	116	121	187	240	349	485	618	600	663	1789
Southern	Total	1092	250	363	452	523	605	691	717	778	686	720	952
	Bahraini	1092	250	268	342	383	432	458	396	326	262	243	231
	Non-Bahraini	0	0	95	110	140	173	233	321	452	424	477	721
Total	Total	12148	3257	5166	7036	9810	13047	15398	16172	15363	12682	11343	18785
	Bahraini	12148	3257	4208	5811	8156	10766	12265	11429	8716	6456	5518	4923
	Non-Bahraini	0	0	958	1225	1654	2281	3133	4743	6647	6226	5825	13862
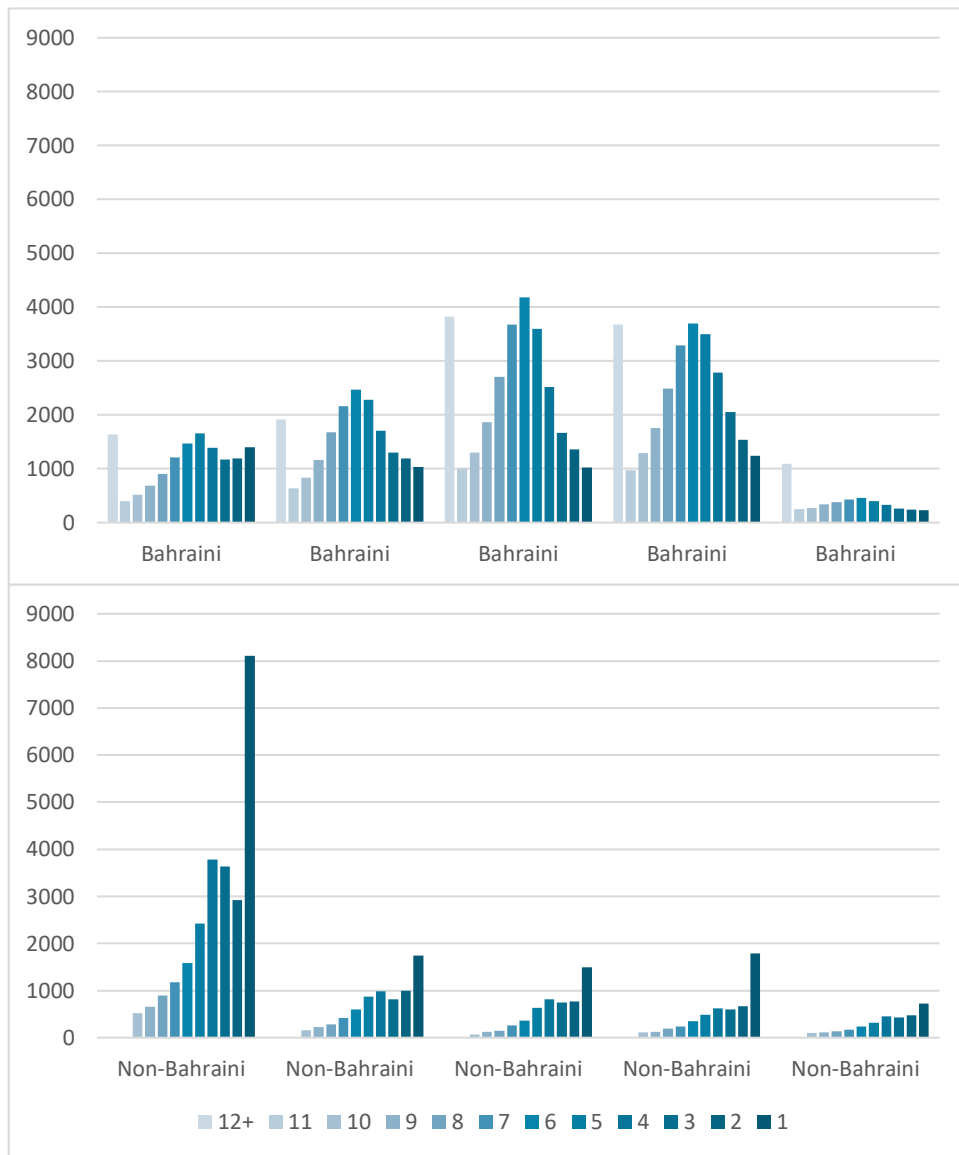
Figure 8. Household size by Governate and Nationality

The earlier discussion illustrates that the Muharraq governorate exhibits a better array of sustainable features, particularly in terms of residents' ethnic diversity, gender representation, household size, and housing typology. To effectively use POE as a research method for assessing urban and architectural features, the selected case study needs to feature close resemblance to the features in question. Since this research focuses on the sustainability of affordable housing neighbourhoods, I should ideally select a neighbourhood built based on the framework of a specific NSAT. However, Bahrain, like the rest of the Middle East, lacks any affordable housing neighbourhoods constructed under an existing NSAT framework. Consequently, the next logical step was to choose a case study embodying as many sustainable features as outlined in neighbourhood sustainability literature. Muharraq, with its diverse sustainable features across the governorate, emerged as the suitable context for this case study. This selection enables me to

examine the use of community-led POE to adopt LEED-ND in the context of affordable housing neighbourhoods in Bahrain.

This case study was conducted in an inductive approach to explore the larger question: how can professionals use community-led evaluation to adapt generic NSA frameworks to the needs of specific cultural contexts? Which fits within the literature on hybrid neighbourhood sustainability assessment. The following chapter provides an extensive review for neighbourhood sustainability assessment literature in terms of development, relevant concepts, and the tension that exists between its dominant top-down approach, and a less prevailing bottom-up one.

Chapter 1: Review of Neighbourhood Sustainability Assessment Literature

Neighbourhood Sustainability Assessment (NSA) evolved as an identifiable scale within the literature of sustainability assessment, with its own frameworks and tools. NSA is used to describe the process of evaluating a local development's progress towards achieving sustainability goals (Sharifi & Murayama, 2013). This definition involves a series of complex processes needed to assess the sustainability of a specific neighbourhood. The processes of NSA include (figure 1.1): 1) Defining sustainability goals, which typically result in creating a Neighbourhood Sustainability Assessment Framework (NSAF) (Tran, 2016); 2) Carrying the assessment process, where the framework is used to evaluate the sustainability of a local area; 3) Evaluating the efficiency of the devised NSAF, which means testing the effectiveness of the NSAF in achieving its stated aims to review and modify the framework (Doussard, 2017); and 4) Reviewing the devised framework based on the findings of stage 3 (Arslan et al., 2017).

Researchers and practitioners cannot verify the assumptions of the designed NSAFs (stage 1 outcome) with certainty without following it by stage 3 (reviewing the impact of the implemented NSAF in a specific context). Stage 3 represents the phase of collecting empirical data on the success of the implemented NSAF in achieving its stated aims (generated in Stage 1). Overall, stage 3 is either underrepresented in the literature (Szibbo, 2016) or carried out theoretically without backing the assumptions with empirical evidence (Dempsey, 2008). My research focuses on stages 3 and 4 and the impact they could have on adapting generic Neighbourhood Sustainability Assessment Tools (NSATs) to suit specific cultural contexts.

The following chapter presents background information on the development of NSA literature and the main initiatives that shaped it. From there, it presents the main approaches and tools of NSA, which are dominated by expert-led frameworks. In this part, I built primarily on Sharifi & Murayama's review (2013) of NSATs, which offered a comprehensive evaluation of existing tools, highlighting their strengths, weaknesses, successes, and failures. The decision to use this review as a cornerstone for my study was based on its comprehensiveness, and the impact it had on NSA literature. From there, I discussed ethical and impact concerns that accompany the conventional top-down assessment methods and focuses on their weakness in responding to the cultural differences in various local contexts, particularly in the context of Affordable housing neighbourhoods. The section focused on the work of Dempsey et al. (2011) and Dempsey et al. (2012), which highlight issues facing the social dimension of NSA, particularly around concerns regarding the contextual responsiveness of its implemented tools. The section demonstrates how contextually-dependent problems could be mitigated by involving the public

in the assessment processes to localise international expert-led NSATs. This discussion leads to chapter two, which reviews community participation with regard to NSA.
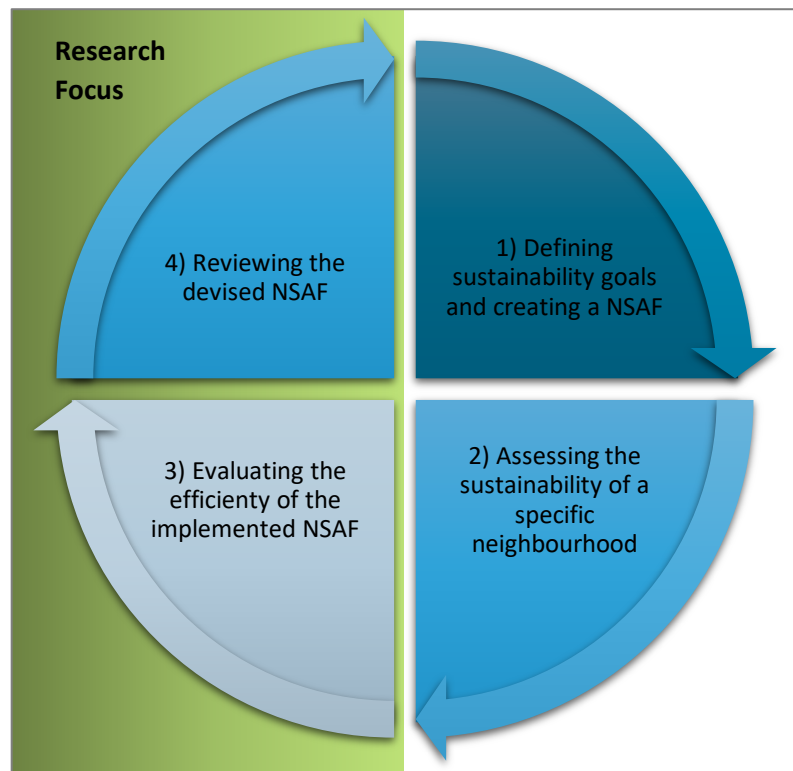
Figure 1.1. Processes of Neighbourhood Sustainability Assessment

1.1. Historical Development of Neighbourhood Sustainability Assessment Policy and Practices

In 1987, the Brundtland report defined sustainable development as '*Development that meets the needs of the present without compromising the ability of future generations to meet their own needs*' (the United Nations, 1987). Since then, the discussion around sustainability has increased dramatically within academic and political circles with three dominant pillars that encompass the concept of sustainability, which are the environmental, economic, and social pillars (Holden et al., 2017; Sharifi et al., 2021). Although those dimensions seem ubiquitous within sustainability literature, Purvis et al. (2019) could not pinpoint the time or source that generated those pillars as a whole within sustainability literature. Despite that, those pillars constituted the main structure for the sustainability assessment frameworks, with a dominance of the environmental pillar over the other two (Boström, 2012).

To approach the broad concepts of sustainability, researchers and practitioners developed several sustainability assessment frameworks to measure and evaluate its concepts.

Initially, sustainability assessment was focused on assessing individual buildings (micro-level) with a focus on their environmental performance (Kaur & Garg, 2019). The scientific nature of the environmental performance indicators resulted in relying on experts to develop building performance assessments (Retzlaff, 2009). Despite their significance, researchers have increasingly found this scale insufficient for assessing the sustainability of whole developments because they could not consider the interrelationships between the buildings and their surrounding elements, being physical components (e.g. parks, in-between spaces, etc.) or non-physical components (e.g. culture, awareness, power dynamics in decision making, etc.) which affect the buildings at an intermediate level (Berardi, 2012; Haapio & Viitaniemi, 2008; Lützkendorf et al., 2019; Sharifi & Murayama, 2014). Also, the neighbourhood scale represents the minimum level for allowing meaningful engagement with the community and impacting the economic and social features of developments (Berardi, 2012; Sharifi & Murayama, 2014). Those critiques were among the main ones that led to a growing interest in sustainability assessment at the neighbourhood scale.

The significance of this Meso-level (interchangeably known as the local or neighbourhood scale) grew first with the release of Agenda 21 (the outcome of the UN's Earth Summit in Rio de Janeiro in 1992) and again with the announcement of the Sustainable Development Goals (SDGs) in 2015 (Woodcraft, 2012). The SDGs comprised 17 goals, with goal 11 focusing on sustainable cities and communities. The aim of SDG 11 is stated as 'Making cities and human settlements inclusive, safe, resilient and sustainable' (the United Nations, 2015b). The goal has ten indicators (as represented in figure 1.2, adapted from (the United Nations, 2015b)); of those, the majority focused on the local scale, especially in terms of the provision of safe and affordable housing, public transportation, green and public space, preservation of culture and heritage, and implementing inclusive and participatory planning and management schemes.

MAKE CITIES AND HUMAN SETTLEMENTS INCLUSIVE, SAFE, RESILIENT AND SUSTAINABLE

Target 11.1
• By 2030, ensure access for all to adequate, safe and affordable housing and basic services and upgrade slums

Target 11.2
• By 2030, provide access to safe, affordable, accessible and sustainable transport systems for all, improving road safety, notably by expanding public transport, with special attention to the needs of those in vulnerable situations, women, children, persons with disabilities and older persons

Target 11.3
• By 2030, enhance inclusive and sustainable urbanization and capacity for participatory, integrated and sustainable human settlement planning and management in all countries

Target 11.4
• Strengthen efforts to protect and safeguard the world's cultural and natural heritage

Target 11.5
• By 2030, significantly reduce the number of deaths and the number of people affected and substantially decrease the direct economic losses relative to global gross domestic product caused by disasters, including water-related disasters, with a focus on protecting the poor and people in vulnerable situations

Target 11.6
• By 2030, reduce the adverse per capita environmental impact of cities, including by paying special attention to air quality and municipal and other waste management

Target 11.7
• By 2030, provide universal access to safe, inclusive and accessible, green and public spaces, in particular for women and children, older persons and persons with disabilities

Target 11.a
• Support positive economic, social and environmental links between urban, peri-urban and rural areas by strengthening national and regional development planning

Target 11.b
• By 2020, substantially increase the number of cities and human settlements adopting and implementing integrated policies and plans towards inclusion, resource efficiency, mitigation and adaptation to climate change, resilience to disasters, and develop and implement, in line with the Sendai Framework for Disaster Risk Reduction 2015-2030, holistic disaster risk management at all levels

Target 11.c
• Support least developed countries, including through financial and technical assistance, in building sustainable and resilient buildings utilizing local materials

Figure 1.2. SDG 11 goal and indicators. Adapted from (the United Nations, 2015b)

The former indicators of SDG11 had a strong social dimension that encouraged being sensitive to the needs of local contexts through adopting inclusive, participatory approaches. This social theme differed from the earlier environmental focus at the building scale. With the increased focus on the neighbourhood level for approaching sustainability holistically, several tools were developed to assess this scale. Many NSATs were developed as spin-offs of initial building assessment tools (e.g. LEED-ND, ECC, BREEAM Communities, CASBEE-UD, Qatar Sustainability Assessment System (QSAS) Neighborhoods, Green Star Communities, Green Mark

for Districts, and Green Neighborhood Index (GNI)). In contrast, others were developed primarily for the neighbourhood scale (e.g. Neighborhood Sustainability Framework, HQE2R, Ecocity, SCR, EcoDistricts Performance and Assessment Toolkit, Sustainable Project Appraisal Routine (SPeAR), One Planet Living (OPL), and Cascadia Scorecard) (Sharifi & Murayama, 2013).

The history and politics of developing sustainability assessment tools appear to have influenced the trends within NSA practices, which Boyle et al. (2018) describe as dominated by generic top-down tools. Despite their dominance, top-down approaches appear to have shortcomings in responding to local requirements of individual contexts in terms of culture, needs, and limitations (Sharifi & Murayama, 2013). In addition, relying on expert-led tools raise some ethical concerns around the equity and inclusion of the decision-making process (Sharifi & Murayama, 2013). Those critiques led to a growing interest in engaging the community more in NSA processes for ethical and instrumental reasons. The bottom-up approaches to NSA represent a more recent and increasingly growing trend within NSA literature.

1.2. Defining Relevant Concepts Within Neighbourhood Sustainability

NSA covers numerous complex, dynamic, and overlapping concepts, which range from objective ones (e.g., reducing CO^2 emission) to subjective ones (e.g., community cohesion). While recurrent themes appear within NSA literature (Berardi, 2013), those rarely have consistent definitions, indicators or measures to assess them (Missimer et al., 2017b). Some views conclude that this inconsistency marks a chaotic and unclear understanding of what neighbourhood sustainability assessment is about (Missimer et al., 2017b). In comparison, others like Dempsey et al. (2011) believe that this inconsistency results from neighbourhoods being contextual and dynamic entities which are affected by the culture of locals at a specific time. The latter view suggests that the dynamic notion of neighbourhood sustainability should be acknowledged as an integral part of this practice as opposed to a weakness in its literature and practice.

Differentiating neighbourhoods and communities

The dynamic nature of the concepts within neighbourhood sustainability is more evident and critical around concepts within social sustainability, primarily when the concepts are understood from the view of the public. Starting from the overarching concept of neighbourhoods, this term is rather challenging to define and operationalize despite having abundant definitions in the literature, as well as possible identifiable geographic boundaries based on official records. The discussion of what a neighbourhood or a community means crosses different disciplines. In geography, neighbourhood definition shifted from being a static area defined by census tract (Buslik, 2015) to a fuzzy place with socioeconomic dependency (Poorthuis, 2018). In the urban context, community and neighbourhood are often interchangeable and refer

to the socio-spatial setting in which people live (Dempsey, 2008). In community psychology, a community is defined as a social network which provides mutual support and is often environmentally rooted (Mannarini & Fedi, 2009). Community and neighbourhood are frequently used interchangeably because of the evident relationship between the place and the bonds formed by people who live in it.

Despite that, it is challenging to match a geographical boundary to a socio-political one (Fraser et al., 2006). Besides, neighbourhoods do not necessarily have clear administrative boundaries, Unlike cities and individual buildings (Lützkendorf et al., 2019). A study by Coulton, Jennings and Chan used GPS to compare neighbourhoods' physical boundaries to the perceived boundary according to low-income people (2013). The study showed that environmental and demographic factors altered the perception of neighbourhoods' size. For example, residents of dense and mixed-use areas had a smaller perception of neighbourhood space than those in low-density areas. Also, long-term residents had a larger neighbourhood perception. This means that neither demographics nor physical attributes can define the extent of a neighbourhood with certainty.

In my research, I define neighbourhoods from an urban and architectural perspective while attempting to bring residents' perspective to what neighbourhoods mean. This is important because this research is committed to bringing bottom-up approaches of NSA closer to the top-down ones; hence, the definition needs to reconcile what this space means from an expert's perspective with what it means from a resident's perspective. I differentiate the term "neighbourhood" and "community" to help evaluate new affordable housing projects where a community might not have been formed yet in terms of having strong social bonds, formed networks, and identifiable character.

I use the term Neighbourhood to describe the physical planning unit of a residential area that includes a group of adjacent dwellings, not separated by high-speed roads and repeated as blocks. Community, on the other hand, will be used to describe people living in physical proximity and sharing common interests because of this proximity. This differentiation agrees with the one used by Shirazi and Keivani (2018) in their framework of neighbourhood social sustainability. The framework triad consists of 1) 'neighbourhood', which refers to a residential area's hard infrastructure or physical aspects. 2) 'neighbours', which refers to the population profile. And 3) 'neighbouring' which refers to the soft infrastructure and social relationship. In my research, the term neighbourhood is identical to the one used by Shirazi and Keivani. The term community refers to the combination of 'neighbours' and 'neighbouring', which results from the dynamics between community members and their perceived sense of community. The following sections show how those three social sustainability themes can be used to better operationalize and

characterise NSA for improving the communication between expert-led and community-led assessment to help mitigate the limitations of its dominant top-down approaches.

1.3. Traditions of Neighbourhood Sustainability Assessment Literature and Practices: identifying areas of Concern

The literature on NSA faces repetitive critiques that include being: 1) vague in defining its concepts and aims (Haider et al., 2018; Holden et al., 2017), 2) difficult to operationalise in practical systems (Bramley, 2009; Purvis et al., 2019), 3) based on theoretical assumptions that are not supported by empirical evidence (Dave, 2010; Sharifi & Murayama, 2014) (e.g., the common claim that high-density neighbourhoods have better social qualities such as inclusion and social contact),4) weak in responding to the local differences and requirements of various contexts, and 5) weak in including the locals in the decision-making process (Sharifi & Murayama, 2013). Those critiques can be grouped into two categories: 1) Instrumental, which relates to the accuracy of the frameworks' assumptions and their efficiency in achieving their stated aims, and 2) Ethical, which relates to issues that involve equity and the democratization of the decision-making processes. The two critiques are typically addressed separately by responding to instrumental concerns by prioritising expertise and scientific opinions of experts (Reed, 2008); and with ethical critiques catered for by prioritising community input (Heritage & Dooris, 2009).

In the following section, I show how these two approaches have indispensable advantages for sustainability assessment at the neighbourhood scale while having clear limitations within each. The tradeoffs between the two approaches make it important to strengthen the area of hybrid sustainability assessment, in which the outcome of both approaches can be combined to balance the ethical and instrumental requirements of the NSA. Below, I classify NSA literature based on its implemented processes or the aim intended by the assessment processes (figure 1.3). The literature around both classifications ends in approaches that take a dominating expert-led form or a less common bottom-up one.

Despite being promising, participatory sustainability assessment practices come with their limitations of applicability and impact that are less evident in expert-led approaches. The review explains why expert-led approaches became more dominant despite their limitations in adapting to the cultural and contextual differences of the local scale. It then shows how those limitations can be mitigated using community-led assessment practices. I define applicability as the feasibility of implementing bottom-up NSA processes in terms of time, funds, personnel, and knowledge. I define impact as the extent of achieving neighbourhood sustainability aims set in collaboration by experts and locals. The review ends with recommendations for shifting the sustainability debate at the neighbourhood scale from prioritising either of those approaches to

promoting better communication between the two. This approach, known as hybrid sustainability assessment, has received increased attention in sustainability literature over the past 15 years.
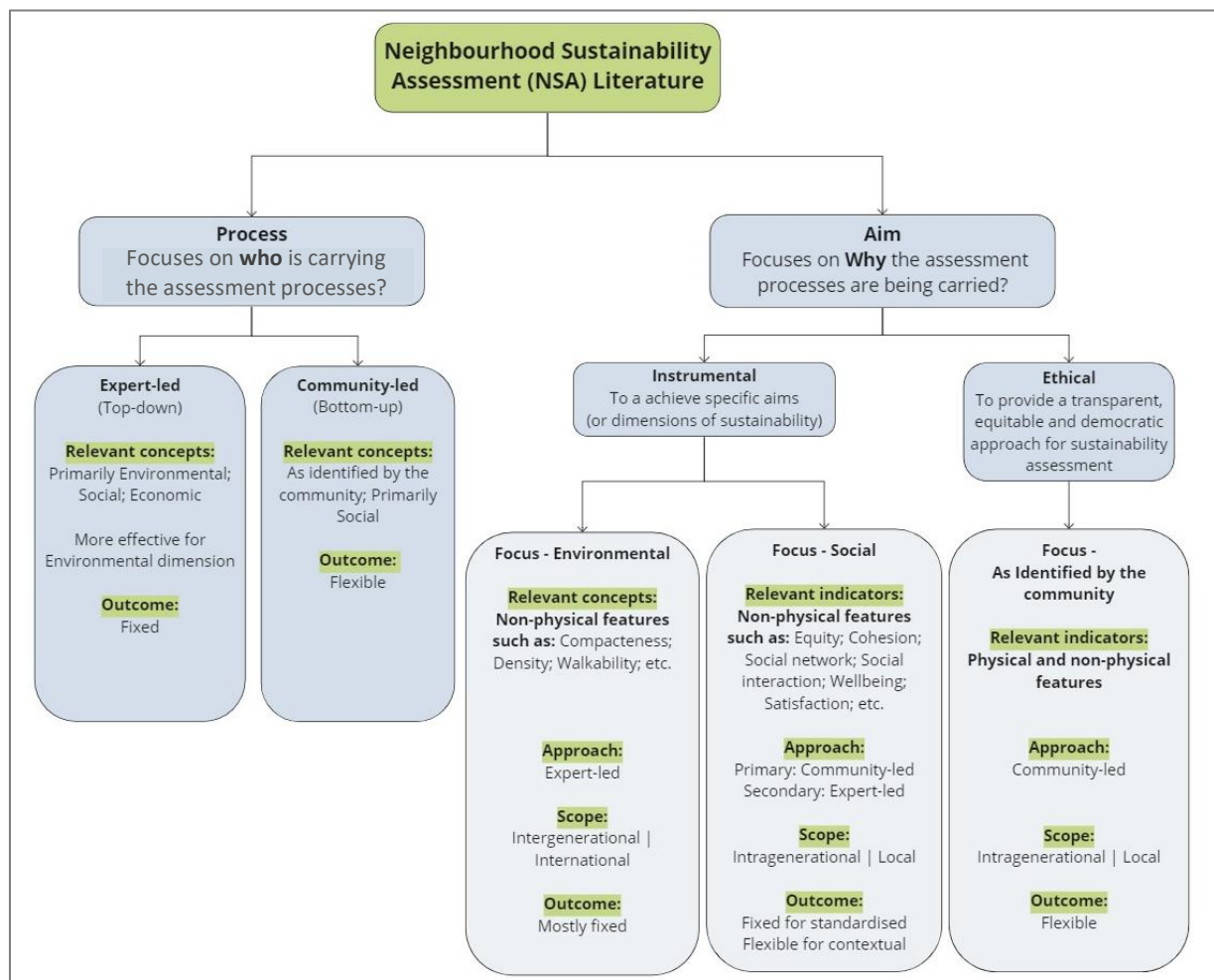
Figure 1.3. Categorising discourses in Neighbourhood sustainability Assessment Literature

Sustainability assessment literature has numerous frameworks and assessment tools (Reed et al., 2006). I tried to identify the main viewpoints that researchers take when designing, selecting, or promoting a specific tool. Those stances show the main strands of thoughts within NSA literature and could aid in identifying the likely advantages, disadvantages, and limitations of the reviewed tools. Overall, I identified two main perspectives used by researchers to discuss NSA literature and depicted those in figure 1.3. The first perspective is based on which stakeholders dominate the assessment processes, and the second is based on the aim behind developing and implementing such tools. Process discourse dominates the literature and primarily classifies NSATs to top-down tools (interchangeably known as expert-led), which are tools developed, implemented and reviewed by experts, and bottom-up tools (interchangeably known in the literature as community-led), which are tools developed and implemented while prioritising the input of the community members (Fraser et al., 2006).

While the term community-led seems to focus on the community's actions, it can be misleading. A closer review of such tools shows that community members do not necessarily drive them. Still, they instead describe tools that favour the local community's interests. For this reason, I find it more meaningful to use the term community-oriented tools to describe the latter type of NSATs. Expert-led tools are presumed more rigorous as they primarily adopt a framework with quantifiable objective measures (Boyle et al., 2018). Their consistency produces fixed frameworks that are considered universally valid by their developers, and they tend to focus more on the environmental pillar of sustainability (Doussard, 2017). On the other hand, community-oriented tools focus more on subjective qualitative measures that are likely to change based on the engaging participants. This makes their outcome vary across time and place, making some researchers view them as less robust and methodical (Missimer et al., 2017b).

This clash between the two categories of NSATs takes us to the second theme of discussion around NSATs, which is based on their aim (figure 1.4.). The aims of NSATs can be classified into two; a dominating instrumental aim and a less evident ethical one. NSATs with Instrumental aims are the ones that seek to achieve specific outcomes concerning the three pillars of sustainability, as in the work of Hay et al.(2016), Shuib et al. (2015), (Vaidya & Mayer, 2014) and Dempsey et al. (2012); while ethical ones are the tools that seek to engage with the community members because of the obligation towards inclusiveness, engagement of the locals, and democratisation of decision making, as in the work of (Heritage & Dooris, 2009). The approach to implementing tools within this category ranges from expert-led to community-led, depending on the purpose behind the specific tool. Literature with a strict environmental focus is more likely to have a top-down approach, as in most of the tools reviewed by Sharifi & Murayama (2013). In comparison, literature that focuses on social gains is likely to have a bottom-up approach, as in the work of (Heritage & Dooris, 2009). Instrumental approaches can also adopt a hybrid approach, especially around promoting pro-environmental behaviour, as in the work of (Lange & Dewitte, 2019). This happens when researchers believe that they need to understand how the community responds to imposed measures of NSAFs in order to improve their efficiency.

Theoretically speaking, unlike the instrumental approach that starts with defined aims, the focus of the ethical approach evolves as defined by the community members because they are considered the source of power in the decision-making process. While this process seems ethical and embedded within democratic practices, such acts could jeopardise the sustainability for future generations when community members decide to pursue measures that are not sustainable, such as simplifying the use of private transportation over public one. Another risk is that the decisions made by the public could overlook minorities within the community, which could jeopardise the equity of this approach. Therefore, it could be argued that a strictly ethical approach could mask unethical practices. It is worth mentioning that while the theoretical

discussion of this approach is found in the literature, I could not find applied research that implements this approach in an actual situation.

Based on the above discussion, there are clear risks that come with the polarised current traditions of NSA literature, which are torn between promoting expert-led approaches or community-led ones. The dominating top-down approaches which overlook the input of community members could compromise social justice, inclusion, or even the efficiency of their frameworks, which could be isolated from the reality of individual contexts. While approaches that strictly adopt a bottom-up was could jeopardise the sustainability of the decisions taken by the local community in the long run or might run the risk of overlooking minorities that could be hard to reach within communities.

Therefore, this research calls for a reconciliation between the two approaches, where researchers develop meaningful channels of communication between the outcome of the two in order to consider the three pillars of sustainability for current and future generations. To mitigate the above-mentioned risks, the following section goes in detail through the advantages and disadvantages of the current practices of NSA and identifies specific problems that need to be considered for the advancement of the field.

1.3.1. Identifying Areas of Concern Between Top-Down and Bottom-Up Approaches to Neighbourhood Sustainability Assessment

NSATs can be classified into two main categories, top-down and bottom-up (Reed et al., 2006). Top-down approaches are initiated and led by experts, generally associated with the advantages of having quantifiable measures that are easy to use and replicate in different regions (Bell & Morse, 2003). However, those approaches are claimed to be less sensitive to local issues and lack community engagement (Sharifi & Murayama, 2013). Bottom-up approaches are initiated or led by the community; therefore, they are considered more inclusive and equitable (Morse & Fraser, 2005; Reed et al., 2018). Those approaches are often praised for their ability to respond to local issues (Sharifi & Murayama, 2013) and to reduce conflict between stakeholders (Pahl-Wostl & Hare, 2004). Bottom-up approaches are criticised for being subjective; difficult to compare between regions; and being time and labour-intensive (Fraser et al., 2006). Despite this dominant categorisation in the literature, the design of NSATs can sway the advantages and disadvantages of both methods in either direction of prioritising the benefits of the locals. Overall, it is difficult to categorise a tool at one side of the two ends (top-down or bottom-up) because assessment tools have different stages in which a community can participate.

Sharifi and Murayama identified three stages for community participation in NSATs; those are: 1) identifying criteria, 2) weighing them and 3) giving feedback for tool review (2013). Other

studies added performing the evaluation as a part of the roles of community engagement (Corbiére-Nicollier et al., 2003). According to Khakee, the distinction between design and evaluation in planning is very blurry and could reduce the value of planning (1998). The potential risk of separating the design, implementation and review stages can be seen in HQE2R and Ecocity NSATs, the only participatory tools among the seven tools that Sharifi and Murayama (2013) investigated. While Ecocity and HQE2R used intensive dialogues with neighbourhoods residents to develop their frameworks, this input stopped in the weighting and feedback stages (Sharifi & Murayama, 2013). Such a distinction can push the tool's output in favour of expert judgement by adding more weight to the indicators valued by the experts without a transparent justification.

The impact of participation on the final decision-making process is not the only concern within the implemented NSATs. Despite being widely spread, expert-led NSATs operate under two contradicting criteria: being standardised and being valid in different contexts. This inherent weakness results from oversimplifying the complex and sometimes conflicting facets of sustainability. Neighbourhood sustainability assessment tools sometimes work under the assumption that improving one aspect of sustainability will positively impact its remaining aspects, but that is not always the case (Boström, 2012). For instance, advocates of building compact urban developments state that the compactness reduces car usage; increases walkability; and positively influences social life by creating more social contact (Carmona et al., 2010). Jenks and Jones (2010) criticise those advocates for lacking empirical evidence to support their conclusion. Although the assumption that compactness creates better social environments seems logical, some research on compact developments reported an advert effect on the residential satisfaction and wellbeing of residents because of the crowdedness and anxiety associated with densification (Hofstad Hege, 2012).

To be relatable to real-life situations, NSA literature should acknowledge that not all environmentally sustainable practices create positive social environments. And that not all participatory practices yield equitable or sustainable outcomes (this includes potential negative social outcomes, e.g., the locals could call for antagonistic measures against minorities). The conflicting evidence on the pillars and approaches of NSA calls for a reconsideration of linear deduction in neighborhood sustainability, especially in the social aspect, as human behavior varies across individuals, generations, and societies. My research, therefore, challenges the standardisation of the indicators and measures of international NSATs across different contexts.

The approach of 'One solution does not fit all' has gradually gained more merit in NSA, and the research methods for approaching sustainability at the local scale need to be updated accordingly to respond to the local differences between different communities. Sharifi and

Murayama (2013) had a similar criticism of NSATs after reviewing seven tools. Their study revealed design weaknesses in responding to local requirements based on two observations: 1) the scarcity of locally relevant indicators and 2) their non-mandatory nature. They attributed this setback partially to the top-down approach of those tools, which is adopted because it is considered more objective and feasible in terms of time, resources and knowledge acquisition (Sharifi & Murayama, 2013). The standard frameworks of top-down NSATs could also be seen as a way of setting a benchmark for the quality of neighbourhood environments.

Standardisation could be seen as a holistic approach to responding to the environmental, economic and social pillars of sustainability. Standard frameworks are also more feasible and easier to implement due to their repetition. And it could be argued that they assure equity by providing a consistent target across different places and times. The presence of an international benchmark can also provide room for incremental progress in sustainability assessment. With all those potential gains, the most common rationale for implementing a standard expert-led NSAT is that it makes it possible to address the environmental aspects of sustainability (Sharifi & Murayama, 2014) as it requires technical knowledge mostly only relevant to and accessible by experts. While the urgency of the environmental pillar of sustainability is undisputed, it frequently comes at the expense of its social pillar and identifying the specific needs of local contexts (Sharifi and Murayama, 2014; Howley, Scott and Redmond, 2009).

While the top-down approaches do not differentiate between the needs of people based on their cultural differences, this feature can make them irrelevant or difficult to implement in particular cultural contexts (Eckerberg & Mineur, 2003). Maginn (2007) attributes the insensitivity to local and social requirements at the neighbourhood scale to the limited community influence on urban policy at this scale despite their unique knowledge of their community needs and potential ways to meet them. Recently, more researchers such as Dempsey et al. (2011) and Bacon et al. (2012) have been emphasising that communities differ in their social constructs and how they interact and get impacted by their neighbourhoods' components should be seen as dynamic.

To understand how sustainability indicators vary in impact across contexts, let's analyse the concept of equity. Do equitable environments translate to providing identical urban forms to all people, or is it about creating identical opportunities to benefit from urban forms? To clarify this point, I use the example of density and residential satisfaction. Several researchers use the example of density to verify the dynamic impact of the components of the built environment on its users. Kaya and Weber (2003) found that Anglophone cultures are less accepting of density in residential settings. In the UK, Dempsey et al. (2012) showed that in the UK, densities higher than 120 dwellings per hectare had an advert effect on social interaction and aspects of wellbeing.

Carrying on the same example, Dave (2010) reported that high density does not seem to disturb the residents of dense neighbourhoods in Mumbai, India. Those results cannot be used to deduct that high densities are acceptable in India and not in the UK. Rather, they provide empirical evidence that the notion of 'high' density differs from one community to another. The results challenge the idea of a universal measure that creates the same impact in all places, and suggests that measures should be re-evaluated at individual contexts.

It is very difficult to untangle the variables affecting sustainability indicators and their acceptance thresholds in various contexts. Still, it is a step that researcher needs to take if they want to create efficient sustainability frameworks that are likely to influence sustainable behaviour; and positively impact the residents' wellbeing. My research, therefore, stresses the importance of verifying the hypotheses of NSA frameworks in localised and case study-based research. Case studies need to carefully attempt to detangle the variables influencing how each indicator and measure takes shape in a specific context. Hence it is essential to complement top-down NSATs with qualitative input from community members. This practice would better reflect the reality of a specific framework's problems, needs and efficiency in a particular context. It could also improve the sense of ownership over the resultant sustainability framework and therefore improve the likelihood of benefiting from it.

The theoretical weaknesses of existing NSATs in responding to local requirements, coupled with empirical evidence supporting this claim, make it important to re-evaluate the use of global NSATs in contexts other than their initial design context, especially around issues with social impacts. In a review of evaluating neighbourhood sustainability in the context of developing countries, Yigitcanlar et al. (2015) stated that numerous frameworks and assessment tools in NSA literature claim international validity (such as LEED-ND and BREEAM community), and are being implemented in countries other than where they were originally designed. Despite that, the value of using international NSATs in different contexts is highly contested (Dawodu et al., 2019), particularly around approaching the social dimension of sustainability (Sharifi & Murayama, 2013). Arslan, Durak and Aytac (2017) used LEED-ND to assess the efficiency of sustainability assessment tools in transforming neighbourhoods in historic centres through a case study of Bursa City, Turkey. Their research showed that using LEED-ND managed to respond to general environmental issues such as transport links and access to open space but failed to respond to the historical importance of the city and residents' aspirations regarding urban life quality. Their research acknowledged the value of international NSATs but stressed the need for a new tool to adjust global NSATs to local requirements.

Based on the discussed gaps in the dominant international NSATs, my research identified four needs to be considered when trying to engage the local community in NSA processes: 1) To empower the community to influence the decisions related to their local environments and facilitate equity. Which is regarded as an ethical obligation towards democratising decision-making at the local scale, as identified by the 2030 agenda for sustainable developments (the United Nations, 2015b); 2) To be more sensitive to the local requirements, which is added for the instrumental value of knowing the situation at which a framework needs to operate, and how people are likely to react to the framework's measures; 3) To be feasible (time and resource-efficient), which I define as possible to implement given the existing limitations of resources, knowledge, funds, and personnel, as well as the time restrain on the required impact (e.g. developing new neighbourhoods after an environmental crisis or wars might require an urgent solution); and 4) To have local sustainability visions aligned with larger-scale holistic sustainability agendas (environmental, economic, social). This means that the outcome of sustainability frameworks should lead to a holistic improvement in the three dimensions of sustainability and that the trade-offs between the three should be considered based on the needs of the context in question.

1.4. Conclusion

The practice of NSA is dominated by tools developed and carried by experts. Those tools rely mainly on standardised frameworks used to assess the sustainability of neighbourhoods at various contexts. The standardisation of expert led NSATs gave them an advantage in terms of the ease of their implementation, and the comparability of their outcomes. However, the restricted community input in terms of developing, carrying, and reviewing those tools makes them poses two concerns, an ethical one concerning the legitimacy of imposed expert-led tools, and an instrumental one concerning the effectiveness of top-down tools in approaching neighbourhood sustainability.

While the advantages of top-down NSATs make them indispensable for the practices of NSA, their reported limitations need to be mitigated by properly complementing them with community-led input. This approach should not only respond to the ethical issues concerning the current NSA practices, but also the instrumental ones that relate to improving tools' performances. While many environmental sustainability issues require technical knowledge that are beyond the interest or knowledge of the public, those measures can still be affected by the behaviours of people who are supposed to pursue them. Therefore, it is imperative for NSA literature to acknowledging the impact of understanding the local context and community engagement to improve the impact of existing top-down NSATs. In the following section, I

discuss bottom-up NSATs in more detail, with a focus on their use in the context of urban and architectural practices; especially in terms of their potential for improving the impact of NSATs.

Chapter 2: Review of Community Participation in the Architectural and Urban Discipline and its Relevance to NSA

The concept of community participation became prominent in architectural and urban practices in the 1960s (Djabarouti, 2023). According to Abagero (2021), this period marked a significant paradigm shift from traditional functional modernism, which is architect-centered to a more collaborative and inclusive architecture that is community-centered. Abagero (2021) notes that this shift was notably influenced by Henry Sanoff, who conceptualized the role of community engagement and collaborative design processes, especially within urban disciplines. Sanoff's approach was based on the belief that users should have a say in creating spaces (Sanoff, 2000). His work aimed to actively involve community stakeholders in decision-making, aligning urban development with collective aspirations (Djabarouti, 2023). His methods included mapping and scenario-building exercises, empowering communities to shape their environments directly (Sanoff, 2000).

Parallel to Sanoff's contributions, John Habraken also significantly influenced participatory design theories. Habraken's work centered around his "Supports" theory, emphasizing the obligation of architectural practices to foster user involvement and participation in design processes (Nascimento, 2012). Habraken's approach aimed to use community participation to re-envision living spaces, balancing individual preferences with collective needs (Habraken, 2023). According to Sanoff (2000), Habraken's ideas played a role in reshaping the architect's responsibilities, advocating for a more balanced design control distribution between professionals and users. In addition to Sanoff and Habraken, Samuel Mockbee is considered to be one of the figures who contributed to the new culture of community engagement in architectural design (Kroiz, 2012). Mockbee's approach challenged and expanded the traditional role of architects. His work emphasized on architectural pedagogy and ethics, where he trained architecture students to engage the community in design processes (Rural Studio, 2023). These practices highlight key efforts in the history of participatory design to incorporate diverse perspectives and needs, aiming to create more inclusive, democratic, and sustainable built environments.

Because it focuses on the user, community participation could offer a significant counterbalance to the dominant top-down methods in Neighbourhood Sustainability Assessment (NSA). This approach could enhance local engagement, ensures more responsive planning, and promote sustainability tailored to the community needs. However, it is still

underdeveloped in this specific field. Those tools still appear underdeveloped even in fields where bottom-up practices are more commonly used in policy-making and environmental management. Nevertheless, this literature provides a valuable and more rigorous source for understanding and operationalising community participation in disciplines other than their intended ones.

In the following chapter, I review community participation practices within the broad architectural and urban design areas. Then, I derive an analytical framework for the concepts of community participation and the levels they operate at. I focus on involving the community in the Post Occupancy stage of architectural and urban processes. There is a clear gap in the literature on community participation at the Post Occupancy stage. The value of this stage is that it offers contextual evidence for examining the impact of residential environments on their residents. The following review shows a tension between an ethical approach to participation and an instrumental one. The ethical commitment to community participation is when participation is considered a stand-alone aim, whereas instrumental understanding is when participation is regarded as a tool for creating better environmental and social living settings.

The theoretical position of this research views community participation as both an ethical and instrumental necessity at the neighbourhood scale. I focus on how to align the outcome of community participation with broad sustainability visions (environmental, social, and economic). Because of the architectural and practice-based perspective, I am adopting, the chapter will highlight the difficulties facing participatory practices in real-world situations. To address the applied research dimensions of this literature, I review case studies that used community participation to approach diverse objectives within the neighbourhood sustainability concepts, focusing on Post Occupancy Evaluation (POE). As my research question focuses on the context of Bahrain, I end the case studies by displaying the state of community participation in Bahrain and some initiatives with a community-centred dimension. I end the chapter by summarising the potentials and limitations of community participation in the context of urban neighbourhoods, particularly affordable housing ones, and suggest a road map to implement it effectively for approaching sustainability in this context.

2.1. Theoretical Positioning of Community Participation in Architectural and Urban Design Literature

Because participation can take different forms and be implemented for a variety of purposes, there is a broad difference in what qualifies as community participation. Reed (2008) defines participation in environmental management as:

'a process where public or stakeholder individuals, groups and/or organisations are involved in making decisions that affect them, whether passively via consultation or actively via two-way engagement, where publics are defined as groups of people who are not affected by or able to affect decisions but who engage with the issues to which decisions pertain through discussion (after Dewey 1927; Ikegami 2000) and stakeholders are defined as those who are affected by or can affect a decision (after Freeman 1984).'

Just as in Reed's definition, Jenkins (2009) differentiates between two types of community participation, one that only involves the direct users of the project and another that involves the wider public exposed to the project in any direct or indirect manner. Based on this classification, Jenkins defines the term 'Wider Social Participation' as participatory activities involving the 'wider public' in taking part in the architectural activities involving the creation of the built environment. While Jenkins' classification bears a logical breakdown, it seems intuitive that using the term community participation does not refer strictly to the project's users but to the groups and individuals affected by it, particularly when they lack the power to impact the project's outcome. Therefore, while it is important to acknowledge that the aim of participation should reach the distant public, using a specific term for this type of participant can bring unnecessary complexity to this developing field. Therefore, from this point onwards, I will use the term 'participants' to refer to both direct users and the wider public.

In addition to who benefits from participatory activities, the definition can be influenced by the level of community involvement. Reed's (2008) definition includes passive and active community involvement, while other researchers, such as Hofland and his colleagues (2017), do not qualify passive engagement as community participation. However, defining community participation based on the level of involvement can flatten participation and limit its value to getting legal or public validity. It can also set unrealistic goals that hinder the applicability of participation, where participation is conditioned upon reaching a very high level of community involvement in the decision-making process, which is costly, time-consuming, and labour-intensive. Rowe and Frewer (2000) systematically reviewed the effectiveness of several public participation methods. They noted that most effectiveness criteria are concerned with the process of involving the public and not the quality of the outcome. Later in this chapter, I review participation impact literature and use its findings to challenge the suitability of the dominant ethical stance to participation in the area of NSA. In that part, I illustrate how the literature can fixate on the mode of conducting participation while overlooking its impact on shaping urban environments.

The focus on either process or outcome comes from two main strands of viewing community participation in planning and urban design literature, as identified by Heritage and Dooris (2009). The first considers community participation an ethical obligation and therefore values participation as an end-product, regardless of whether it impacts the quality of the built environment. The other category is instrumental and values participation because of its presumed advantages in improving certain aspects of the built environment. In my research, I adhere to both aspects of participation. Therefore, I acknowledge the ethical and instrumental necessity of involving the community in influencing decisions related to their neighbourhood setting.

Balancing both the ethical and instrumental implementation of community participation in NSA comes from the fact that while community participation can be a way to democratise decision-making, it can also lead to decisions that might harm the environment. For example, the community can suggest providing larger parking spaces to simplify transportation, but this can, in turn, increase the CO_2 emissions in urban neighbourhoods. Therefore, research in urban planning and urban design needs to build a second layer for verifying the outcome of community participation to ensure that its outcomes do not contradict sustainability agendas. Based on the above discussion, I define community participation for this study as the process of involving participants in influencing the decisions that affect their living environment while acknowledging and approaching broader scales of sustainability. This definition excludes the public who are not affected by a certain environment but does not limit it to the direct users of the urban neighbourhoods.

2.1.1. Breaking Down the Concepts and Structures of Community Participation in the Architectural and Urban Disciplines

Participation is one of the areas that cannot be isolated from practice. It is theorised to operate in real-world situations. Hence, its analysis needs to build on applied research and examine case studies to refine its abstract concepts. Between 2007 to 2008, the UK Arts and Humanities Research Council (AHRC) funded social participation research to investigate the role of community participation in architectural processes (Jenkins, 2009). The research was carried out through a collaboration between different universities in Scotland. The project aimed to facilitate wider social participation. Its objectives were to scope relevant concepts of social participation in architecture and use case studies to document its methodologies, and utilise the research team's expertise. The purpose was to link the theory of community participation to its practice. The outcome was the creation of an analytical framework to base future participatory research on. The AHRC research defined three dimensions for community participation in the

built environment: 1) Who is Participating? 2) When are they Participating? And 3) How are they Participating?

I argue that those three dimensions operate within a fourth dominating dimension (figure 2.1) which was not identified by the AHRC research, and that is 4) Why is the community participating? The higher importance assigned for this dimension is because it aids in informing the three former identified questions: Who should participate in architectural and urban processes? When should they participate? And how to participate? For instance, if participation is implemented to provide a binding political decision, extreme participatory measures should be used. A suitable method would be a referendum, the involved individuals would be all eligible adults, and the time for participation should be before taking the decision.
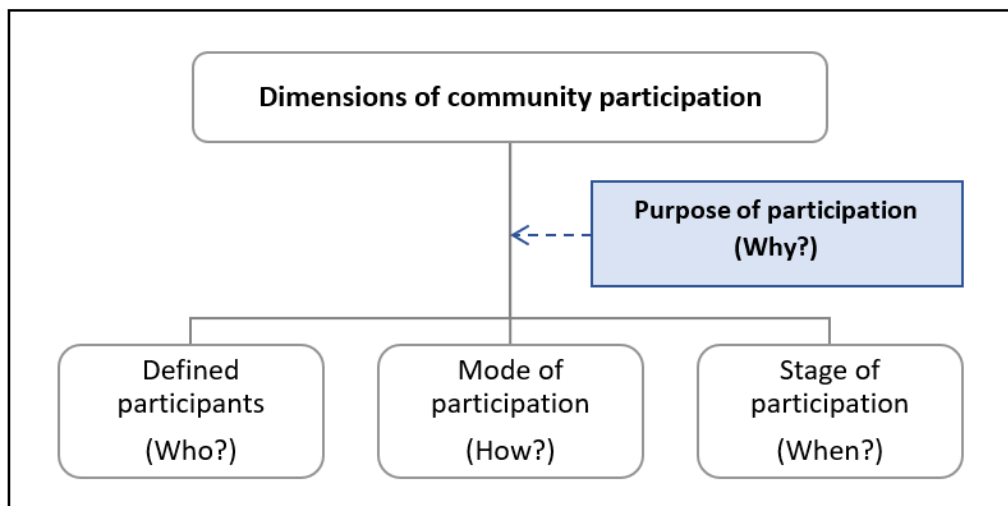
Figure 2.1. Dimensions of Community Participation based on AHRC research, adopted from Jenkins (2009), with the addition of the (Why?) dimension I defined

As previously discussed, there are two main theoretical foundations for participation: an ethical foundation (also known as normative) and an instrumental (pragmatic) one. The ethical foundation is driven by the commitment towards democratising communities and enabling residents to take a role in shaping their environments. This approach implies that participation eventually creates better environments, though it does not necessarily verbalise that assumption or use it as a factor to facilitate community participation. Abelson & Gauvin (2006) also criticised the advocates of this approach for rarely providing empirical evidence to support their assumption that enabling communities to participate in shaping their local environments helps create better environments.

There is even evidence to support the opposite. Staddon, Nightingale, and Shrestha (2015) documented cases in Nepal where community participation in ecological monitoring reinforced the existing power dynamics within the community and marginalised the minorities

(women and illiterates) even more. The examined participatory project for monitoring Nepal's community forests did include those marginalised groups in the project's design, but rather than actively taking decisions, those segments just sat there without giving significant input. This could be attributed to the lack of participation culture by those segments of the community; therefore, involving them immediately in high participation levels without earlier education resulted in deepening their absence while giving it ethical validity. Such adverse effect of participation requires paying attention to how to enable community participation to avoid having a negative effect on the environment, either socially or physically, in the immediate and/or long run.

As for the instrumental justification of community participation, this approach aims to facilitate community participation in environmental design and management to improve the quality of the built environment both physically and socially (Shuib et al., 2015). However, the authority of judging if the outcome of participation is good or bad is problematic in itself; how would you assume an outcome is bad unless you are starting with the preposition that experts know better? And if they know better, why start a time and resource-consuming process of community engagement? The response is that regardless of the specific outcome, Richards, C., Blackstock, K.L. e Carter (2004) reported that decisions taken in collaboration with the community are more likely to be implemented by the users due to their felt authority over the outcomes. Therefore, theoretically speaking, engaging the community in the processes of developing NSATs should improve the acceptance of the devised frameworks, which in turn improves the effectiveness of participatory NSATs in achieving their goals.

With this added behavioural advantage, it is important to address an underdeveloped area in NSA literature which is identifying which concepts of NSA are relevant and suitable for community participation. To do so, it is necessary to untangle the concepts within the pillars of NSA to see where the community input needs to be prioritised, accounted for, or even changed (e.g., how to promote using public transportation instead of private cars despite the convenience of private transportation). Moreover, some concepts might appear irrelevant to bottom-up NSA practices (e.g., technical, environmental measures). In addition, it is beneficial to know the topics of NSA, which the community would be keen to voice their opinion about. Interestingly, empirical evidence suggests that some topics do not interest the community to participate in, even if they had the chance to do so. For instance, Pinfield (1997) examined indicators within participatory research and found that people care about indicators they can understand and those that affect them personally.

In summary, community participation can be examined based on various standpoints, including: why is it happening? How is it happening? When is it happening? Who is included? And what level of participation is taking place? Because participation is often paired with basic human rights of inclusion and equity, defining the aim of participation can easily be overlooked in individual research endeavours. However, as I have established earlier, the ethical driver of participation does not always generate positive outcomes for the physical environment, nor does it guarantee to create positive social places and/or practices. Therefore, for enhancing the quality and sustainability of urban neighbourhoods, it is imperative to define the aim of facilitating community participation in the context of NSA.

As I have discussed, there is strong evidence to support that the dialogue between bottom-up and top-down urban and architectural planning and design practices could aid in improving neighbourhoods' social and environmental conditions. This is why the following section attempts to establish a theoretical framework for operationalising community participation in NSA research, especially for affordable housing neighbourhoods, which are significantly understudied. The framework aims to define how and when bottom-up input should be linked to top-down frameworks of NSA. Ultimately, the purpose of doing so is to enhance the performance of sustainability indicators in urban neighbourhoods, especially in terms of responding to the social pillar of NSA, facilitating shifting towards pro-environmental behaviours, and localising generic expert-led NSA frameworks.

2.1.2. Analytical Framework of Community Participation in Architectural and Urban Practices Through the Lens of NSA

According to Jenkins (2009), participating in urban and architectural processes can occur in any of the three activities that concern the development of the built environment: 1) Design (including planning), 2) Construction, and 3) Post completion. These activities can be broken down into more detailed stages, as defined by the plan of work of the Royal Institute of British Architects (RIBA) (2020). The activities (figure 2.2) include 1) strategic definition, 2) preparation and brief, 3) concept design, 4) spatial coordination, 5) technical design, 6) manufacturing and construction, 7) handover, and 8) Use.

Figure 2.2. RIBA plan of work 2020. Source: (RIBA, 2020)

The value of community participation at each stage is different. In the early stages, it can be used to inform users about the project (Dawodu et al., 2021) or to get input from them to influence the design outcome (Hatleskog & Samuel, 2021). During construction, little input can be taken from the community members to influence the outcome. Participation at this stage is mainly top-initiated, primarily to inform and communicate information with the participants. Attempting to change the design outcome at this stage would mostly need to be initiated by the community in an attempt to resist anticipated negative social or environmental impacts. At the post-occupancy stage, participation predominantly takes the form of POE, which is the only stage of the three at which the collected opinion of users is not speculative, but rather assertive, in the sense that the users are not predicting certain impacts but are reporting what has already taken place. This makes the community's input at this stage of empirical value to gauge the impact of living in a certain context, which many researchers criticise for being lacking in NSA (Hatleskog & Samuel, 2021; Hay et al., 2016).

According to Jenkins (2009), the mode of participation in the stages of design, construction, and post-completion can take one of three forms: providing information, consultation, and negotiated decision-making (figure 2.3). Reed *et al.* (2018) break down the negotiated decision-making into deliberation and co-production, where deliberation suggests resolving conflict through the compromise of one or more stakeholders, and co-production suggests reaching a consensus. Those forms of engagement are not specific to architectural and urban processes. Rowe and Frewer (2000) reviewed the public participation methods in science and technology policy that targeted issues like environmental management and health risk. Their research showed that the level of community engagement can range from minimal, in the form of collecting information, to a higher one with some sort of decision-making authority.
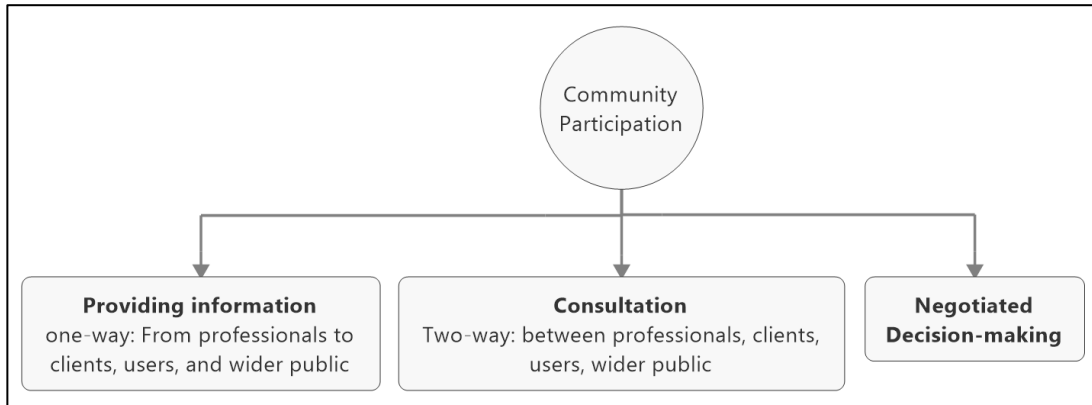
Figure 2.3. Characterising Community Participation Based on The Form of Participation, adapted from Jenkins (2009)

The progressive nature of citizen engagement was first established by Sherry Arnstein (1969) in her influential 'Ladder of Participation' model (figure 2.4), which remained long unchallenged until Davison suggested the 'Wheel of Participation' in 1998 (figure 2.5) (Davidson, 1998, cited in Heritage and Dooris, 2009, p. 4). Reed et al. (2018) pointed out that the primary difference between the ladder and the wheel is that the ladder suggests that moving upwards gives you more positive outcomes. In contrast, lower levels of participation have negative outcomes. Conversely, the Wheel does not indicate a hierarchy by which the mode of participation brings better results.
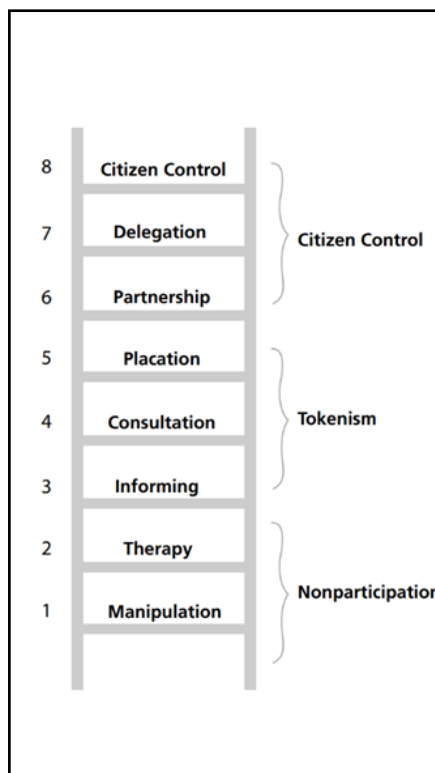
Figure 2.4 Arnstein Ladder of Participation
(Arnstein, 1969)

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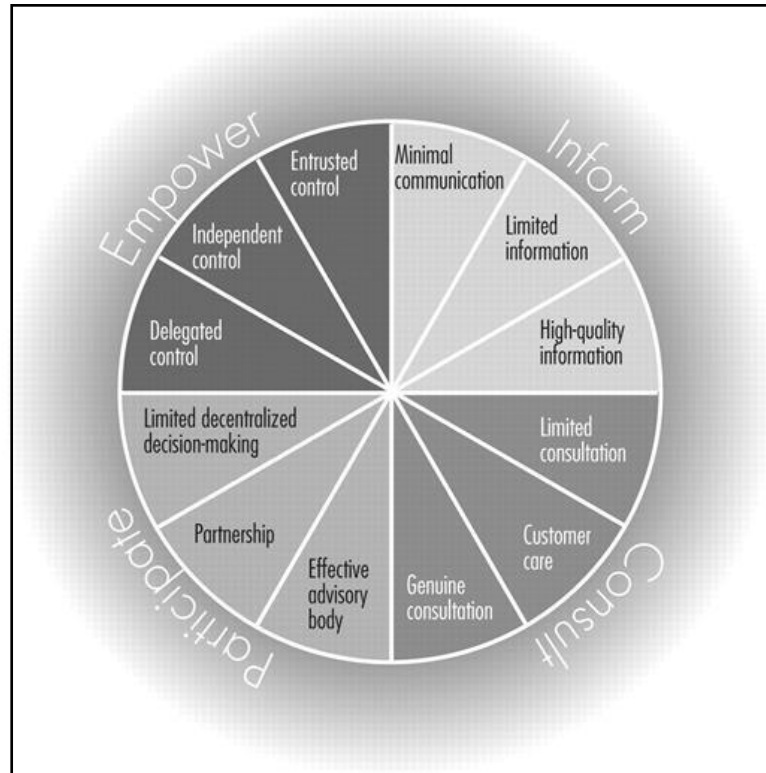
Figure 2.5. Davidson's Wheel of Participation Developed in 1998. (Davidson, 1998, cited in Heritage and Dooris, 2009, p. 4).

In one of the few attempts to develop a theory of participation for environmental management, Reed et al. (2018) developed a fourfold scheme to explain why different types of participation impact the environment and participants differently. They aimed to help practitioners design engagement processes with a higher likelihood of achieving their desired goals, which revolve around positively impacting environments' physical and social qualities. The developed theory starts by classifying participation based on two types: 1) who initiates and leads the processes (top-down or bottom-up), which Reed et al. (2018) refer to as 'Agency'; and 2) 'mode of engagement', which means the type of engagement with the community members that could range from simple communication to co-production. This typology draws heavily on Davidson's wheel of participation (figure 2.4), but it differs from it by not assigning specific benefits to the different modes of engagement. Instead, Reed et al.'s paper (2018) adds the 'agency' ring to the original wheel structure to represent the top-down and bottom-up sides of initiating participation (figure 2.6). This outer 'agency' ring encompasses an interior 'mode of participation' ring, which includes four modes identified by their research. Those are top-down, one-way communication and/or consultation; top-down deliberation and/or co-production; bottom-up one-way communication and/or consultation; and bottom-up deliberation and/or co-production.

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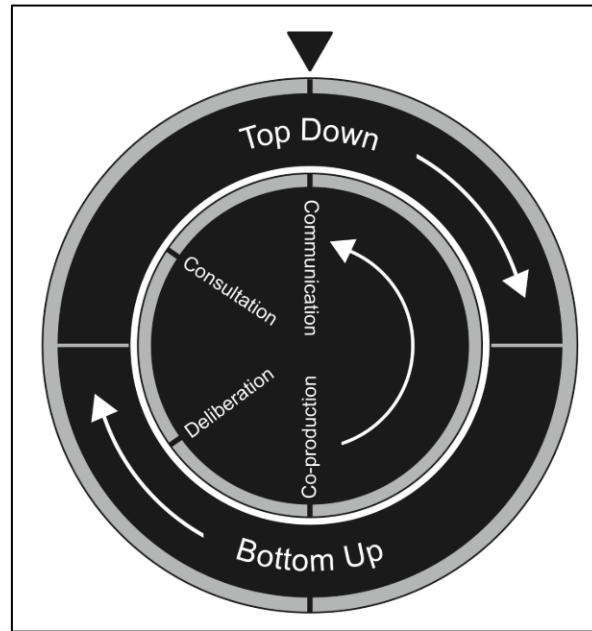
Figure 2.6. Wheel of participation typology (Reed et al., 2018, p. 7)

Reed et al.'s theory of participation (2018) suggests that the outcome of the former typologies of participation can be impacted by four factors (figure 2.7): 1) context, including socio-economic, cultural and institutional variables; 2) process design; 3) power, including the dynamics between stakeholders, and the values and epistemologies of the participants (how they build and evaluate knowledge); and 4) spatial and temporal scales for which participation is used. The theory suggests that properly considering the former factors in specific contexts could make participation more successful. The success of participation was roughly gauged through two outcomes: 1) implementation of participation outcomes and 2) positively impacting the physical environment and the participants. While those two factors could be understood as a cause and effect, meaning that implementing participation outcome was the reason for improving the physical and social environment, the theory did not suggest this linear causation. This could mean that the two measures operated independently or that the theory overlocked this potentially significant relationship. Either way, the theory explicitly evaluated the success of participation by positively affecting two beneficiaries, the environment and the participants.

Despite Reed et al.'s (2018) attempt to operationalise successful participation by defining two beneficiaries, their theoretical development did not engage with community participation impact assessment literature. Instead, it was developed soley by reviewing many qualitative and quantitative case studies in participatory environmental management literature. This limitation made their justification of what counts as more sussessful participation quite vague. For instance, when considering the positive impact on participants, which agency evaluates what counts as positive impact? is it the experts? the participants? or a combination of both? Despite this limitation, the environmental management perspective of this theory makes it valuable for operationalising community participation in NSA literature as this discipline needs a theory that acknowledges the interrelation between the social and environmental components of neighbourhoods. The following section attempts to overcome the aforementioned limitation by engaging with participation impact assessment literature.
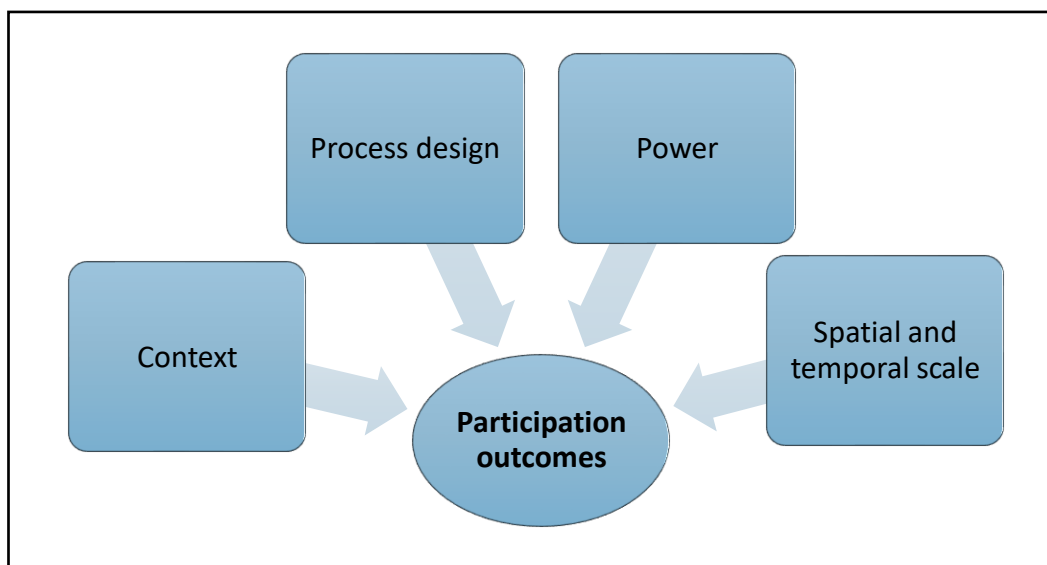
Figure 2. 7. Factors that influence the outcome of community participation, based on Reed et al.'s theory of participation (2018)

2.1.3. Evaluating the Effectiveness of Participatory Processes

The question of which mode of community participation should be implemented at various stages of NSA is difficult, as it is bound with feasibility and efficiency concerns. In this research, I use the term efficiency to refer to the ability of participatory outcomes to impact real-life situations as intended. This concept is not widely examined in public participation literature and is sometimes confused with impact, value or effectiveness. Those three terms are more common in participation literature and are frequently used interchangeably without giving a clear definition of what they mean. According to Abelson and Gauvin (2006), there are two categories for evaluating the impact of participatory tools: outcome-driven and process-driven.

The outcome-driven category puts more value on the quality of the outcome (e.g., how much it is improving the environment), while the process-driven one puts more value on the extent and truthfulness of participation, which translates to giving more value to deeper levels of participation, more accessibility, higher participation level, more user power, more implementation of the bottom-up outcome, and more transparency of the process (Abelson & Gauvin, 2006). Building on the discussion in the earlier sections, the process-driven impact assessment draws more from the tradition of the participation ladder, which starts at its lower levels with what it considers a less impactful type of participation and goes up to the most impactful one; while the outcome driven impact assessment is more linked to the participation wheel, where the act of participation is not given a progressive impact but is instead seen as a loop that can spin in either direction towards more positive or less positive practices depending on the case in question.

Although the outcome and process classification for impact assessment is not the most common in participation literature, it appears to have a better translation in NSA literature than other more common impact classifications. For instance, in one of the highly cited works for evaluating the impact of community participation with 3195 citations (Google Scholar, 2023), Rowe and Frewer (2000) developed a theoretical framework for evaluating the impact of public participation methods. Their developed framework had two sets of criteria: acceptance criteria and process criteria. Acceptance criteria are concerned with how acceptable the participation process is to the wider public; and includes the following criteria: representativeness, independence, early involvement, influence, and transparency. While process criteria relate to the methods' construction and implementation, which aid in its liability and effectiveness, this set includes the following criteria: resource accessibility, task definition, structured decision-making, and cost-effectiveness. This framework is influenced by Webler's framework (1995) who referred to 'fairness' and 'competence' as guidelines for evaluating the impact of community participation.

While this classification for assessing the impact of community participation is more common in the literature, it is primarily based on the ethical commitment to participation. Both acceptance and process criteria evaluate elements within or leading to the participation process and refrain from evaluating the final implemented outcome and its impact on the social and physical environments it was meant to serve. This limitation makes the criteria of 'outcome' and 'process' more relevant for my research that aims to improve the effectiveness of NSA frameworks in individual contexts, as this classification can account for the instrumental value of participation when it comes to improving the environmental and social qualities of urban neighbourhoods. Evaluating the outcome of community participation can come across as unethical or patronizing, as it gives the impression of having an agency (typically experts and/or

policymakers) that knows which decisions count as good and which as bad. This, in turn, will dismiss the value of community input if it contradicts the presumably positive outcomes, rendering the whole participatory exercise pointless. What I am rather suggesting is not to evaluate the specific decision as an outcome but its ability to achieve specific aims. Meaning that evaluating the outcome of community participation needs to be done after allowing the decision to be implemented and affect people's lives for a while, or what is better known as post-Occupancy evaluation (POE).

The significance of the post-occupancy stage comes from the limitations and inconsistencies of the 'outcome' and 'process' driven categories of the impact assessment. According to Abelson and Gauvin (2006), the 'outcome' and 'process' classification for participation impact assessment is roughly evaluated using three bases: 1) a theoretical base, 2) a user base, and 3) a goal-free base. This classification bares some problems and limitations within each base of evaluation. For complex contexts such as residential neighbourhoods, so many physical and non-physical factors can play a role in affecting the lived experience of the users. Therefore, theory-dependent evaluation is very hard to develop and verify because of the complexity of its issues and the difficulty of isolating its influencing factors and mediators. It is important to understand that features of the urban neighbourhoods are not related in a linear manner where the effect of one variable is known on the other; instead, variables are rather nested in a manner where various variables and mediators affect each other simultaneously in different ways. This is particularly significant considering that the users' experience of the neighbourhood can be affected by subjective factors that are difficult to identify and theorize.

As for user-based evaluation, evaluating the participation outcome strictly from the users' perspectives does not measure effectiveness but satisfaction. While residential satisfaction is found to correlate with higher levels of wellbeing and lower levels of residents turn-overs (Bonaiuto & Fornara, 2017; Howley et al., 2009; Ilesanmi, 2010), residential satisfaction does not necessarily create environmentally or socially sustainable solutions. For instance, recent NSA research showed that environmentally sustainable solutions do not necessarily bring positive social outcomes. For example, compact cities can cause anxiety due to crowdedness (Dempsey et al., 2012). While this effect seems intuitive, the opposite was widely promoted by the literature in earlier years, as in the work of Carmona et al. (2010). Even more problematic is that seemingly positive social practices can create social problems. For instance, more diverse communities can create tension between groups (Dempsey et al., 2011; M. (Michael) Jenks & Jones, 2010). This tension could result in higher stress levels or even cause clashes, where minorities can be antagonized by majorities. In that case, minorities would suffer from what seems to be an equitable measure that is causing an unexpected outcome.

Therefore, it is important to evaluate the relationship between the theoretically derived and user-based indicators using a context-based approach. This build-up of knowledge is very experimental and is more meaningful when developed in the form of action research. The experimental nature of participation impact research makes its scientific value questionable, as it does not have clear objectives from the start. Despite this limitation, NSA desperately needs to understand the correlations between the elements of the built-environment and its effect on its users to balance between the instrumental and ethical commitment to community participation. Because of this, my research suggests using POE as a way to link the outcome of context-specific participation to compare it to the presumptions and expectations of the experts. This way, participatory NSA research would have a higher likelihood of achieving the aims of its defined measures, which were developed in relation to a specific temporal and spatial context.

Using POE to facilitate effective community participation in NSA can serve two purposes. On the one hand, it would give more power to the public as the impact assessment is made relying on their own perspective. On the other hand, understanding how people actually behave and get affected by their local environments can aid in developing strategies to facilitate a feasible and impactful transition towards more environmentally and socially sustainable neighbourhoods. Incorporating findings derived from POE in developing NSA can improve the wellbeing and life quality of the current generations (intragenerational sustainability) while setting in motion the process of creating gradual change towards approaching intergenerational sustainability.

Since NSA literature intends to impact real-life situations, it requires understanding the limitations and opportunities for community participation in individual contexts. This makes the practicality and feasibility of participatory processes an intrinsic aspect of their success. Among the limitations that can affect the practices of community participation are the conventional limitations of time, funds, and human resources. In addition, Reed et al. (2018) found that the prevailing culture towards participation, in terms of valuing the process and believing in its truthfulness, can significantly affect whether participation would result in a positive impact that would fulfil its intended result or not. This means that for the context of NSA, one of the aspects of successful participation needs to be in terms of how much of a participatory outcome ends up being implemented to create real-life change, especially towards facilitating pro-environmental and pro-social behaviours and features. The applied nature of participation made much of its research practice-based, inductive, and case study driven, which takes us to the following section that reviews applied formalised and experimental community participation methods.

2.2. Formalised and Experimental Methods of Community Participation

Community engagement can be carried out using several methods. Rowe and Frewer (2000) documented the most formalised community engagement methods that could be implemented in the urban context. Those tools are referenda, public hearings/inquiries, public opinion surveys, negotiated rule-making, consensus conferences, citizens' juries/panels, citizens'/public advisory committees, and focus groups (figure 2.8). Those methods can be conducted using various tools not necessarily documented in the literature. The weak documentation of community participation tools can be attributed to its informal nature, where the locals are typically not interested in having their effort documented. This is particularly true for experimental tools involving the community in urban environment processes.

Despite that, the neighbourhood scale involves many diverse contextual conditions that could require some form of customisation in developing, carrying out, or evaluating the involved tools. This makes many community participation tools involving the housing environments quite unique and experimental, which are less likely to draw research interest because of the difficulty of their replication and their informal nature. Still, contextualised conditions are the norm for housing projects, where environments, residents, and limitations of each project are different in terms of the environmental, time, budget, knowledge or skills limitations. For this reason, despite the difficulty of documenting and analysing experimental community participation tools for the neighbourhood scale, they remain an important exercise that needs to be documented and critiqued in order to improve their robustness and replicability. The following section examines some of those efforts in the context of urban neighbourhoods.

Referenda	Public hearings/inquiries	Public opinion surveys
Negotiated rule makin	Consensus conferences	Citizens' jury/panels
Citizens'/public advisory committee	Focus groups	

Figure 2.8. A number of the most formalized methods for public participation according to Rowe and Frewer (2000)

2.2.1. Community Participation in Housing, Neighbourhood, and Urban Settings

Community participation in processes involving creating and evaluating sustainable neighbourhoods can vary depending on their aim. Among the different tools, neighbourhood audit tools (NATs) seem to be the most systematically reviewed ones in the literature. Those tools differ from the neighbourhood sustainability assessment tools (NSATs) I reviewed in chapter one. As discussed earlier, NSATs are primarily indicator-based and involve a checklist used in the planning and design stage to evaluate the sustainability level of the development. Neighbourhood auditing tools, on the other hand, involve post-occupancy visits to the concerned neighbourhoods to survey their existing features (being physical and/or social). The survey is conducted to assess a broad range of impacts on the residents and their living environments, such as their levels of wellbeing, health, and sustainability. While NATs are less discussed in NSA literature than NSATs, they appear to have a stronger and more localized evaluation approach. They also have the POE advantage, which can better document the 'outcome' impact of the participation efforts, as opposed to the 'process' impact discussed earlier.

In one of the few recent publications, Hofland et al. (2017) reviewed NATs with a participatory practice that were published in English or Dutch between 2010 to 2015 in both scientific and grey literature. Their review defined participation as 'the active participation of lay people in audit design, data collection and/or analysis' (Hofland et al., 2017, p. 24). Their review aimed to identify those tools, classify the level of participation that takes place within them and the stage at which participation occurs, provide an inventory of the tools measures, and document the methods used to conduct the auditing. Their defined levels of participation were extreme citizen science, participatory science, distributed intelligence, and crowd-sourcing. The definition of each level is listed in table 2.1.

Table 2.1. Participation level in reviewed Neighbourhood audit tools reviewed by Hofland et al. (2017, p. 25)

Participation level	Definition
Extreme citizen science	Residents involved in problem definition, data collection, analysis and interpretation
Participatory science	Residents involved in problem definition and data collection
Distributed intelligence	Residents involved as volunteered thinkers and interpreters, providing lay input to the audit
Crowd sourcing	Residents involved as informers carrying out data collection

The review documented 13 tools that met the criteria of being designed for the neighbourhood level and involving some level of community participation. Those tools were: Wijkscan zwerfafval (Community litter scan); New Hampshire Liveable Walkable Communities Toolkit; St. Louis Audit Tool—Checklist Version; The Stanford Healthy Neighborhood Discovery Tool; BEAT Neighbourhood Assessment (Built Environment & Active transportation); Beleef je wijk! (Experience your neighbourhood!); The Walkability Assessment Tool; Rural Active Living Assessment tool; LEED—ND; Neighborhood Observational Checklist; CBPR intervention; Sidewalks and Street Survey; and The Community Mapping Toolkit. Although LEED-ND can be better categorized as an NSAT than a NAT, LEED-ND can be used for the evaluation of recently built neighbourhoods (within three years of completion) (USGBC, 2022), which makes it qualify as a NAT with a post-occupancy level using Hofland et al.'s inclusion criteria.

With regard to my research topic, Hofland et al.'s review (2017) had two significant outcomes. First, only two of the thirteen found tools appeared to have an extreme level of participation, where the participants were involved in the problem definition, data collection, and data analysis and interpretation. Second, there was a significant lack of measures used for auditing the social features of neighbourhoods, or at least; the used measures relied on physical proxies, which had questionable effectiveness in documenting the real-life impact of the relevant features (e.g., using the presence of bicycle lanes to measure cycling behaviour, or using litter and vandalism measures to assess the social structure of a community). In addition, while Hofland et al. emphasized the importance of using community participation to better implement the defined urban policies, they used the level of participation to evaluate the significance of the tool in relation to participatory practices. For example, the review did not show whether the different types and levels of public involvement affected critiques of their corresponding tools. For instance, did the tools involving resident participation in the problem definition stage better capture social qualities? Or was involving the residents in the actual auditing exercise more effective in reflecting their actual behaviour?

Hofland et al.'s review (2017) also acknowledged that other public participation tools are used in urban research, some of which include measures for capturing social, behavioural, and temporal features of urban settings, which were lacking in their documented tools. However, those were excluded from the study because they did not meet the definition of being a NAT. In addition to research scope limitation, the review found that most NATs use traditional pen and paper checklists for registering the data. Which they believed played a role in limiting the types of audited domains and focusing on the physical features. Hofland et al.'s (2017) also argued that

the classic use of pen and paper made the NATs less attractive for residents to use, who would have preferred other modern technologies, such as mobile phone applications.

Amongst the reviewed tools, the Netherlands-originated tool of 'Beleef je wijk!' or 'Experience your neighbourhood!' had an advantage in innovation and the attempt to capture accurate residency impacts as experienced by the locals. The tool used maps as a data registration method where residents would put green star stickers on places they felt positive about and red stars on places they felt negative about. Another tool that allowed for more flexibility in auditing neighbourhoods' qualities and impacts as perceived by the residents was the Community Asset Mapping Toolkit which originated in the UK. Instead of conventional detailed domains and sub-domains for auditing (commonly known as indicators and measures in NSA literature), the tool provides a broad category of 'individual, community and institutional assets' (Hofland et al., 2017, p. 26), which residents were required to evaluate based on their personal assessment. Such approaches provide innovative solutions for conducting community-led POE for urban neighbourhoods.

Interestingly, research originating in the UK stands out in terms of the novelty and number of community-led tools that aim to measure the social and communal qualities of local areas. This research focus can be because of the policy focus on the same themes, particularly the enactment of the Social Value Act in 2012. The act requires the public sector to demonstrate that any service they procure provides maximum economic, social and environmental benefits for local communities (Allen & Allen, 2015). The correlation between political, academic and public interest in improving local environments demonstrates the importance of coordinating between top-down and bottom-up efforts concerning the creation of sustainable neighbourhoods, especially in the context of affordable housing ones where the beneficiaries represent a particularly vulnerable segment of the community.

Outside the scope of NATs, the Social Value Toolkit (SVT), developed in the UK, is another novel POE participatory tool that focuses on measuring the social value of local environments as experienced by its users. The tool, developed by Samuel *et al.* (2020), measures four themes that are believed to affect the social value of a place, especially in relation to the impact they have on the wellbeing of the users. Those themes are 1) positive emotions; 2) connecting; 3) freedom and flexibility; and 4) participation. Each theme is measured by four questions, producing 12 questions for the whole POE activity. The answers can be obtained through a suggested array of tools such as online surveys, focus groups, community events, doorstep interviews or any other suitable

form. The limited number of questions and the broad range of data registry tools was intentional in the design of the SVT to maximise the accessibility and inclusion chances for the participants.

The SVT was adapted and used in community-led action research for mapping the eco-social value in Orts Road and Newtown, Reading Borough, UK (Hatleskog & Samuel, 2021). The assessed themes included the ones from the SVT, in addition to two new ones: active lifestyles and taking notice. Each theme had two prompts to facilitate the discussion and evaluation, and all the prompts were phrased to ask only about positive associations that people have with their local area. For instance, for the theme of positive feelings, participants were asked, 'Is there anywhere locally that you are proud of?' and 'Can you show where you feel happiest locally?' (Hatleskog & Samuel, 2021, p. 598). The participants engaged in single workshops at various venues such as schools, sheltered housing and outdoor community events. The participants were asked to collaborate using one large map of the examined context. For every prompt, each participant was asked to put stickers on the map to locate places they felt corresponded to their answers and add comments on the map whenever they felt necessary. The project outcome was in the format of large, layered maps, each representing one of the examined themes. The maps provided a unique outcome that demonstrated which places meant more to the community, and how those various themes could corelate spatially.

The POE feature of such community-led tools has great potential for enhancing the effectiveness of NSATs in achieving their defined aims. As I have argued, research with a sustainability agenda that focuses on the neighbourhood scale needs to establish a better understanding between the mode and stage of participation and how it correlates with the actual feelings, behaviours and practices of residents in the neighbourhoods concerned. This way, participation research can move from the conventional practice of using the level of participation to assess its impact on neighbourhoods' sustainability to using participation outcomes to determine the impact of participation on creating sustainable neighbourhoods. Theoretically speaking, this differentiation would shift the focus from valuing the model of the participation ladder to the model of the participation wheel, where there is no such thing as a good and bad type of participation, but rather there is a contextually impactful one, given the contexts' local conditions.

In another experimental approach with an explicit focus on facilitating sustainable urban environments, the R-Urban project is one of the initiatives that hold the broad aim of localizing urban solutions, building resilience, and creating new community-led practices that can be carried out and sustained by the locals (Petcou & Petrescu, 2018). R-urban was created to test

and provide alternative collective practices, tools, sites, and networks where non-governmental organizations and self-managed facilities can come together in small-scale initiatives to serve the local community. Those projects were intended to provide an exemplary model for localised bottom-up urban practices that can be replicated elsewhere. The project was initiated by L'Atelier d'Architecture Autogérée (AAA), a non-profit multidisciplinary platform for action and research around urban ecology and urban civic practices (Petcou & Petrescu, 2018).

The first of those projects was the R-Urban Paris, initiated in 2011. The project includes an experimental micro-farm, café, community gardens, as well as cultural and educational facilities. The small-scale project is managed by locals who are supported by representatives from AAA. This project is challenged by the limited funds and the difficulty of sustaining it in the long run, using only volunteers from the local community (Baibarac & Petrescu, 2019). R-urban also has a London-based project, which is the R-urban Wick. While R-urban Paris had an agricultural focus, London's project focused on generating innovative, economical solutions for deprived areas in the city. The project has an experimental range of local economic initiatives, such as a local bicycle repair shop, a tool-sharing unit, ands other cultural and educational facilities. As in the R-Urban Paris project, the benefits of the London version were directed towards the local community. However, London's project had more professionals mediating the creation and maintenance of the project (Baibarac & Petrescu, 2019). This presence of locals and professionals could aid the London version to be better sustained in the longer term, as it is more sensitive to the governing structure of power and supported by the existing network of individuals and organizations who created it.

Initiatives like R-urban that focus on empowering the public and facilitating the co-creation of space have a strong potential to create localized solutions with a strong social and economic focus. However, such projects are highly contextual, to the level that makes their replication in other contexts quite inapplicable. In addition, they require a strong existing network of individuals and organizations to begin with, and demand a long learning curve with unguaranteed outcomes. The lack of a clear structure for such initiatives makes them unappealing to policymakers, as their outcome is not guaranteed. Also, focusing on a very small geographic space with potentially unorganized social networks can be extremely temporal and contextual in the sense that it would be hard to link it to future development plans or connect it with broader geographic boundaries of cities and districts. In addition, relying strictly on the locals' knowledge makes it difficult to incorporate technical issues of environmental concerns in bottom-up sustainability visions.

Those limitations make such community-led approaches quite problematic for operationalising the broader concept of sustainability, with its overlapping environmental, social and economic dimensions and its broad scalar levels. For this reason, the discipline of neighbourhood sustainability assessment needs to balance and facilitate better communication between its top-down and bottom-up practices, as each appears to bring benefits that the other fails to support. With that in mind, building such communication channels requires understanding the specific context for which co-production is needed. Since I am focusing on the context of Bahrain, the following section reviews the state of the limited available community-led practices in the country.

As I transition from discussing the broad principles of participatory design in global contexts to their specific application in Bahrain, it is crucial to recognize how these universal principles are uniquely shaped by the local cultural, social, and political landscapes. Evaluating and implementing participatory practices in Bahrain must align with the specific needs and characteristics of the Bahraini communities. This involves a careful consideration of local traditions, governance structures, and social dynamics to ensure that the participatory methods are not just imported, but thoughtfully integrated into the Bahraini context. To do so, in the following section, I aim to bridge the gap between the general theory of participatory design and its practical application in Bahrain, highlighting both the challenges and opportunities of implementing these practices in a distinct cultural and regulatory environment.

2.2.2. Participatory Practices in Bahrain

Community participation in urban and architectural practices is not common in Bahrain, especially in the context of affordable housing neighbourhoods. This weak presence applies to the two types of participatory practices, top-initiated and bottom-initiated. The absence of a strong impact by the participants on the outcomes concerning their living environments left the housing sector with great dissatisfaction, despite the numerous services provided by the Ministry of Housing and Urban Planning in Bahrain, presented in the background information chapter. With this rare participation in Bahrain's housing and urban sector, it is important to note that participation mostly takes the form of one-directional communication, where information passes from policymakers to the public.

The weak participation culture seems to have left its mark on the housing sector, where houses gradually started to lose their ability to represent the social norms of modern Bahraini society. Such findings can be noted in research that concerns the social sustainability of Bahraini neighbourhoods and houses. In a study to evaluate the social sustainability of the subsidized

Bahraini housing unit in comparison to the traditional Bahraini courtyard houses, Saravia, Serra, and Furtado (2017) noted that the modern subsidized house stopped reflecting important social norms for the community, especially in terms of privacy, the connection of interior house spaces to allow social contact of the family members, and gender sensitivity, particularly for privacy requirements of female residents. These findings were made in comparison to the traditional Bahraini courtyard house, which is extremely introverted, and with a strong presence of a multi-purpose courtyard that is used to connect the spaces of the house.

Public critiques of the subsidized housing units and neighbourhoods (mostly known as affordable housing projects) are occasionally reflected in local newspapers' headlines, random complaints on social media platforms (such as Instagram), and in parliament debates which, in a way, can be argued to reflect the voice of the voters who elected their representatives. Still, the public housing sector in Bahrain witnessed minimum response to public demand, except for a gradual change in affordable housing services provided by the Ministry of Housing and Urban Planning in 2022 to provide a more flexible range of services that can accommodate different family structures, and older residents profiles (Ministry of Housing and Urban Planning, 2022b), which I discussed in the background information chapter. Despite these modifications in the housing services, one cannot pinpoint the starting point for the chain of events that led to this change, but it is undoubtedly, in part, a response to a public need that reached policymakers.

Around 2016, Bahrain government (2023a) reported limited citizen participation, customer satisfaction and transparency in government transactions provided by the public authorities through electronic services. To address these issues, the government constituted the Ministerial Committee for Information Technology and Communication (MCICT), which in turn developed the eGov Strategy. The strategy aimed at 'Strengthening accountability, transparency & civic engagement through open data and e-Participation'(Kingdom of Bahrain, 2023a), and believed that accessible data is one of the primary ways to strengthen informed citizen engagement. This resulted in two primary outcomes: 1) the implementation of a national suggestions and complaints system (Tawasul) (Bahrain Information & eGovernment Authority - Kingdom of, 2023), and 2) the enhancement of the national portal for accessing numerous services and information in one stop (Kingdom of Bahrain, 2023b). While those services were developed in intervals around 2016 and 2018, the breakdown of COVID-19 in 2020 was the main accelerator for the public participation domain in Bahrain, particularly in terms of developing and extending the e-government services, providing accessible and immediate interaction with the public on social media platforms, and developing an online public culture in general, especially for the older demographic who were not used to these platforms.

In a more architectural and urban-related review of the public participation endeavours in Bahrain, one of the projects that stood out was the Learning Alley in East Riffa (figure 2.9, (Bahrain Trust Foundation, 2019b)). This project was the first publicly funded street renovation project in Bahrain, initiated and carried out by the Bahrain Trust Foundation, which is a non-profit organization founded in 2010. The organization tries to use the capabilities of the locals to improve the life quality of less empowered individuals locally and globally. Their approach relies on providing the tools and ecosystems to empower individuals to improve their own living standards (Bahrain Trust Foundation, 2021). To do so, it attempts to provide innovative, practical models of small-scale, equitable and sustainable living solutions.

Figure 2.9. Learning alley, East Riffa, Bahrain (Bahrain Trust Foundation, 2019b)

The Learning Alley initiative aims to rehabilitate narrow streets with restricted car accessibility. It targets neighbourhoods with limited outdoor spaces and intends to transfer alleys to vibrant public spaces that provide a safe environment for kids to play, and for the elderly to have an accessible gathering place. With those specific groups in mind, the project still intended to engage all ages and gender groups in a safe interactive space with a smart sustainable agenda. The Alley in East Riffa is the first and only executed project of its kind in Bahrain. The project brief comprises of simple elements that require minimum use of technology and maintenance. It

included sitting areas, green areas, an open library, and interactive learning and playing stations (refer to the alley's schematic plan in figure 2.10. (Bahrain Trust Foundation, 2018, p. 7).

The project was initiated by Bahrain trust foundation and primarily funded by sponsors from the private sector with an approximate cost of £30, 000 (Bahrain Trust Foundation, 2019a). The ally also received donations from community members, and still has an active donations link on Bahrain Trust Foundation website. In addition to the private sector, formal government bodies partnered with Bahrain trust to provide logistic support to implement the project. Those included the Southern Municipality, Southern Capital Municipal Council, Electricity and Water Authority, and Bahrain Polytechnic from the academic sector.
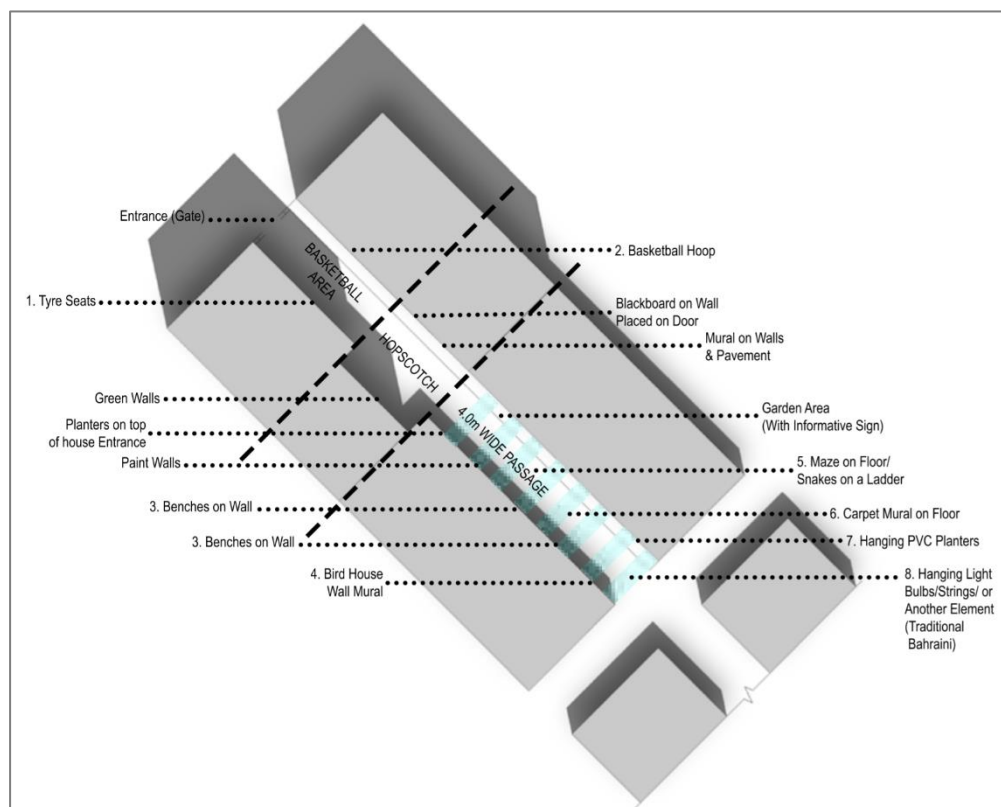
Figure 2.10. Learning Alley schematic plan (Bahrain Trust Foundation, 2018, p. 7)

The public was engaged with the project at different stages. In addition to partially funding it, the community also played a role in creating and maintaining the space. Public organisations and community members donated books as well as recreational and educational tools for the learning stations and the open library. The community also participated in the execution of the alley. While most of the project was carried out by conventional building

contractors, volunteer artists and community members executed the painting and artwork on the walls. They also handled the planting and irrigation of vertical gardens, which were put up using pots on the walls of buildings along the street. Vertical gardens are not typically used in Bahrain; hence introducing them in a narrow-paved street with no access to ground soil serves as an informative model for green solutions in such environments.

The simple design brief was intended to promote community participation, walkability and the introduction of green spaces, which serve the larger aim of promoting sustainable practices by introducing an exemplary space that other communities could replicate and maintain by themselves. Using the earlier discussed theory of public participation by Reed *et al.* (2018), contexts like Bahrain, with a limited understanding of the participatory culture, could benefit more from such small-scale initiatives than larger scales ones with higher levels of participation. For instance, the alley provides minimum flexibility in seating and planting options using built-in concrete seating with fixed planting pots. Despite their rigidity, those features can perform well in minimising the risk of vandalism and the need for maintenance. According to Foster, S., Giles-Corti, B., & Knuiman (2011), neighbourhoods' tidiness and well-maintenance correlate with the perception of safety in that area. Perceived safety was also found to increase the usage of neighbourhoods' outdoor spaces (Dempsey et al., 2012), and the increased presence of people can, in turn, bring in more people (Gehl & Gemzøe, 2004), which can be understood by the users as a success in the participatory endeavour. In urban neighbourhood contexts where users are sceptical about the outcome of public participation in decision-making, preserving the main features of beauty, tidiness, and a sense of safety could potentially build gradual trust and communal ownership of the area, which might be more important than maximizing extent and level of participation.

As expected, the project resulted in increased street usage and turned it from being an abandoned area to a recreational attraction and a place that hosts different communal events such as national day celebrations and other local events. While the intention for the project was to be solely maintained by the public, the learning alley houses another Bahrain trust foundation project, dikkan alfereej (which translates to 'the local neighbourhood shop'). This shop is also an innovative take on business incubators, where the shop is used as a selling platform for local small businesses (mostly local artists) who can reach out to the Bahrain trust foundation for a spot in the shop as well as an online version of it. The presence of a facility operationalized by the foundation within the learning alley makes it easier to monitor and maintain the alley. Still, it also makes it difficult to assess whether the project's success is being maintained and sustained by the community members alone.

While this is problematic for evaluating the project's success, it does increase the likelihood of sustaining this project in the long run, which can build trust in other projects elsewhere and spark a wave of similar acts. Therefore, starting with a small-scale project with more success probability could be a wise approach for contexts with limited public participation culture. To replicate this approach, potential future sites should ideally be implemented in locations with an existing social network already interested in public activities to be able to self-sustain the implemented projects once they start operating.

The Learning Alley in Riffa, Bahrain, shares more similarities with R-urban Wick, London. This is because both projects rely heavily on professionals that have a local interest in the specific sites where the projects are taking place. Although the learning Alley in Bahrain has a more limited engagement level, the fact that many of its users happen to be professionals interested in social welfare makes it easier to sustain and modify in the future. The approach of finding local sites that have an already existing network of people who are interested in civic engagement makes it easier to build trust between the initiators and the community. R-Urban projects identified those local entry points as the first foundation for accessing bottom-up urban co-design projects (Baibarac & Petrescu, 2019).

While promising, this form of small-scale initiative for modifying local environments is still very limited and challenged worldwide. Despite their scarcity, experimental small-scale participatory practices are growing as a form of empowering communities to adapt to the rising economic and environmental challenges. Whether designers and urban planners engage the community to overcome physical problems or to democratize the creation and adaptation of local environments, this approach is an important step in building resilience towards the challenged local urban practices. It is also a way to introduce innovative solutions for engaging the local community in identifying and fulfilling its urban needs and enabling them to sustain those practices by themselves.

2.3. A road map for implementing community participation in Neighbourhood Sustainability Assessment

In summary, I discussed the prevailing categorization of how to understand and structure public participation practices in architectural and urban contexts. I mentioned that this field is dominated by the ethical commitment to participation despite the limited evidence or sometimes even the complete disregard for how positive the participation outcome would be on the physical and social environments they intend to serve. To counter that, especially in the context of sustainable neighbourhoods, I argued that there needs to be a balance between the ethical and pragmatic or instrumental approach to community participation, where participation practices

need to be designed to aid in the gradual shift towards more pro-environmental and pro-social behaviours, planning and design solutions. The interdisciplinary facets of sustainable neighbourhoods require facilitating communication between stakeholders ranging from experts and professionals to the local public. This is because each stakeholder can bring different inputs that could benefit one aspect of sustainability more than the other, as well as considering different temporal considerations of how to balance the needs of current and future generations.

Because my research focuses on the actual impact on the neighbourhood components, I discussed different modes for evaluating the impact of community participation, ranging from process driven to outcome driven. With an emphasis on the outcome, I highlighted the importance of evaluating the impact of community participation after its completion. The emphasis on the post-completion stage implies that community participation on the neighbourhood scale should result in a direct impact on the final decisions concerning residential neighbourhoods. Meaning that it should not be carried in a way that hinders the implementation of its deliverables, either because it took too long, was too expensive to carry through, or resulted in too much conflict where a decision could not be taken effectively, which in turn highlights the practicality considerations for public participation practices. This concern steered the discussion towards examples of experimental community participation methods to approach sustainability in urban neighbourhoods, which were not strongly documented or formalised in literature.

Based on reviewing participatory tools that focus on the neighbourhood scale, those tools appeared to have a fair share of critiques concerning their practicality and impact. Still, community participation remains essential for operationalising the pillars of sustainability holistically, especially with regard to the social aspect of sustainability and facilitating pro-environmental behaviour. The review suggests that the critiques of community participation in NSA context can be mitigated using a combination of bottom-up and top-down practices, which could produce more impactful sustainable practices in terms of environmental, social and procedural outcomes. This does not mean that all three pillars will improve simultaneously at the same rate, but at least the tradeoffs between them can be better understood and accounted for in a specific context. Therefore, it appears that NSA literature needs to focus more on the hybrid practices which facilitate the communication between expert-led and community-led processes to create balanced neighbourhood sustainability visions. This way, NSA can combine the benefits of expert-led approaches' comparability, practicality, and environmental sensitivity with the localised social sensitivity of bottom-up approaches.

The significance of the real-life outcome of NSA on improving the quality of physical and social components of urban neighbourhoods requires a closer look at the post-occupancy stages of projects because they are the only stages at which the actual impact can be empirically assessed as opposed to speculating. To this end, the next chapter will discuss, in more rigour, hybrid approaches to neighbourhood sustainability assessment, with a focus on POE and how it can create channels of dialogue between experts and locals at the neighbourhood scale.

2.4. Conclusion

In light of the preceding discussions, it becomes evident that the traditional approach to community participation in architecture and urban planning, which predominantly values the mere act of participation, requires reevaluation. I suggest that the focus should pivot towards not just the process but the tangible outcomes of such engagements. This paradigm shift is paramount in steering efforts toward the creation of sustainable living environments that are as much about the physical fabric as they are about the social setting. It is imperative that community participation transcends theoretical discourse and manifests in pragmatic applications. These applications should be reflective of the lived experiences within various neighborhoods, with particular emphasis on resource-limited settings typical of affordable housing. To facilitate this paradigm shift, I suggest incorporating community participation in the post-occupancy stage in addition to its conventional use in the design stage. Incorporating community participation in the POE can provide concrete measures of the effectiveness of architectural and urban interventions, thereby serving as a catalyst in the transition towards more sustainable neighborhoods. Such an approach not only fulfills the democratic ethos of participation but also ensures its instrumental role in enhancing community well-being and promoting environmental stewardship.

Chapter 3: Towards a Hybrid Approach to Assessing the Sustainability of New Affordable Housing Developments

The following chapter attempts to reconcile the current approaches to Neighbourhood Sustainability Assessment (NSA), which are polarized between a dominating top-down one, and a less common bottom-up one. The chapter contains three sections; the first starts by explaining why NSA needs to build stronger communication between expert-led and community-led approaches, more commonly known as hybrid approaches to NSA. Then, it reviews hybrid theoretical frameworks for approaching sustainability at a local level. From there, I explore two research areas within hybrid NSA which relate to the scope of my research that aims to localize sustainability assessment tools for the context of affordable housing neighbourhoods. Those two areas are hybrid research in localizing expert-led Neighbourhood Sustainability Assessment Tools (NSATs) and hybrid research in NSA for the context of affordable housing neighbourhoods. While both research areas relate directly to the aim of my research, I could not find available research on localizing expert-led NSATs specifically for the context of affordable housing neighbourhoods. Therefore, I present two sub-sections, each addressing one area separately. The reviewed cases of applied research within both areas show that hybrid NSA draws heavily on POE methods to address its aims.

From there, the second section aims to link the findings of the two earlier discussed hybrid areas of NSA. I, therefore, focus on POE as a tool to link top-down to bottom-up practices of NSA. I do so by explaining the relevance of POE to sustainability assessment at the neighbourhood scale. As in the first section, which reviews fragmented areas of hybrid approaches to NSA, section two also reviews two research areas that relate to the POE at the neighbourhood scale: POE research specific to new housing-led developments and POE research that relates to the neighbourhood scale in general. In the second part, I aim to link existing POE tools that relate to the local scale and customize them for the context of new affordable housing neighbourhoods. I use three primary tools to structure my new POE tool that is customized for the context of new affordable housing neighbourhoods: the Social Value Toolkit (SVT), the Berkeley Group social sustainability assessment tool and the place standard tool.

I use those three tools because each focuses on one aspect related to my research question. The SVT focuses on the social qualities of local areas, the Berkeley Group social sustainability assessment tool focuses on new housing-led developments, and the place standard tool includes broad questions that relate to local areas in general. The section concludes by presenting a novel community-centred POE tool which I developed for the context of new affordable housing neighbourhoods.

After presenting my developed POE tool, I present a methodological framework for using the community-led outcome of this POE tool to aid in approaching sustainability in individual contexts. I developed seven criteria for designing applied case study research for approaching NSA; those are: 1) To acknowledge the three pillars of sustainability (environmental, social, economic); 2) To be reflective of real-world situations; 3) To be ethically obtained; 4) To be triangulated for validity; 5) To be capable of generating credible community-led data; 6) To be time efficient; and 7) To be applicable.

3.1. Why a Hybrid Model?

As discussed in the earlier sections, the limitations of the dominant top-down approaches to NSA led to an increased interest in bottom-up sustainability assessment research (Fraser et al., 2006). Despite their limitations, top-down NSATs dominated NSA literature and practices for justifiable reasons. Those tools can provide a consistent framework that draws mostly on the common guidelines of the UN for approaching sustainability, starting from the broad definition of sustainable communities by the Brundtland report in 1987 to the more detailed aims of the sustainable development goals (SDGs) released in 2015. Using identical frameworks to create neighbourhoods worldwide is a tempting idealistic approach. For instance, using standardized frameworks creates comparable neighbourhoods (Morse & Fraser, 2005). This could be interpreted as if those frameworks do not discriminate between the local environments depending on cultures, ethnicities, or other background information of the residents' profiles. However, being standardized also means that the frameworks lack the sensitivity to acknowledge, understand, and respond to local limitations and social structures, which can be drastically different from one place to another.

The shortcoming of the dominating expert-led NSATs led to a growing research interest in bottom-up approaches of NSA. However, those also have their fair share of critiques and limitations as they can be very complicated and time-consuming to carry out (Steg & Vlek, 2009); not to mention their limitation of encompassing broader temporal and spatial scales of sustainability (Pietrzyk-Kaszyńska et al., 2017). Dependency on a bottom-up approach for sustainability assessment at the neighbourhood scale can bare several risks; some might even undermine the advantages of this approach. For instance, although participatory approaches are considered more equitable as they minimise the political power influence on sustainability agendas (Morse & Fraser, 2005), neighbourhood residents can overlook the needs of future generations to improve their current life quality (Dempsey et al., 2011).

In this sense, community participation can impose ethical concerns on locally defined sustainability agendas. In a study of defining urban social sustainability, Dempsey et al. (2011) highlighted that the public's social needs are not necessarily sustainable or equitable. For

instance, the locals might ask for urban developments that are antagonistic and exclude minorities and justify this by the need to maintain community identity (Dempsey et al., 2011). The same is evident in the environmental dimension of sustainability. Howley, Scott and Redmond (2009) showed that people could resist changes to their preferred ways of living even if they acknowledge the environmental benefits of the change. They give the example of a community refusing a proposal to put fees on car parking in order to reduce car usage. Those pieces of evidence show that relying only on community participation in creating local sustainability frameworks can create inequitable frameworks and ignore the needs of future generations. This potential setback could be mitigated by methodically incorporating participatory input in expert-led NSA, which is the broader scope of my research.

A parallel yet unexplored equity concern is that residents in deprived areas might focus on basic residential needs, such as affordability and safety, and overlook higher-end needs, such as access to green spaces. Identifying a spectrum of higher and lower needs is common in affordable housing sustainability studies such as Severson and Vos's work (2018). This spectrum can be read in parallel to Maslow's hierarchy of needs which starts with basic physiological and safety needs and reaches to those of aesthetics and self-realisation (Niezabitowska, 2018). Eliminating experts' opinions with their regional thresholds in approaching sustainability for affordable housing neighbourhoods could extend the gap between different classes of the community because community members would likely focus on specific local concerns, which the context of affordable housing neighbourhoods are mostly related to very basic needs of providing affordable and safe shelters. Besides, it is difficult to maintain a holistic approach to sustainability (environmental, economic, and social) by relying strictly on participatory approaches because community members are likely to lack technical environmental and economic knowledge (Boyle et al., 2018).

Despite the presented limitations of both expert-led and community-led approaches to NSA, each brings advantages that the other does not provide. As a result, sustainability assessment research needs to improve the area of hybrid approaches to NSA to benefit from both models. Therefore, the discussion of NSA should not be polarized between top-down and bottom-up approaches but rather encourage better communication between the two. It is important to understand that bottom-up approaches to NSA should not be seen as an alternative to top-down ones but rather as a complementary approach to minimise some of the setbacks of the latter tools.

3.2. Hybrid Models for Approaching Sustainability at a Local Level

The only hybrid model for approaching sustainability at a local level that I found —a heavily cited work with 1015 citations (google scholar, 2023)— was developed by Reed, Fraser

and Dougill (2006). Their model defines an iterative learning cycle for developing, applying, and reviewing sustainability indicators in local contexts (figure 3.1). The model has four stages: 1) establishing context; 2) establishing goals and strategies; 3) identifying, evaluating, and selecting indicators; and 4) collecting data to monitor progress. All stages involve different levels of community participation, and the stage of selecting indicators has a loop designed to allow iterative dialogue between experts and the community. To make their model flexible, Reed, Fraser and Dougill (2006) did not specify tools for conducting each stage. However, they emphasise that the model needs to implement more than one data collection method, which is a technique known as triangulation. Triangulation is commonly used in qualitative research to increase the credibility of subjective data. It is used to describe the process of collecting similar data using more than one data collection method to increase the scientific robustness of qualitative research, as well as to understand better the meaning of the collected data (Fielding, 2012).

A key advantage of this model is that its use of mixed methods does not run in parallel but rather as a cycle. This means that the data collection, decision-making, and outcome evaluation happen more than once and use more than one method. The consecutive collection, data interpretation, and outcome evaluation allow better understanding and verification of the involved qualitative data. It also allows iteration of the outcomes through a dialogue between experts and locals. Such data integration is one of the difficulties of research involving social phenomena. Fielding (2012) emphasises that the aim of triangulation for data involving social issues should be to link and better interpret the data and not simply collect them using more than one method. He also notes that such integration is often overlooked in research concerning social contexts, of which neighbourhoods are a part. This note makes the hybrid model developed by Reed, Fraser and Dougill (2006) hold a significant reliability strength.

Despite this advantage, the model has a few limitations. First, the model does not suggest how to resolve the conflict between stakeholders, whether through consensus or by prioritising a particular side. In addition, the model includes a stage for testing the indicators and renegotiating them amongst stakeholders before their selection. While this is a justified step, it prolongs the time needed for creating a local sustainability framework. This long time could make the selected indicators irrelevant by the time of implementation. Another concern is that the model does not link the framework goals to long-term sustainability visions, which can negatively affect intergenerational sustainability and target the model more towards short-term resident satisfaction instead of long-term sustainable development.
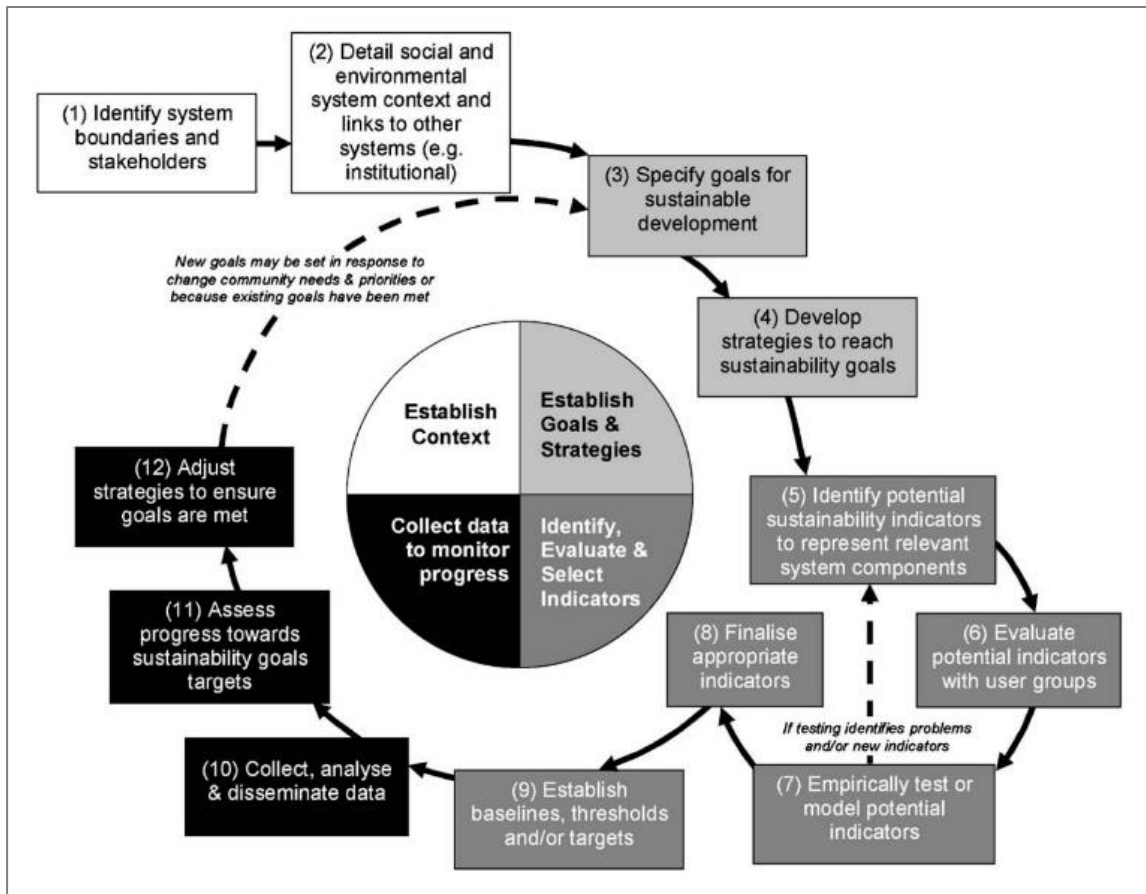
Figure 3.1. Adaptive learning model for developing and applying local sustainability indicators (Reed, Fraser and Dougill, 2006, p. 9)

3.2.1. Hybrid Research in Localising Expert-Led NSATs

The general trend in hybrid approaches to NSA starts with involving the public in defining and prioritising sustainability indicators (Dawodu et al., 2019). Adopting this approach requires each community to design a new local sustainability framework consisting of indicators and measures that are relevant to their local environment. Such an approach can be time-consuming, labour intensive and can generate numerous indicators that are difficult to handle (Reed et al., 2006). Fraser et al. (2006) evaluated the effect of community participation on identifying sustainability indicators through 3 case studies of different communities. One of their case studies was in forestry communities in British Columbia, Canada. There, technical experts used community participation to modify an existing 'wellbeing assessment methodology', which had five social indicators and five environmental indicators. By the time of completing the community participation stage, social indicators increased from 5 to 141 indicators, with over 10% of them having unobtainable data. The large number of indicators and the difficulty of obtaining data for some of them delayed the project completion significantly after the deadline (Fraser et al., 2006).

Such limitations, particularly the long time it takes to involve the community, can threaten the ability to engage the public systematically in effective decision-making. Planners and developers may be disincentivized from consulting with the community owing to time constraints on project implementation. It is also possible that by the time of completing participatory processes, the local area might have experienced significant change, making participation output no longer relevant. In both cases, the time efficiency of community participation needs to be improved for community participation to be useful. Therefore, while creating local sustainability frameworks for each neighbourhood seem to have a higher level of instrumental and ethical validity, it is also extremely difficult to carry out feasibly in the context of affordable housing neighbourhoods.

Both practical and ethical concerns necessitate the development of a new tool that effectively and speedily complements existing international expert-led NSA tools using data derived from community participation. The need for a tool to localize existing expert-led NSATs is not limited to feasibility concerns. Arslan, Durak and Aytac (2017) had a similar conclusion when they examined the value of using LEED-ND to monitor the development towards sustainability in historic neighbourhoods in Bursa, Turkey. Their research showed that LEED-ND managed to address general sustainability issues, such as creating efficient transport links but failed to capture the historical value of Bursa. Their research emphasised the need for developing a tool that can generate local targets by modifying international NSA tools. Their conclusion was not based on the feasibility concerns that I discussed earlier but on effectiveness concerns, which shows that coming up with a tool to localize existing expert-led NSATs is important for numerous reasons.

Using community-led input to localise expert-led NSA frameworks is therefore theoretically advocated. However, Dawodu, Cheshmehzangi and Williams (2019) claim they could not find an executed case for this. To bridge this gap, Dawodu, Cheshmehzangi and Williams (2019) attempted to develop an African-specific NSAT by developing and testing a hybrid methodological model for selecting sustainability themes and indicators (called headlines in their research) for the neighbourhoods of Lagos, Nigeria. In doing so, they aimed to respond to three of the formerly discussed limitations in existing hybrid NSA models: 1) resource limitations (time, labour, and cost), 2) lack of meaningful community engagement, which they defined as enabling the community input to influence the decision-making process, and 3) the need of having a firm connection to comprehensive sustainability agenda. To do so, their model relied on using existing international expert-led NSATs to save time, have regional comparability, and build scientific validity.

Such an approach is advocated by Vaidya and Mayer, who suggest that depending on expert-initiated frameworks can provide tested measures for participatory tools (2014). While

Dawodu, Cheshmehzangi, and Williams's (2019) hybrid approach for localising expert-led NSATs to suit specific cultural contexts are similar to what I am suggesting, I differ in what I define as meaningful community engagement. As I discussed in Chapter 2, meaningful community input that aids in creating more sustainable neighbourhoods cannot come from asking the community what they want because this could relate to satisfaction more than sustainability. Bottom-up input should therefore be generated in the form of POE, which documents how the locals get affected by the environment they live in and how they affect it. Because of this differentiation of what constitutes meaningful participation, my research focuses on POE as a tool to incorporate community input in localising existing NSATs, whereas Dawodu, Cheshmehzangi and Williams (2019) used questionnaires to ask the locals to rate the importance of selected neighbourhood sustainability indicators and suggest new ones.

Dawodu, Cheshmehzangi and Williams' model used the headlines of 9 publicly available NSATs to initiate the participatory stage (2019), which are BREEAM Communities, LEED Neighborhood, Green Mark for Districts, Green Building Index, Global Sustainability Assessment System: District, The Pearl Community, Green Star, Green Township and CASBEE Urban Development. The bottom-up stage was carried out through a questionnaire with questions related mostly to ranking the indicators and selecting the likely ones to succeed. Community opinion was then fed again in a top-down decision-making cycle to review the initial framework, prioritising community opinion, using eight rules for vetting community input (figure 3.2). The quantitative feature of the questionnaire meant that while the data could be collected quickly and from more respondents, public input was limited to prioritising the initial top-down frameworks. This mode of participation does not enable the community to deviate from the initial framework, making their participation minimal. Although quantitative approaches generate manageable data, participatory research needs to provide more innovative tools to ensure that feasibility does not undermine the value of community participation in voicing their opinion and has it influenced the way their neighbourhoods are designed.
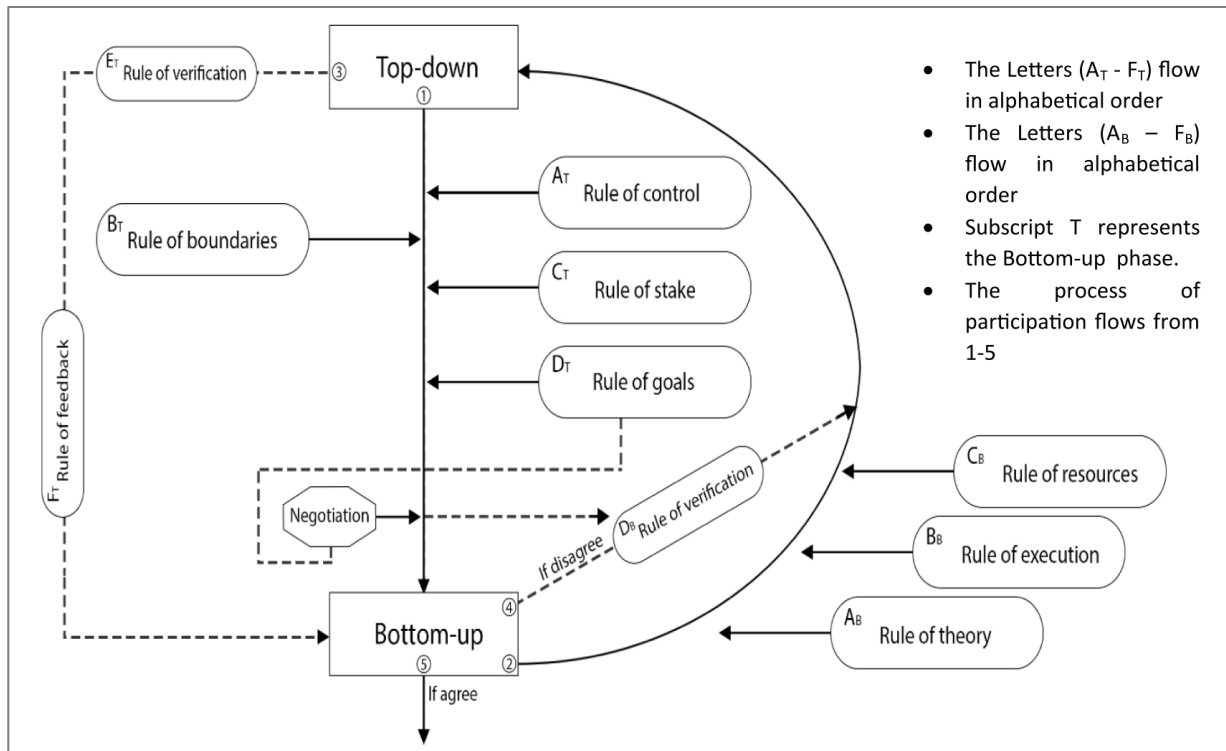
Figure3.2. A hybrid model for Selecting headlines of sustainability in the african context (Dawodu, Cheshmehzangi and Williams, 2019, p. 12)

Martins et al. (2021) used a similar method to identify neighbourhood sustainability indicators relevant to Brazil. Their method started by reviewing the indicators of six available NSATs, which were BREEAM Communities; CASBEE-UD; LEED-ND; Aqua Neighbourhood; 2030 Districts; and the Livability Index. Their review produced initial 340 indicators, which were vetted for relevance to their research scope, and then clustered based on similarity. Eventually, they ended up with 42 indicators which they used to develop an online quantitative questionnaire to ask locals about their level of agreement with each stated indicator using a 5-point Likert scale. The aim of using online questionnaires was to create an accessible format, speed-up and lower the cost of the data collection process and enable the participants to respond freely and confidently.

Even though the data collection took around a year, the study only managed to obtain 124 responses from 56 cities around the country, which they criticised for being limited. They attributed this low number to the low interest of the locals in responding to the survey. While 124 is a relatively low response number for a quantitative country-level study, this number reflects the reality of participation culture in that context. This reality will always remain a source of concern in contexts with limited trust or knowledge of participation culture, yet, those areas are exactly the places that need more local empowerment. Therefore, researchers need to develop strategies to elicit higher and more inclusive participation rates. Still, they also should not be deterred by the low participation at early stages as they are likely to be the case.

3.2.2.Hybrid Research in Approaching Sustainability in New Affordable Housing Contexts

Maintaining a proportion of affordable housing units within communities seems to be an ethical necessity for creating equitable, sustainable developments. However, the dominant top-down NSATs do not seem to provide sufficient incentives for developers to create this type of dwelling. Szibbo (2016) used three methods to examine the extent to which LEED-ND can push developers to include affordable housing units in their developments. First, he reviewed the tool scorecards and found that providing affordable housing units is optional and only accounts for less than 3% of the total obtainable score. The framework also does not specify the provision of rental or for-sale units, which he believed limits the residents' tenure options and negatively affects the developments' social sustainability. Szibbo (2016) believed that the optional structure of the tool's scoring could be to blame for the low percentage of LEED-ND-certified neighbourhoods with affordable housing components, which he found to exist in only 40% of the certified projects.

To further investigate LEED-ND's ability to facilitate the creation of affordable housing neighbourhoods, Szibbo (2016) used online surveys and structured interviews to examine the views held by LEED-accredited professionals towards this issue. The responses reinforced his original conclusion. Most respondents believed that the optional nature of the affordability indicator makes it unattractive and not necessarily pursued by developers, especially because the indicator only accounts for 3 points of the total 110 possible ones based on the LEED-ND rating. This means that developments could still be awarded the certificate without obtaining those 3 points. Professionals suggested a range of solutions to provide stronger incentives for developers to address the issue of affordable housing while pursuing neighbourhood sustainability accreditations. Those solutions included making the affordability indicator compulsory, increasing the credits given to it, specifying different tenure options within this indicator, adding credits for reducing utility costs for residents of affordable housing units or subsidising the cost of accreditation for developments that provide affordable housing options.

While NSA evolved from environmental sustainability literature, the study of affordable housing neighbourhoods within the sustainability discourse evolved from discussions around social sustainability. Focusing on the social sustainability of such developments can be understood as those aspects are at higher risk of neglect because they often come after concerns around economic feasibility and the provision of basic shelter needs. Severson & Vos (2018) believed that relying on the lens of social sustainability to explore issues related to affordable housing made the discussion around its focus on higher-end social needs, which pertain to more sophisticated needs such as cultural identity and self-realisation. While they believed those needs are significant, Severson & Vos (2018) emphasised that they cannot be addressed without first

acknowledging the basic social needs required from affordable housing neighbourhoods, such as safety and affordability.

Although assessing the social sustainability of affordable housing neighbourhoods is encouraged in theory (Pullen et al., 2010), detailed frameworks for measuring them are not widely available in NSA literature. I could not find a hybrid NSA framework specific to the affordable housing context, but the most relevant framework to my research scope was the Capital Region Housing's measurement framework, developed for the context of affordable housing neighbourhoods in Alberta, Canada (Severson & Vos, 2018), which is one of the few available and detailed frameworks to measure social sustainability for affordable housing neighbourhoods. Although this framework does not involve active community participation in its development or scoring, its assessment is done using secondary-source community-led data derived mostly from the Wellbeing Survey available in Canada, making the tool involve some level of community engagement. This framework was influenced by Maslow's pyramid of human needs proposed in 1943. Therefore, it was explicitly structured around a different hierarchy of needs required from affordable residential areas and was also presented as a pyramid (Severson & Vos, 2018).

The framework comprised four dimensions, two within the basic needs domain and two within the higher-order needs (figure 3.3). The basic needs include two dimensions: housing standards (with 19 measures) and non-shelter needs (with 11 measures), while the higher-end needs domain includes community integration and social inclusion dimension (with ten measures); and capacity building and resiliency dimension (with ten measures). The 40 measures were devised to ensure that each has a relevant available secondary source to assess it. Therefore, while this framework can be of great value in the Canadian context, it is not necessarily applicable in other contexts that do not record the same data needed for the assessment. Applicability of existing context-specific frameworks to other contexts is not the only issue facing NSATs, as there is also a concern around generalisability and reliability. Even if the measures devised in the Capital Region Housing's measurement framework were of great success in Alberta, Canada, their relevance and generalisability to other neighbourhoods could not be assured.
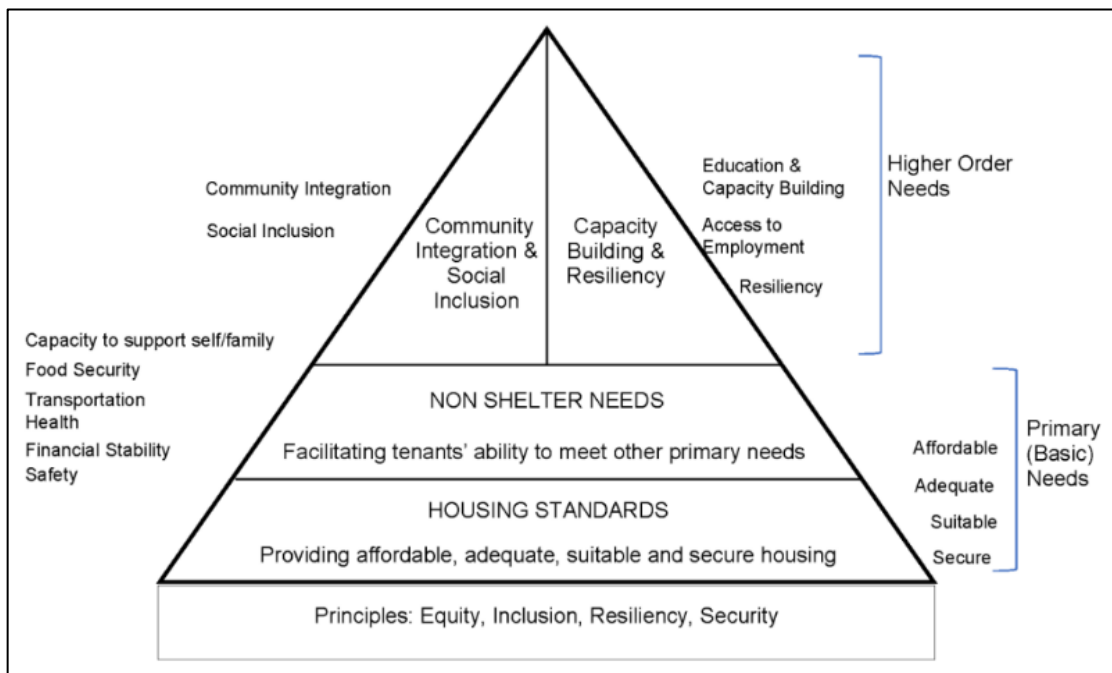
Figure 3.3 Conceptual model for assessing social sustainability of affordable housing (Severson & Vos, 2018, p. 7)

The generalisability of subjective context-specific findings is one limitation that needs further study in NSA literature. But with that aim being very broad and overly ambitious, it is beneficial to focus on methodically valid and feasible ways to localise generic expert-led NSA frameworks to suit individual contexts, which is the aim of my research. Therefore, instead of focusing on the details of the available context-specific NSA frameworks, I use those to guide the broader themes that could serve as prompts to facilitate a dialogue with the community without utilising the specific indicators or measures suggested by the reviewed work and without assuming the validity of the themes (relevant or not), nature of impacts (e.g., positive, or negative), and their magnitude (its weight or level of significance). Therefore, as my research is explorative and inductive in nature and bound by feasibility concerns of applied research, I refrain from adopting precisely defined measures that are not necessarily available in other contexts. Instead, I use the literature review to derive general and accessible themes that can initiate a discussion between experts and locals around issues that relate to sustainability at the neighbourhood scale, especially ones that can be generated using POE methods.

3.3. Post-Occupancy Evaluation as a Tool for Linking Bottom-Up Approaches to Top-Down Approaches in Neighbourhood Sustainability Assessment for New Affordable Housing Developments

3.3.1. The Relevance of POE to Neighbourhood Sustainability Assessment

Post-occupancy evaluation (POE) is a method for evaluating the efficiency of a building or a development in achieving its stated program's aims (Turpin-Brooks & Viccars, 2006). This method received increasing research interest in sustainability assessment for several reasons. One reason is that POE can provide empirical evidence for the effect of the built environment on its users, including those concerning complex issues such as identity and human behaviour (Hay et al., 2016). NSAT indicators are frequently criticised for lacking empirical validation for their presumed benefits (Howley et al., 2009). Therefore, using POE to document the actual impact of living under certain conditions can offset those critiques and validate or refute many of the presumptions of NSA literature. Another reason for promoting POE in sustainability research is that it can bring different stakeholders together as it can be carried out by several methods such as observations, interviews, focus groups, walk-throughs, questionnaires and site surveys (Meir et al., 2009). The broad range of tools for carrying POE means that it can be conducted in an expert-oriented, top-down mode or be more participatory and user-oriented depending on the implemented data collection tool. This feature makes POE very promising for hybrid use in sustainability assessment.

Despite those advantages, POE comes with significant limitations. Turpin-Brooks and Viccars criticised POE for being extremely localised with limited scope validity (2006), meaning that the findings derived in one context cannot be generalized to other contexts without clearly understanding what variables caused the resultant effects. With the numerous factors at play in the neighbourhood setting, identifying variables and mediators that create a specific effect is extremely difficult and oversimplifies the examined social phenomena. Despite this limitation, POE is the only embodied way to understand how people and environments interact with the minimum distancing of the subjects from their relevant experiences. Therefore, the limitation of contextual validity should be countered by designing POE in a manner to allow a deeper interpretation of data and to see how different factors unfold and interact in shaping residents' experiences.

3.3.2. Bringing POE Closer to Bottom-Up Practices

While POE research has been using both top-down and bottom-up approaches for decades, a review of POE literature in neighbourhood and housing-led developments showed that POE is dominated by expert-led and quantitative approaches (Serin et al., 2018). Wongbumru and Dewancker made a similar finding in their review of POE research in public housing (2016). Their research showed that the dominating POE tools were questionnaires, followed by observations, and then interviews. Both studies show that, to date, POE is mainly approached as

a top-down practice but with the potential to be more participatory in its approach (Serin *et al.*, 2018; Wongbumru and Dewancker, 2016).

Attempts to make POE more participatory are not recent. A study of a new building at Harvard University in 1996 tried to combine participatory workshops with questionnaires for evaluating workplace comfort in that building (Horgen & Sheridan, 1996). The study showed that the university administration responded promptly to the recommendations based on the quantitative survey. However, they did not pay as much attention to the recommendations based on the qualitative workshops. This remark shows that it could be difficult to know what to do with qualitative data after collecting it, unlike quantitative ones that give precise findings and/or recommendations. The difficulty of integrating qualitative participatory data in decision-making is not specific to building-evaluation literature. The same issue is witnessed in sustainability assessment literature, where it is difficult to systematically include the findings of bottom-up approaches to sustainability in decision-making (Fraser et al., 2006).

Using quantitative research methods in POE is commonly practised to simplify the use and communication of the gathered data. In a study of affordable housing in Nigeria, Ilesanmi used POE to quantify housing quality and its effect on low-income and middle-income user satisfaction (2010). The POE was designed in two stages, an expert-based evaluation of ten variables related to the neighbourhood and dwellings' physical features; and a questionnaire to measure residents' satisfaction with their neighbourhood and their desire to stay in it. The assessment was done using a Likert scale. While it is simple to carry out, the Likert scale assessment cannot relate residents' satisfaction with their neighbourhoods to specific physical or social features of the place; not without residents' narratives to explain the reasons for their reported satisfaction level.

A POE with a participatory dimension should ensure that data collected from the participatory stage properly feed into the expert-led stage. Otherwise, triangulation will lose its value in adding depth to the collected data and verifying research findings (Fielding, 2012). Such an innovative practice can be seen in the POE of Maggie's Nottingham Cancer Care Centre (Hay et al., 2016). This research used the Social Return on Investment approach, where the social outcomes get identified through qualitative engagement with the stakeholders and then transferred to monetary value using predefined ratios (Samuel et al., 2020). The produced data included narrative accounts of what makes the place successful. The qualitative narratives identified social values for design elements that were not necessarily accounted for in the interview questions, such as referring to the homey feel of discussions around kitchen counters instead of using formal desks (Hay et al., 2016). This reinforces the argument that quantitative

measures related to subjective issues can be better identified and understood using supporting qualitative data.

Using a deductive research approach to explore the aforementioned correlation (the impact of specific furniture types and layouts on users' feelings) would require starting from the presumption that furniture layouts and types impact residents' feelings. Then, the data collection would be structured to explore how this effect happens. Such a deductive approach will always create a level of interference from the researcher on the expected findings, which are unlikely to deviate from elements concerning furniture and feelings. This approach of precise linear exploration of phenomena is unlikely to create meaningful engagement with participants or give them authoritative power over shaping the outcome, which poses an ethical concern over the value and truthfulness of engagement. In addition, it will not enable researchers to identify unknown variables that could potentially affect participants' views and, therefore, pose an instrumental concern to the value of participation. Because of the significance of enabling participants to express their opinions extensively and freely, I suggest relying on loosely structured interview questions to explore unique, contextual, and potentially unexplored socio-spatial correlations, as in those likely to be present within neighbourhood settings.

Having said that, localising existing NSATs cannot be achieved without enabling a dialogue between existing expert-led NSA frameworks and the findings that are likely to emerge through community-led POE. It is therefore important to review existing POE tools and try to roughly base new POE tools on them, which will facilitate the incremental building of knowledge and simplify the communication between the community-led outcomes and the expert-led ones. Therefore, in the next section, I review existing POE tools that relate to NSA literature in order to use them to structure a novel POE tool for the context of affordable housing neighbourhoods.

3.3.3. Reviewing POE Tools For the Context of New Housing-Led Developments

Dixon (2019) tracked the development of several housing-specific social sustainability assessment tools to Berkeley Group Social Sustainability Assessment Tool developed in the UK, including the Canadian Capital Region Housing's measurement framework (Severson & Vos, 2018), which I discussed earlier in the section 3.2.2. The Berkeley group framework has three themes and 13 indicators (figure 3.4) informed by questions based on existing national datasets and industry-standard tools (Bacon et al., 2012). The assessment for this tool is designed to be carried out through site surveys, residents surveys and contextual interviews (Dixon & Woodcraft, 2013). The data then gets interpreted against a comparable geo-demographic benchmark, where the results get presented in a RAG (red-amber-green) system, where the colours respectively represent the following: lower than expected, satisfactory, and better than expected (Bacon et al., 2012)

The RAG representation of results rates each dimension in a simple format accessible and understandable by the public. This practice differs from the common score aggregation implemented in several NSATs, such as LEED-ND. Score aggregation is criticised for masking the meaning of results and passing non-sustainable practices as sustainable (Sharifi & Murayama, 2013). This can happen when the score of ill-performing indicators combines with other well-achieved indicators. In this case, the aggregated score could read as high, where there could have been some seriously overlooked dimensions of sustainability. The individual representation of each score makes Berkeley's tool more efficient in transparently tracking each indicator's performance. This is particularly significant for the social pillar of sustainability, where indicators could have clashing objectives (e.g., enabling individual growth while maintaining cultural identity). Using individual and simple graphical representations for assessing neighbourhoods' performance can be useful for involving and empowering the local community as it facilitates easier and more transparent dissemination of information.
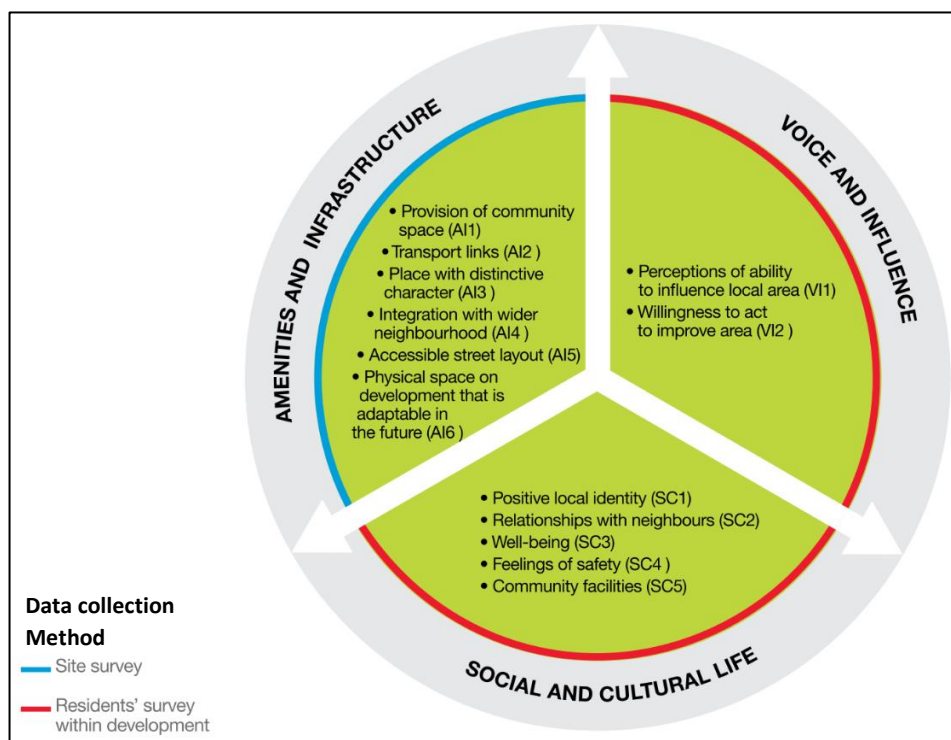
Figure 3.4. Themes and indicators of the Berkeley Group Social Sustainability Assessment Tool for new housing developments. Source: (Bacon et al., 2012, p. 21)

Another way to empower the community and make their opinion have a greater significance is to use local benchmarks to interpret the assessment data concerning a specific development, which is used in the Berkeley tool. A benchmark is a tool used to determine whether the result of a certain performance is good or bad, where the measured performance gets compared to those obtained from comparable areas (Yigitcanlar & Lönnqvist, 2013). According to Yigitcanlar & Lönnqvist (2013), benchmarks can be useful for interpreting the measures obtained using POE across comparable contexts, but this feature can be limited by

data availability. Since you can only compare sustainability measures collected in one context to those that are readily available from another context, having a consistent POE framework carried across different contexts could build up a wider benchmark database, which can then be used to enhance the meaningfulness of data interpretation by selecting relevant benchmarks.

Therefore, having a level of consistency in sustainability-relevant POE frameworks across the world can aid in gradually building a more accurate and deeper understanding of the nature of the relationship between locals and their living environments. But even with providing a broad range of benchmarks, complex social outcomes are solely the result of isolated factors within the built environment (Carmona, 2014; Ives et al., 2017; Kaur & Garg, 2019). Therefore, it is extremely difficult to identify the features that affect comparability between different contexts. While it is unclear which socio-characteristics are responsible for influencing the perception of specific qualities within urban neighbourhoods, there appears to be a geographical clustering that relates the perception of neighbourhood qualities to a combination of spatial, temporal, and sociological components of contexts. Using local benchmarks means that the views of the locals in one area get compared to those of residents with comparable characteristics. In the Berkeley tool, comparability was based on geo-demographic classifications for neighbourhoods and residents' profiles. Still, this is done without sufficient evidence of the correlation between those variables and the residents' evaluations. Therefore, to enhance the reliability of POE benchmarks, NSA research needs to use context-specific approaches to verify the variables that affect residents' evaluations in various contexts.

This can be better understood in relation to the highly contested concept of density, which is seen as the solution to many urban neighbourhoods' problems by several researchers (Carmona, 2021) and as a potential problem by others (Dempsey et al., 2012). Dempsey et al. (2012) hypothesised that sustainability themes remain relevant in various contexts, but the thresholds of whether their presence counts as good or bad changes depending on the context; therefore, they contested the idea of relying on international benchmarks to assess neighbourhood sustainability performance at various context. They used the high density accepted in Egypt and India and not accepted in the UK as empirical evidence for the lack of meaning of a quantitative measure without its context (Dave, 2010; Dempsey et al., 2012). Using international benchmarks to interpret sustainability measures can therefore create inaccurate evaluations, especially if they are used across incomparable contexts. Despite this clear limitation on using international benchmarks, this approach is still promoted by several NSATs, such as LEED and BREEAM, and even used to signify a tool's strength.

To balance the need between comparability, data availability, and local sensitivity, it is important to develop POE tools that build on existing tools. However, POE tools should be

carefully designed to avoid having them overly fitted to particular contexts in order to facilitate unsolicited dialogue with community members. As I have established earlier, I suggest using loosely structured, individual interviews to carry out POE activities to capture the reciprocal relationship between neighbourhood environments and their residents in specific contexts. This way, the data collection would enable participants to express their opinions freely and in confidence without being affected by any type of peer pressure that can accompany focus groups or researcher biases that could accompany observation techniques. Those tools, however, can provide valuable input to further interpret the collected data after establishing basic findings using interview questions. To respond to the limitations of comparability, expanding and utilizing available benchmarks, and building knowledge, the following section discusses three POE tools that relate, in some capacity, to the sustainability assessment of affordable housing neighbourhoods. The tools were used to aid in designing the questions of my suggested POE tool, which aims to develop a community-led understanding of sustainable, affordable housing neighbourhoods.

3.3.4. Reviewing community-centred POE tools and tailoring them for new housing led-developments

In this section, I review existing POE tools related to the neighbourhood scale to create a model tailored to new affordable housing neighbourhoods. Although my case study is in Bahrain, the model I designed is not intended solely for use in Bahrain. Therefore, I needed to design a POE model that is flexible enough to be meaningful at various context, but select its themes carefully so that they have the capacity to solicit context-specific feedback from residents. The intention is to use community-led data from the POE model to facilitate communication channels between top-down and bottom-up input, linking community-identified sustainable features with those considered environmentally and socially sustainable by experts.

To achieve this, the model I designed needed to be structured to align with existing NSA literature, dominated by expert-led themes, indicators, and measures, while also being flexible enough to allow community members to voice their opinions without being influenced by expert preconceptions. I based the themes of my novel POE model on existing POE frameworks covering a broad range of place-related themes. My review included three well-established tools, each with distinctive characteristics: the Berkeley Group Social Sustainability Assessment Tool (Bacon et al., 2012), the Place Standard Tool (PST) (NHS Health Scotland, 2017), and the Social Value Toolkit (SVT) (Samuel et al., 2020). Specifically, for the SVT, I focused on the Mapping Echo Social Assets (MESA) project (Hatleskog & Samuel, 2021), which adopted the SVT's basic structure.

These tools were chosen to create a structured yet flexible POE framework, enabling systematic questioning to link findings to existing literature and explore unknown variables

affecting affordable housing neighbourhoods in various cultural contexts. Each tool had to be relevant to the neighbourhood scale, suitable for POE methodology, and incorporate community-led input. The tools varied in scope, development scale, data collection methods, and result representation. In developing my model, I cross-checked all themes and questions of these three tools, detailed in Appendix a. The PST comprised 14 themes evaluated by 14 questions, the SVT had 4 themes assessed by 8 questions, and the Berkeley Group Social Sustainability Assessment Tool included three themes, with 13 indicators, assessed by 45 questions.

The grouping resulted in a total of 21 themes and 67 questions. For clarity in each theme's definition, I grouped similar questions, as the detailed questions more elaborately defined what they intended to measure. This grouping was crucial for translating the content into other languages, particularly Arabic, the primary language in Bahrain. By doing so, I ensured that the POE questions, when translated into Arabic, could retain their intended meaning as understood in prevailing literature. This aspect of translation was particularly important to ensure that the themes and questions were contextually relevant and understandable to Arabic-speaking residents, thereby enhancing the applicability and effectiveness of the POE model in Bahrain's unique cultural setting.

In terms of scope and scale, the Berkeley tool was the only one that explicitly referenced sustainability assessment, as it was designed to measure the social sustainability of new housing-led developments. The SVT was designed to measure the social value of places with reference to sustainability. The tool's theoretical development relates to communities in general, but it used housing-specific monetary proxies to convert the measured social qualities to monetary equivalencies (Samuel et al., 2020). The MESA project, which implements an adaptation of the SVT, is also concerned with the social assets of a place but does this using mapping techniques so that the outcome would provide physical anchorage for the assessed social qualities (Hatleskog & Samuel, 2021). While the social value of developments could closely relate to their social sustainability, its involved themes cover broader and more flexible themes than the ones discussed in NSA literature. This could expand the dialogue with the locals to cover topics not necessarily identified by the experts in NSA literature, while keeping them relevant to the literature.

The PST, on the other hand, pertains to fostering well-being and equity by discussing a range of social and physical components of places (NHS Health Scotland, 2017) and does this without any reference to sustainability. It is also created to cover different sizes of developments that range from neighbourhoods to cities, whether they are at the planning stage, undergoing change, or existing. The larger scale and scope of the PST broadens the discussion about the components that can affect residents' life qualities while keeping it relevant to sustainability

themes and to community participation at the neighbourhood scale. Between the three, the tools discuss a broad range of physical and social components of places, which maximises the breadth of the reviewed themes while keeping them relevant to the residents' lives at the neighbourhood scale.

Across those themes, the tools occasionally used similar terminologies or used different terms to discuss similar concepts. The tools show overlaps between several indicators and defined questions. For instance, the MESA project evaluates 'Connection' using the question ', Is there anywhere that you find you tend to stop and speak to people regularly?' (Hatleskog & Samuel, 2021). Similarly, PST evaluates 'Social contact' using the question ', Is there a range of spaces and opportunities to meet people?' (NHS Health Scotland, 2017), while the Berkeley group tool uses the themes 'Integration with the wider neighbourhood' and 'Relationships with neighbours' (Bacon et al., 2012) to assess the same quality.

Below, I compare the tools' themes and questions and use those to develop a novel POE tool for approaching sustainability in the context of affordable housing neighbourhoods. Starting with the Berkeley group Social Sustainability Assessment Tool this tool revolves around three themes with 13 indicators (shown earlier in Figure 3.4). The tool uses 45 questions to measure the 13 indicators, and the questions are mostly based on existing industry assessment tools or national data sets. The three themes are 1) amenities and infrastructure, assessed by the indicators: provision of community space; transport links; place with distinctive character; integration with the wider neighbourhood; accessible street layout; and physical space on development that is adaptable in the future. 2) voice and influence, assessed by the indicators: perceptions of ability to influence local area and willingness to act to improve the area. And 3) social and cultural life, assessed by the indicators: Positive local identity; relationships with neighbours; well-being; feelings of safety; and community facilities.

The SVT involves four themes: 1) positive emotions; 2) connecting; 3) Freedom and flexibility; and an optional fourth participation theme which can be used for projects that involve community members in the project's development. Each theme has four questions that enquire about a different social or psychological feature, making a total of 8 questions. The assessment is done using a 5-level scale that ranges from strongly agree to strongly disagree. The MESA project, which is based on the SVT, does not have a participation theme and has additional 'active lifestyles' and 'taking notice' themes, where the former theme relates to identifying recreational and community facilities and the latter relates to identifying beautiful or natural elements in the area (Hatleskog & Samuel, 2021). The themes of the SVT and the MESA project are mapped in Figure 3.5. Finally, the PST is designed around 14 questions used to prompt the discussion around the physical and social components of a place (figure 3.6). Those dimensions include: 1) Moving

around; 2) Public transport; 3) Traffic and parking; 4) Streets and spaces; 5) Natural space; 6) Play and recreation; 7) Facilities and amenities; 8) Work and local economy; 9) Housing and community; 10) Social contact; 11) Identity and belonging; 12) Feeling safe; 13) Care and maintenance; and 14) Influence and sense of control.
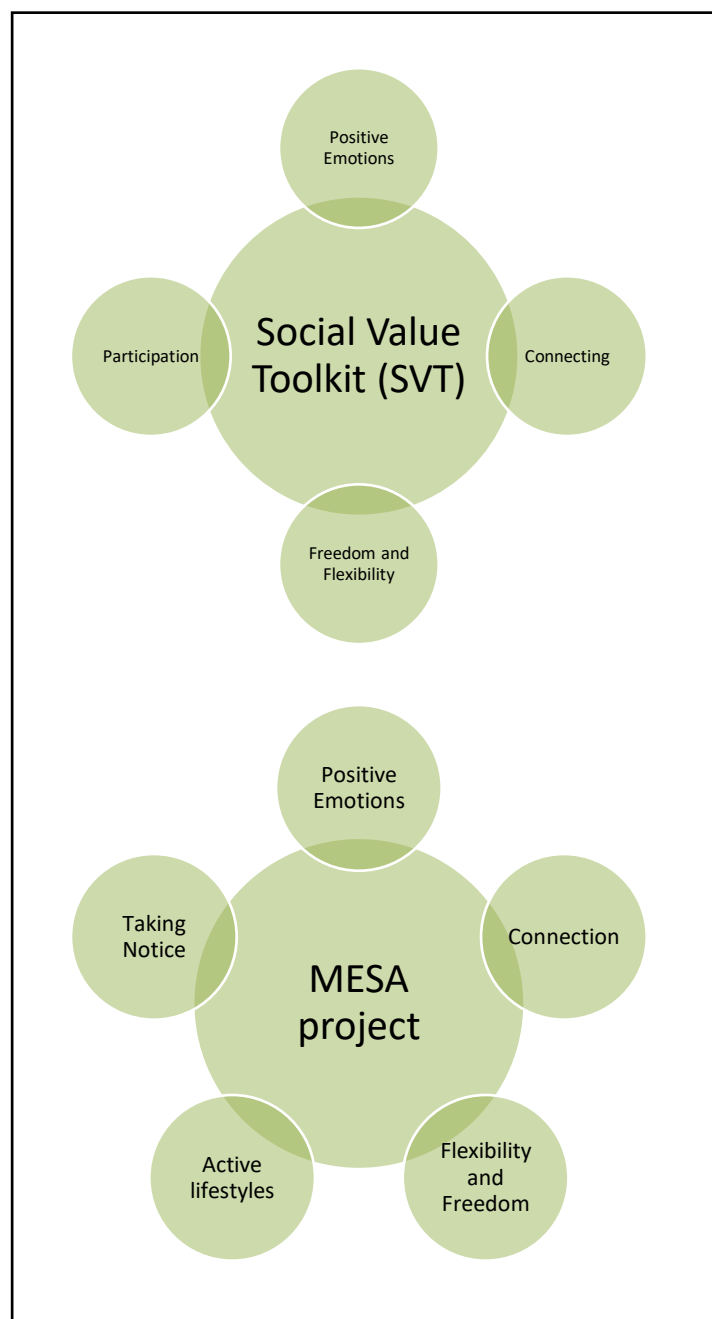
Figure 3.5. Themes of the SVT and its adaptation in the MESA project
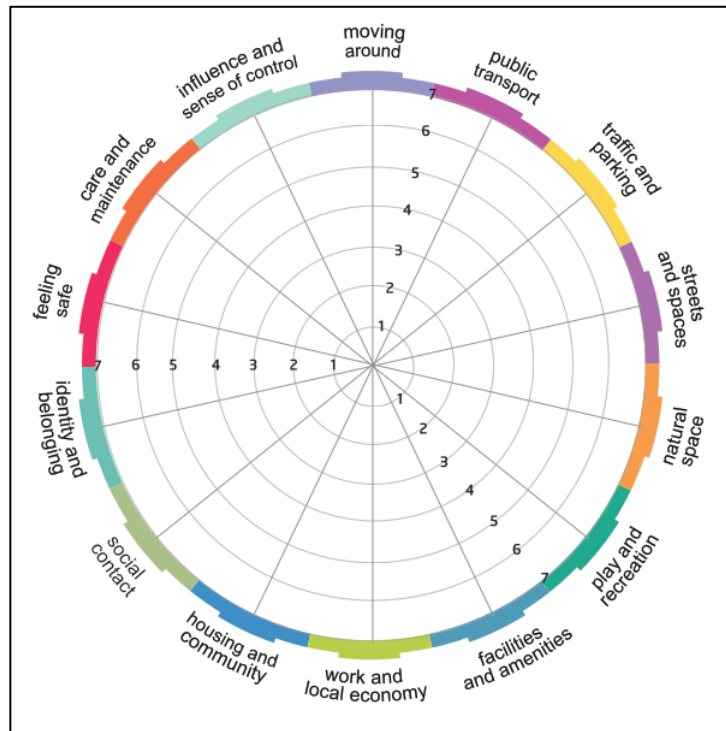
Figure 3.6. Rose diagram showing the themes of the Place Standard Tool
(NHS Health Scotland, 2017, p. 19)

The most significant difference among the tools is in the data collection methods, particularly around question phrasing and the method of assessing the tool's indicators of the MESA project. Both the Berkeley tool and the PST directly ask the users of the place about the level of fulfilling an identified quality, while in the MESA project, the users are asked to identify places they associate with the assessed quality. For example, in the PST, identity and belonging are assessed by the question, 'Does this place have a positive identity, and do I feel I belong?' (NHS Health Scotland, 2017), which is parallel to 'place with the distinctive character' and 'positive local identity' in the Berkeley Group Tool (Bacon et al., 2012). Carrying on the same example, identity and belonging are examined in the MESA project through the question 'Can you mark onto the map any areas that you feel responsible for?' and 'Is there anywhere locally that you are proud of?' (Hatleskog & Samuel, 2021). This difference makes the approach of the MESA project more capable of exploring unidentified socio-spatial correlations than the Berkeley tool and the PST.

The exploratory ability of the question formatting adopted in the MESA project is of great significance to my research, which aims to localize expert-led NSATs using community-led input. The MESA project allows participants to identify components they believe are important in their local environment without asking them to evaluate specific physical elements and their presumed

social outcomes. Not only does this give the community a stronger impartial voice, which is essential for the ethical impact of participation, but it also allows them to provide local insights that could aid experts in understanding unfamiliar contexts and better adapting the measures and themes of existing NSATs to be more meaningful for the contexts in question.

The last difference between the three examined tools lies in their representation of results. While the three tools use graphical representation for that, each uses a different technique. The Berkeley Group Tool uses a RAG rating, which was discussed in detail in section 3.1.3. This type of result representation (represented in Figure 3.7) can be easily understood by non-experts, as each indicator is evaluated individually using simple three-colour coding that reads as positive, negative or neutral. The PST also represents each theme's evaluation individually but uses a rose diagram (figure 3.8). This technique gives a larger evaluation range than the RAG system but can be harder to understand for non-experts.

The three tools display the results of each assessed indicator individually. This makes the evaluation more transparent and meaningful as it does not aggregate the score with those for other indicators. Despite this advantage, isolating the scores is unlikely to capture the interrelationships between the various themes and is likely a result of oversimplifying the dynamics between the components of the built environment. This setback is minimized in the MESA project, which uses maps with coloured values to represent the participants' responses (figure 3.9). The mapping is represented once for each theme and again using an overlapping map that layers the results of all the assessed themes. While this technique can be more complex to understand by the average user than the RAG rating and the rose diagram, this approach is the only one that can show correlations between the different assessed themes. Once again, this feature makes the approach adopted at the MESA project more valuable for understanding how the locals interact with their environments and what features either amplify the positive effects of each other or cause some tradeoffs. Therefore, using a mapping approach for the POE responses whenever suitable can bring insights that cannot be identified otherwise.
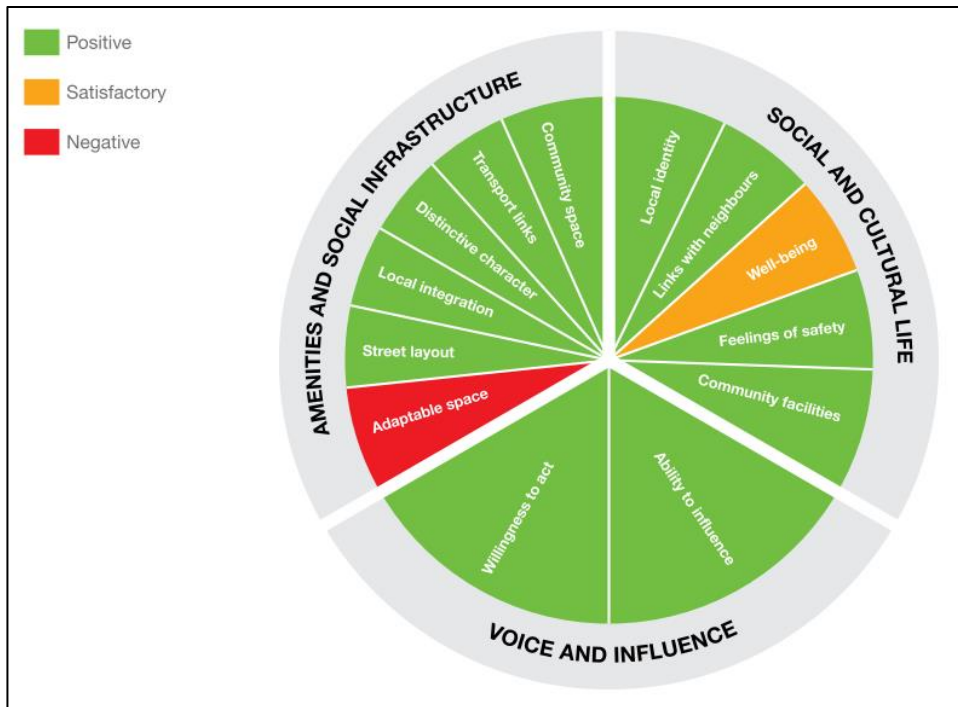
Figure 3.7. RAG system showing assessment results sample using the Berkeley Tool (Bacon et al., 2012, p. 14)
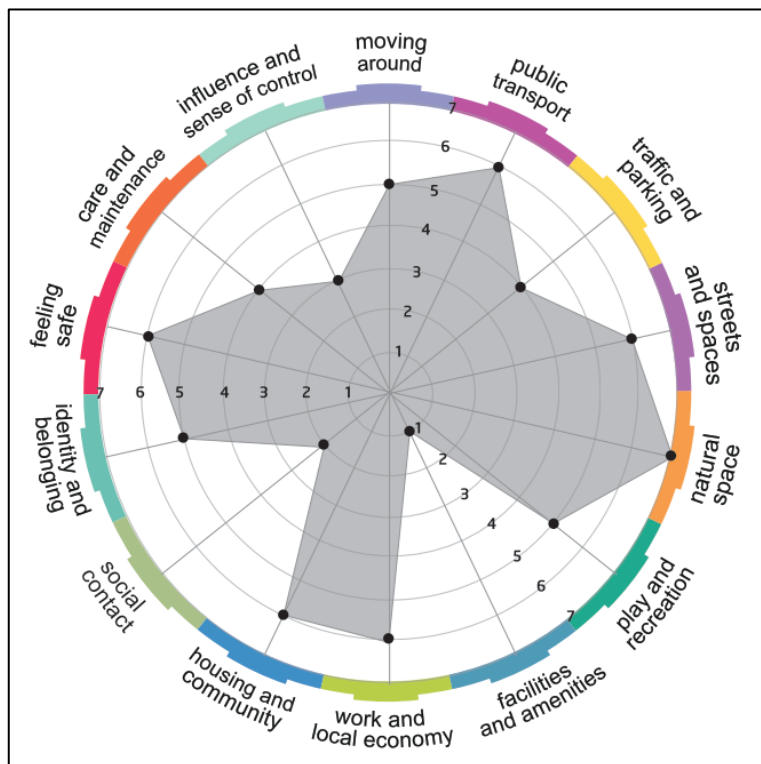
Figure 3.8. Rose diagram showing assessment results sample using the Place Standard Tool (NHS Health Scotland, 2017, p. 1)

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Figure 3.9. Value map showing assessment results sample using the Social Value Toolkit (Hatleskog & Samuel, 2021, p. 608)

After reviewing the available documents on each tool, I clustered the themes and questions used to carry out the assessment activity across the three reviewed tools. The three tools together had 21 themes with clear repetition across the tools. These themes were assessed using a total of 67 questions across the reviewed tools. From there, I clustered the themes and their corresponding questions by aligning similar questions from the three tools instead of just aligning the theme title. Using the questions as a basis for clustering the themes allowed for a more nuanced and detailed understanding of each theme's intended scope of measurement. The details of this comparison are presented in appendix a, table 1. Using this approach, I obtained an initial number of 16 themes which were: Aesthetics; Connection with Nature; Social Contact; Identity, Belonging and Pride; Community Facilities; Recreation; Support and Influence; Psychological Wellbeing; Walkability and Accessibility; Public Transportation; Traffic and Parking; Job Proximity; Housing Suitability; Safety; Maintenance; and Adaptability, as depicted in Figure 3.10.

Of these 16 themes, 'Job Proximity' was only present in the PST, which could be because this was the only tool intended for evaluating both the city and the neighbourhood scale. Because of the small geographic area of Bahrain, the theme Job Proximity' was relatively more significant to the city scale than to the neighbourhood scale. Therefore, I excluded this theme because it fell outside the scope of my research. This left me with 15 themes. Then, I merged the themes with relatively similar content to simplify the flow of the interviews and to minimise the direct steering of the interview outcome. At this stage, I merged the 'Public Transportation' and 'Traffic and

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Parking' themes with the 'Walkability and Accessibility' theme. I also merged 'Maintenance' with 'Community Facilities'. I deleted 'Safety' as its content was partially covered across the 'Walkability and Accessibility' theme and in parts across the remaining themes. The final framework, therefore, concluded in 11 themes (figure 3.11) which are: 1) Aesthetics; 2) Connection with Nature; 3) Social Contact; 4) Identity, Belonging and Pride; 5) Community Facilities; 6) Recreation; 7) Support and Influence; 8) Psychological Wellbeing; 9) Walkability and Accessibility; 10) Housing Suitability; and 11) Adaptability.

Aesthetics	Connection with nature	Social contact	Identity, belonging and pride
community facilities	Recreation	Support and influence	Psychological wellbeing
Walkability and accessibility	Public transportation	Traffic and parking	Job proximity
Housing suitability	Safety	Maintenance	Adaptability

Figure 3.10. Initial clustering of POE theme relevant to NSA based on the analysis of Berkeley group tool, SVT, and PST

Aesthetics	Connection with nature	Social contact
Identity, belonging and pride	community facilities	Recreation
Support and influence	Psychological wellbeing	Walkability and accessibility
Housing suitability	Adaptability	

Figure 3.11. Final clustering of POE themes relevant to community-led NSA of affordable housing neighbourhoods

After identifying the themes for my proposed POE tool for the context of affordable housing neighbourhoods, I had to phrase questions to assess each theme. Interviews could be easily influenced by the researcher's bias and preference towards directing the discussion towards a specific direction (Lucas, 2016; Roulston, 2016), which could negatively influence the

value of community participation and the validity of the collected data. Therefore, the interview questions had to minimize the suggestive influence on the respondents. For example, for the adaptability theme, the PST uses the question, 'Do external spaces and layout allow for adaption, conversion or extension?' (NHS Health Scotland, 2017). Such a direct question does not prompt the respondents to reveal other factors that they find relevant to adaptability and forces them to focus on how spaces can change as a result of outdoor flexibility only. A parallel, yet more general, question can be, 'Do you want to live here for a long time? Why?' The answer to this question would also have to consider how the place adapts and responds to the future needs of its users, but it does that without suggesting the variables that can influence adaptability. Building on the questions found in the reviewed tools and iterating them to be more flexible and explorative means that the data collected from the POE will be based on available standard tools yet, be locally relevant, explorative, and verified. The standardisation of questions enables progressive building in knowledge within sustainability research, which is believed to be particularly lacking in POE research (Meir et al., 2009). As for verification, it is intrinsic in the POE practice because POE means that residents' feedback is not based on their speculation but on the actual perceived relationship between them and the built environment as being experienced.

Using the comparison table 1 in Appendix a, I developed the questions for my suggested POE tool. Whenever possible, I adopted the same question phrasing found in the reviewed tools' library of questions, which was possible when the existing question phrasing was generic and accessible to the public. This was done to maintain comparability and relevance to existing literature and available benchmark data sets, which is believed to enhance the effectiveness of POE tools in building knowledge and interpreting data in the long run (Yigitcanlar & Lönnqvist, 2013). In the remaining cases, I developed new questions to assess the derived themes. The final questions are presented below:

Theme 1- Aesthetics:
What is beautiful in your neighbourhood?

Theme 2 - Connection to nature:
Are there any nice natural elements in your neighbourhood?

Theme 3 - Community facilities:
Do the local facilities and amenities meet your needs?

Theme 4 - Recreation:
Do you have any places you go for recreational activities and hobbies?

Theme 5 - Social contact:
Is there anywhere that you find you tend to stop and speak to people regularly?

Theme 6 - Identity, belonging and pride:

1) Does your neighbourhood have a local identity?
2) Do you feel you belong here? Why? Is there anything you are proud of?

Theme 7 - Support and influence:

Do you feel able to take part in decisions to make things better in your local area?

Theme 8 - Walkability and Accessibility:

Can you move around your area safely, quickly and using different transportation modes?

Theme 9 - Housing suitability:

Does your house meet your (and your family's) needs?

Theme 10 - Adaptability:

Do you want to live here for a long time? Why?

Theme 11 - Psychological wellbeing:

Does living here make you happy? Why?

Interviews with open end questions can be difficult to control, especially for a novice researcher (Spencer et al., 2014). It is, therefore, important to keep a clear guide for how to conduct the interviews and how to maintain relevance to the discussed theme. While making sure the respondents touch upon the required research focus, the researcher must not eliminate the explorative value of qualitative research by exerting too much control over the interview. Hence, I prepared a detailed interview protocol (appendix b) and prompts to facilitate the discussion when needed (appendix c). This protocol needs to be implemented in all interviews, especially when more than one researcher will conduct the interviews to maintain consistency in the research. Defining prompts for interview questions beforehand also assures that the collected data can relate to the reviewed literature for analysis and future research work. Further justification for the sequence of the questions, along with guidelines for conducting the interviews, are provided in appendix d.

In formulating the questions, it was essential to ensure they were relevant to the predominantly English-speaking literature while also being comprehensible and meaningful to Arab respondents in Bahrain. I aimed to retain the original terminology as much as possible, adjusting the order of the questions and designing additional prompts when necessary. For example, since 'Aesthetics' in Arabic primarily relates to nature, I sequenced the question about 'Aesthetics' before one concerning natural elements, allowing respondents to discern and elaborate on any perceived differences. The term 'Recreation' also required careful handling due

to its vacation-related connotations in Arabic. To address potential confusion, I included extra prompts, such as asking if respondents have places for recreational activities and hobbies, followed by a prompt about the versatility and inclusivity of these places. For complex themes with significant cultural variances, like 'Identity, Belonging and Pride', I kept the questions broad to capture the local interpretation without imposing an international perspective.

3.4. Methodological approach for localising top-down NSATs: Using the literature review summary to link the outcome of community-led POE to experts' evaluation

As discussed in earlier chapters of the literature review, NSA literature is governed by experts-Led tools which are used to evaluate the sustainability of a specific neighbourhood development (Reed et al., 2006). Most of the tools use a framework consisting of indicators to measure the level of sustainability of the assessed neighbourhood (Lützkendorf & Balouktsi, 2017). Seven tools dominate the NSA literature (Sharifi & Murayama, 2013); those are LEED-ND, EarthCraft Communities (ECC), BREEAM Communities, CASBEE-UD, HQE2R, Ecocity and SCR. These tools share the criteria of being fully developed, with manuscripts accessible to the public. They also acknowledge the environmental, economic and social triad of sustainability and use a scoring system to evaluate the sustainability of the assessed development.

Despite their advantages, the literature review showed that top-down NSATs have clear limitations in responding to the local requirements of residential neighbourhoods (Sharifi & Murayama, 2013), particularly around the social dimension of sustainability (Howley et al., 2009). Despite that, top-down NSATs provide many advantages that make them essential for approaching sustainability at the neighbourhood scale. Those advantages include regional comparability, environmental sensitivity (Fraser et al., 2006), consideration of long-term (intergenerational) sustainability (Vaidya & Mayer, 2014), and a time-saving capacity (Sharifi & Murayama, 2013) as they are readily developed and familiar to professionals. On the other hand, bottom-up approaches to NSA seem to be more sensitive to contextual variations (Reed et al., 2018), particularly around the social aspects of sustainability (Fraser et al., 2006). Despite that, those tools come with the disadvantage of being extremely complicated and time-consuming (Steg & Vlek, 2009), insensitive to the larger temporal or geographic scale of sustainability (Pietrzyk-Kaszyńska et al., 2017), and tilted towards subjective opinions, which makes their scientific robustness questionable (Missimer et al., 2017b). To balance the limitations of both approaches, I aim to devise a method for localising expert-led NSATs using community input.

Neighbourhood sustainability assessment frameworks can be used as decision-support systems by designers, urban planners, formal authorities, developers, and other stakeholders.

Their use can be applied to either new or existing neighbourhoods. Lützkendorf and Balouktsi (2017) reviewed the difference between the indicators used to assess new neighbourhoods and the ones used for existing ones. The main difference they reported was that the former was mostly top-down and fixed in nature, while the latter was bottom-up and flexible in nature. Because of having fixed indicators, Lützkendorf et al. (2019) concluded that top-down NSATs are only relevant for evaluating new neighbourhoods. They also noted that when existing neighbourhoods want to assess their sustainability, they mostly resort to a flexible, community-led NSA system. This conclusion makes sense because if existing neighbourhoods were not built using the guidelines of expert-led NSATs, then how would it be possible to evaluate their sustainability using said tools?

Based on this logic, POE data can only be used to review and localise a specific NSAT if the tool was used to design the evaluated case study. While the former conclusion seems logical, it operates under the assumption that NSATs consider the interrelationship between its indicators (I represent this logic visually in Figure 3.12). However, the impact of implementing one indicator on the remaining ones is not considered in the design of expert-led NSAT. This is evident through the fact that most implemented NSATs use a scoring system for their evaluation (Sharifi & Murayama, 2013). In a scoring system, each indicator is given a score based on how far it was addressed in the urban development (using a set of measures). The scores of individual indicators
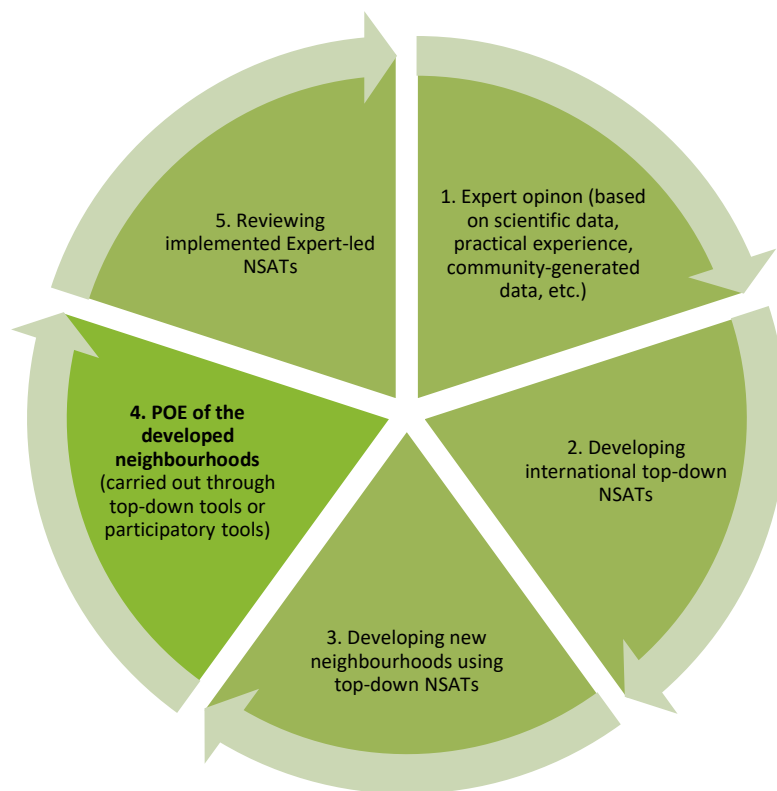
Figure 3.12. Logical model for using Post Occupancy Evaluation to review a specific NSAT – Governing condition: the framework considered the interrelationship between its indicators

are then aggregated to come up with a figure that represents the sustainability level of the assessed development.

This practice of scoring individual indicators and aggregating the figures has a significant setback in assessing neighbourhoods' sustainability. Aggregation makes it possible for developments to perform badly in a specific aspect and still be considered sustainable if they score high enough in other indicators. Experts try to avoid this problem by having some mandatory indicators in their framework. This practice assures that significant measures remain implemented in the developed neighbourhood, but it still doesn't mean that the framework considers the interrelationship between its indicators in its design. Although this issue weakens the design of top-down NSATs, it makes it theoretically valid to finetune or modify any tool's framework using case studies that did not use the examined tool in its initial design. The former theoretical proposition represents the base on which I developed my research model (figure 3.13). In this research, I suggest using community-based Post Occupancy Evaluation of a local neighbourhood to localise a generic top-down NSAT. I define localising a top-down NSAT as adapting its framework to accommodate the conditions of a local community (considering the limitations of the examined context, the local problems, and the local culture).

Figure 3.13. Logical model for using Post Occupancy Evaluation to review a specific NSAT – Governing condition: the framework does not consider the interrelationship between its indicators

The decision to use Post Occupancy Evaluation as the primary data collection tool was because POE is the most reliable tool for documenting the built environment's impact on the attitudes and feelings of its residents (Meir et al., 2009). This is because POE minimises the separation between the individuals and the act of evaluation, which make their responses more embedded and reflective of their real-life practices. Despite this increased validity, it is still difficult

to isolate the exact element of the built environment that caused a specific impact. Researchers cannot conclude with certainty that the reported impact directly resulted from a specific urban or architectural element. Hay et al. (2016) suggested enriching the meaning of POE data using qualitative narratives, which could deepen the understanding of the given residents' opinions. They also suggested increasing the credibility of the collected data by reinforcing it with more than one data collection method. I implemented both strategies in the initial design of this case study research, where I intended to use two data collection methods: a primary one using individual POE interviews and a complementary one using focus groups. This design was intended to balance the explorative nature of qualitative narratives with the robustness of analysing it against data generated using another method.

In addition to credibility, it is also important to note that the validity of POE findings is contextually limited and not generalisable (Turpin-Brooks & Viccars, 2006). To address the limitations of credibility and limited validity, I use qualitative residents' narratives as primary collected data in order to understand the causes of the publics' perspective regarding housing-related issues. Individual interviews provide a safe environment for the participants to give transparent answers without worrying about the impact of voicing their opinion (Lewis & Nicholls, 2014). This level of trust is particularly important in contexts where involving the community in decision-making is not a common practice. The privacy of an interview setting allows the participants to build the needed trust between them and the researcher, which Richards et al. (2004) believe to be crucial in any participatory practice, especially because the participants can be sceptical at first about the value and the intention behind initiating a community participation practice. Those advantages give POE interviews instrumental and ethical merits to promote their use in NSA.

Despite those advantages, individual interviews come with the trade-off of eliminating the impact of power dynamics, which is intrinsic in any social setting. This means that while participants' opinions can be more honest in individual interviews, their attitudes might differ in a social setting. This could negatively affect the credibility of the participatory data, which should best resembles participants' actual beliefs in addition to their behavioural patterns. To offset this weakness and maintain a more realistic yet ethical approach to hybrid NSA, my initial plan was to triangulate the POE interview data with data generated using focus groups. This was intended to replicate the power dynamics and peer pressure of a social setting, therefore revealing participants' opinions or attitudes that they would likely express in front of others. In doing so, I aimed to compare and contrast the outcomes of the interviews and the focus group and relate their findings to an initial expert-led sustainability framework. Unfortunately, the outbreak of

COVID-19 hindered the possibility of holding face-to-face focus groups, and virtual ones had limitations which I discuss later in Section 3.4.2.

With focus groups rendered unfeasible, I had to ensure that the interviews would reveal the possibly contradicting views or attitudes of the participants. I tried to achieve this by having the themes of the POE tool overlap to some extentand by using generic phrasing for the interview questions. This way, the participants would be able to reiterate their opinions around similar topics if they felt the need to. For instance, the themes, 'Aesthetics', 'Connection to nature, and 'Social contact' were to be respectively assessed using the questions: 'What is beautiful in your neighbourhood?', 'Are there any nice natural elements in your neighbourhood?' and 'Is there anywhere in the neighbourhood where you tend to stop and speak to people regularly? While the three themes are separately present in NSA, residential satisfaction, and well-being works of literature, the questions' phasing makes it possible to discuss natural elements within the 'aesthetics' theme or social contact within the 'connection to nature' theme. This approach enriches data interpretation and verification by collecting opinions around similar themes more than once without insinuating a specific direction or restricting participants' responses.

Using community-led POE to finetune an existing expert-led NSAT was expected to integrate the outcome of community participation with expert-led frameworks to make it more locally sensitive. The balance between top-down and bottom-up input would therefore provide a more feasible and holistic approach to NSA. The attempt to link community participation to an existing sustainability assessment framework provides a more practical solution that could balance the need for a comprehensive (environmental, social, economic) NSA method that is also feasible (time and resource-wise), one that provides regional comparability while being able to respond to local variances.

3.4.1. Community-led POE as a Tool for Finetuning Expert-led NSATs: Why Include it? And How to Include it? The Theoretical Framework for This Case Study Research

The previous section presented instrumental and methodological limitations for isolating top-down from bottom-up approaches to NSA. It showed how certain dimensions of sustainability are more suitable for being considered in top-down practices (objective quantitative measures, particularly ones attaining to environmental indicators) and how others lend themselves to bottom-up approaches (subjective qualitative measures, particularly ones relevant to the social dimension of sustainability). This isolation makes it difficult to integrate the top-down recommendations into bottom-up ones and frequently results in prioritising fixed expert-led NSA frameworks. The standardisation of expert-led frameworks makes them appear

more equitable; however, in practice, it could make them insensitive to the local variations between different contexts.

The neglect of the cultural and social interpretation of the quantitative frameworks results in three significant problems: 1) it could cause immediate social problems as a result of the implemented measures (Dempsey et al., 2011) (e.g., compact developments can increase stress due to crowding, forcing diverse communities can cause social conflict due to lack of homogeneity). 2) People could find ways around the suggested frameworks to reside in their preferred ways of living (Vallance et al., 2011); this option is more accessible to people with better socio-economic conditions, which could result in serious equity concerns. Finally, 3) people could find ways around the imposed measures, which could hinder their success in achieving their aims, especially in relation to environmental benefits which are relatively consistent across contexts (Lange & Dewitte, 2019) (e.g., people could travel further by car to go to their preferred communities, resulting in increased CO_2 emissions). Those problems show that it is essential to devise a hybrid approach to NSA that could communicate the outcomes of bottom-up and top-down NSA and suggest ways to resolve the inevitable conflict between them.

The benefits of involving the local community in designing, implementing, and reviewing NSATs go beyond responding to the community's social needs or understanding its local problems. It could also improve the efficiency of the suggested expert-led frameworks in achieving their stated environmental goals. The key to this approach is understanding that the resultant hybrid outcome is dynamic and will change depending on the context. Therefore, one of the biggest challenges in hybrid sustainability assessment is understanding the limitations of its validity. In other words, what variables make the findings relevant to a specific context valid in another? This means hybrid NSA research needs to be process-driven, not outcome-driven. Researchers in this field should pay great attention to verify the data collection methods, which can provide valuable lessons for replicating the approach in other contexts, as opposed to valuing the collected data, which is contextually limited.

Specifically, my research suggests implementing a case study approach to understand how community participation can influence the understanding and materialisation of expert-led frameworks in a specific context. This includes identifying and finetuning the relevant themes, indicators, and measures of an initially selected top-down NSA framework and understanding the variables that influence the validity of the generated findings. Research in NSA is frequently criticised for lacking theoretical clarity and agreement over the definition of its concepts (Missimer et al., 2017a). I expect this lack of clarity to be attributed to the dynamic nature of sustainability concepts at the local scale. This means that I expect the most significant outcome of my research

to be in setting acceptable thresholds by the community for the qualitative indicators defined by experts and in devising suitable measures for the concepts in question. This would explain why reviews of NSA literature show a general agreement over the main concepts of sustainability at the neighbourhood scale (as in the review conducted by Woodcraft (2012) and Boström (2012)) and why those reviews still find it difficult to operationalise those concepts in applied research.

To clarify that, let us take the concept of privacy, which is universally relevant to residential environments. Privacy in one's home is a psychological need that is relevant to all people in different cultures (Ibem et al., 2015). But privacy does not mean the same thing everywhere. It can take the shape of a front yard in a house in the suburbs of the USA or a 3 m high boundary wall in a house in Saudi Arabia. This means that researchers cannot operationalise neighbourhood sustainability assessment frameworks at a local scale unless they acknowledge the subjective nature of its concepts and the trade-offs between its conflicting ones. The inevitable trade-offs necessitate an ethical yet practical approach to sustainability at the local scale. One that uses equity as its moral foundation, whether social or environmental, intra-generational or inter-generational. Balancing those trade-offs required careful integration of top-down and bottom-up approaches to NSA, or what is increasingly known as hybrid sustainability assessment at the local scale. This approach requires acknowledging the challenges of ethics, feasibility and impact that face most topics in applied ethnographic research.

3.4.2. Criteria for Designing this Case Study Research

Pinpointing the exact variables that influence the findings of qualitative urban research is extremely difficult for many reasons. To start, it is hard to isolate one factor from the other to understand the real cause of a reported behaviour or feeling (Bramley, 2009). It is also unrealistic to assume linear causal relationships in nested social settings (McCool & Stankey, 2004). And finally, this type of research is ethically challenging, as a deep examination of social contexts can disturb the life of the studied population. This is more critical when the research population involves a vulnerable group, such as beneficiaries of affordable housing projects, as in this research. The difficulty of identifying variables that influence contextual research findings puts it at risk of being hard to verify and being regarded as not very useful in producing generalisable findings.

Despite those difficulties, sustainability assessment research at the neighbourhood scale needs to understand better the variables influencing its validity and replicability. This makes it essential to have a well-elaborated research methodology and a systematic approach to data

analysis before initiating the research. To overcome the aforementioned concerns of ethics[2], impact, and feasibility while achieving the research's aim of 'devising a methodological tool to finetune generic expert-Led Neighbourhood Sustainability Assessment Tools (NSATs) to suit specific contexts', I developed the following criteria to govern the design of my case study research:

a) To acknowledge the three pillars of sustainability (environmental, social, economic).

To achieve this criterion, I narrowed the scope of expert-led NSATs that can be considered for integration with community opinion. I define expert-led NSATs relevant to this research as tools designed to acknowledge the three pillars of sustainability (environmental, social, and economic).

b) To be reflective of real-world situations:

This means that the study design should acknowledge the way in which real-world dynamics can alter people's beliefs and/or attitudes. To respond to this criterion, my initial plan was to combine individual interviews, complimented with a hybrid focus group. The purpose of adding the focus group as a secondary data collection method was to resemble a community's collective and collaborative setting, with its peer pressure and power dynamics. This was intended to help in comparing and contrasting the findings of the individual interviews. Unfortunately, around halfway through my PhD research, the world witnessed the outbreak of COVID-19, which significantly affected the regulations around social contact, rendering focus groups unfeasible except through virtual meetings.

For the context of affordable housing in Bahrain, virtual focus groups were difficult to carry out, especially for older demographics and people with lower incomes who were unfamiliar with the necessary technology to conduct virtual focus groups. In addition, the emergency measures and lockdowns also created a very unexpected daily schedule, especially for working mothers with children at school who had to be home-schooled remotely. The clashing time schedules, the unfamiliarity with the technology, and the lack of trust around community-engagement activities, which are very unconventional in Bahrain, made arranging a focus group with diverse participants unfeasible. This made

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[2] Refer to appendix e - Ethics Application, for a detailed listing of potential ethical concerns around conducting this case study research, and suggested ways to overcome them.

me overlook focus groups and rely solely on individual interviews, which were the primary data collection method from the start.

As discussed earlier, this limitation was relatively managed by having interview questions that overlap around various themes. This way, potential inconsistencies between people's beliefs and attitudes were likely to be captured through addressing similar topics from more than one perspective, particularly because the confidential setting of individual interviews is far more empowering and transparent than the collaborative one of a focus group since more confident and assertive participants can easily dominate the latter.

c) To be ethically obtained, as in:

- Accessible to all community members, particularly groups that are hard to reach (e.g., minorities, immigrants, females, etc.). To achieve this, I planned a variety of techniques to engage with the participants (face-to-face, phone calls, and virtual interviews using social media applications and meeting applications).

- Do not put the participants at any harm because of their participation (e.g., being discriminated against, fearing losing any type of public or private aid, etc.). To achieve this, I designed confidential individual interviews to be the primary data collection method.

d) To be triangulated for validity:

Triangulation refers to the technique of collecting similar data using more than one data collection method. This approach is frequently encouraged in qualitative research around complex social topics which are likely to involve subjective opinions. The purpose of this approach is to understand better and interpret the collected data and verify its validity by collecting it using numerous sources, which is likely to increase the scientific validity of the subjective findings (Fielding, 2012).

While triangulating data makes sense, it could imply that any difference between the sets of collected data means that one of them is wrong. However, this conclusion contradicts the essence of subjective opinion, which is expected to vary under complex, and often ununderstood conditions. The triangulation in my research is therefore intended to aid in two issues which are relatively important for process-driven research: 1) To examine the impact of the data collection method on the given responses, and 2) to provide a better

understanding of the correlation and causation between the variables that influence the generated data; therefore, increasing the validity and reliability of this qualitative research.

Triangulation was also intended in my research design to offset the limitations of individual interviews that could lower the reflection of the social dynamics of a community. In subjective matters, people could unintentionally alter their opinion based on their thinking process. There is a reported difference between how people think they would act and how they act and between their presumed beliefs and the beliefs they act upon (Diener et al., 2012). This difference is known as cognitive bias (Thomas et al., 2011). While unintentional, cognitive bias can affect the credibility of qualitative participatory data, which would justify the need for more than one data collection method in qualitative research. Still, I regarded the POE interviews as the primary source for data collection because of the following factors:

- Interviews enable an in-depth understanding of the phenomenon in question and allow steering the discussion towards issues that matter to the respondent. This makes interviews more capable than other tools of capturing the correlations between residents' background information and their reported evaluations, which could increase the reliability of the findings.

- Individual interviews eliminate peer pressure on the participants and provide a confidential setting. This makes the interviews more capable of eliciting honest, transparent responses.

- Interviews generate large and deep sets of data, which can be used to better understand the collected data (De La Barrera et al., 2016).

As mentioned in criterion b, I intended to use two data collection methods in my initial research design: individual POE interviews with the neighbourhood's residents and a collaborative focus group. However, the use of focus groups (along with alternative tools of observations and site surveys) became unfeasible because of the outbreak of COVID-19 and the restrictions it imposed on social interactions and the use of public spaces. While the use of a secondary data collection methods could have provided an additional layer of meaning to the data analysis, the enrichment and verification of the participant's opinion were imbedded in the interview design, where questions were designed to address relevant concepts from more than one perspective through the use of numerous interrelated themes.

e) To be capable of generating credible community-led data:

As discussed in the literature review, this research adopts an instrumental approach of community participation in Sustainability Assessment (Abelson & Gauvin, 2006). This theoretical position encourages community participation in NSA to promote pro-sustainable behaviour and to improve the effectiveness of any implemented sustainability vision in achieving its set aims. Those benefits are seen in parallel to the more commonly known benefits of participation which include democratising decision-making (Gupta, Pouw and Ros-tonen, 2015; Eckerberg and Mineur, 2010); empowering the community (Heritage & Dooris, 2009); and promoting learning and communication amongst involved stakeholders (Reed, 2008). I define meaningful community participation as 'participation that generates credible data which can eventually influence the decision-making process. I also define credible community-led data as 'data that best resembles participants' actual believes and behavioural patterns.'. Based on these definitions, the collected data in my research needed to be:

– Capable of influencing the decision-making process. To achieve this, participatory practices need to be feasible (can be carried out in a timely and cost-efficient manner) (Kajikawa et al., 2011); and systematic, which means it should clearly identify how it will be integrated with experts' opinions (Dawodu et al., 2019).

– Representative of participants' real-life beliefs and behavioural patterns. This representativeness could provide a deeper understanding of the relationship between the components of the urban environment and residents' behaviours and feelings, which could provide empirical evidence on how to design or rehabilitate residential neighbourhoods.

To achieve credibility, I used POE interviews with open-ended questions as my primary data collection method. On the one hand, open-ended interviews can be arranged around specific themes, which makes them relevant to the available literature. On the other hand, the open-ended nature allows the participants to give any response they feel is relevant. This freedom could reveal new concepts that were not considered in the initial interview design. Individual interviews also provide a safe environment for participants to provide detailed narratives about their experiences in their neighbourhood. In addition to the comfort of the interview setting, POE as a practice reflects how participants actually act and feel in their residential neighbourhoods, which makes POE inherently more credible than other qualitative data collection methods in documenting the impact of the

built environment on its residents. This eventually increases the credibility of my designed methodological tool.

f) To be time-efficient: This means that the localised framework should remain relevant by the time needed to design, verify, and implement it.

The first design strategy I implemented for addressing time efficiency in developing the hybrid methodological framework was to couple bottom-up data to an initial international top-down NSAT. This eliminated the need to derive environmental indicators or verify the local framework against global sustainability visions. The second strategy was to minimise the data collection and data verification stages by resorting to a POE data collection method. Conventionally, hybrid NSA starts with involving the community in workshops or focus groups to identify local sustainability indicators. Those indicators should then be empirically tested in the intended context to verify their validity (Reed et al., 2006). The need for verifying the produced indicators is understandable, as workshops and focus groups are hypothetical practices where participants are asked about their likely responses. In my suggested design, I replace hypothetical discussions with a POE practice. The nature of POE makes it grounded in opinions that the participants have already established in their living environments. This makes POE a source of empirical evidence of the effect of the urban environment on its residents, which eliminates the need to verify the outcome of this stage in a realistic context. This would significantly save time in the data verification stage, which makes my suggested model more time-efficient, while scientifically robust.

g) To be applicable: this means designing research which acknowledges the time and resource limitations of affordable housing projects (typically urgent and with low funding (Severson & Vos, 2018)). This criterion can be read in conjunction with criterion 6, which can aid in saving time and lowering the research cost.

In the following chapter, I discuss how I used those seven criteria to develop a detailed design for the case study research.

3.5. Conclusion

In conclusion, the review of hybrid models for approaching sustainability at a local level emphasises the importance of balancing flexibility and structure when designing POE research that concerns neighbourhood sustainability. This equilibrium is vital for a tool like POE to foster the accumulation of knowledge while simultaneously welcoming novel insights. The review demonstrates how adhering solely to either an expert-led or community-led approach in

Neighbourhood Sustainability Assessment cannot effectively approach sustainability at the neighbourhood scale, as each approach has its distinct advantages; while one is methodically feasible, the other offers adaptability and rich, context-specific information. Hence, a hybrid model, which integrates both perspectives, emerges as a more effective strategy, allowing for a comprehensive understanding of the neighbourhood context.

Moreover, it is essential to clearly identify the purpose of community involvement in specific research to carefully design a meaningful way to facilitate it. For neighbourhood sustainability, it is imperative to use community input to intertwine physical attributes with social dynamics, recognizing that the success of physical improvements is often underpinned by robust social structures. Lastly, the ethical considerations in conducting hybrid NSA research are paramount. The research methodology should be designed in a way that ensures meaningful participation without adversely impacting the users. This entails a careful and empathetic approach to data collection and analysis, ensuring that the voices of all community members are heard and respected. The insights gained from this chapter pave the way for more nuanced, ethical, and effective approaches to neighbourhood sustainability, particularly in the contexts of affordable housing neighbourhoods where research resources are limited and where research resources are limited, and residents are often vulnerable to socio-economic challenges. This discussion sets the stage for the next chapter, in which I discuss the case study research design and methodology.

Chapter 4: Case Study Research Design and Methodology

As discussed earlier, my research contributes to the discussion around promoting hybrid approaches to Neighbourhood Sustainability Assessment (NSA). The aim of this research is to examine the value of community participation in complementing international, expert-led Neighbourhood Sustainability Assessment Tools (NSATs) to help adapt them to the context of new affordable housing neighbourhoods. I attempted to address this aim by answering the question: how can professionals use community-led evaluation to adapt generic NSA frameworks to the needs of specific cultural contexts? Given the complexity of Neighbourhood Sustainability Assessment frameworks, I narrowed the scope of the study to two areas: Identifying the indicators and measures relevant to hybrid sustainability assessment and understanding how community-led POE interviews can aid in complementing expert-led NSATs.

To achieve those outcomes, I developed the following research objectives: 1) to identify the dimensions of neighbourhood sustainability assessment that are relevant to hybrid assessment approaches; 2) To develop a participatory post-occupancy evaluation (POE) framework specific to the context of affordable housing neighbourhoods; and 3) to examine the value of POE in adapting international NSATs to local contexts. I addressed objectives 1 and 2 throughout the literature review chapters, in which I developed a community-centred POE framework for the context of affordable housing neighbourhoods. Objective 3 constituted the main contribution of my research, in which I attempted to put my developed POE framework into use and examine its value in complementing a specific expert-led NSAT to meet the needs of a specific context.

My research employed qualitative, semi-structured community-led interviews to conduct a Post-Occupancy Evaluation (POE) of the Alsayah Affordable Housing Neighborhood in the Muharraq Governorate of Bahrain. These interviews were open-ended, allowing for depth and flexibility in responses. I conducted the interviews over the phone and recorded them with the participants' consent, which was obtained electronically via WhatsApp. These interviews adhered to ethical standards ensuring voluntary participation and no harm to the participants. I maintained that by keeping the interviews confidential and anonymous, and by approaching participants only through social networks to avoid the implication of coercion. The detailed ethical considerations, including the aspects of confidentiality and anonymity in the consent process, are further elaborated in later in this chapter, with reference to and in appendices b and e of this thesis.

To ensure a representative sample, my sampling strategy involved stratification based on several demographic attributes of the Muharraq Governorate's residents, derived from national data sets. These attributes included equal representation of male and female participants, a diverse age range reflective of Bahrain's population pyramid, and varying family sizes, with a focus on households comprising around six members. This stratification was followed by network sampling, initially contacting individuals within my personal and professional networks, and then expanding to snowball sampling, where interviewees facilitated connections to additional participants, always adhering to the pre-defined demographic stratification.

In the following chapter, I detail my case study research design and methodology throughout three sections. In the first section, I present an overview of the rationale used for adopting my research approach, which is qualitative and case-study-based. Section two explains the details of the case study design, which comprises four stages: 1) selecting a case study site; 2); selecting a relevant expert-led NSAT; 3) conducting POE interviews; and 4) data analysis. Each stage is first discussed theoretically to provide a road map for replicating the research in any intended context. Then, the stage is discussed in relation to my conducted case study. I conducted a case study at Alsayah affordable housing neighbourhood in Muharraq governate, Bahrain. In this case study, I attempted to examine the value of POE interviews in complementing the LEED-ND framework for the context of affordable housing neighbourhoods in Muharraq, Bahrain. The chapter ends with a conclusion that recaptures the research methodology and discusses its limitations.

4.1. An Overview of the Devised Methodological Approach for Examining the Value of Community-Led POE in Localising International Expert-Led NSATs

POE is a tool used to evaluate the efficiency of a building/development in achieving its stated program aims (Turpin-Brooks & Viccars, 2006). Typically, one starts the POE activity by identifying a development that has set certain aims to achieve (those can be objective/quantitative aims, such as lowering CO^2 emissions using specific design solutions or subjective/qualitative aims, such as creating stronger social bonds). The development needs to be occupied for a while to facilitate developing users' behavioural patterns and psychological, social, and environmental impacts because of occupying this development. Finally, you evaluate the success of the development in achieving its stated goals using a suitable evaluation tool for the examined aim (which can be quantitative, qualitative, or a combination of both). Therefore, POE is conventionally designed to evaluate the success of development in achieving its initially stated design aims.

In my proposed hybrid model, I'm reversing the conventional use of POE. Instead of using it to evaluate how successful a neighbourhood was in achieving its aims, I intend to use it to generate community-based data about the impact of living in a specific urban neighbourhood on its residents' attitudes, feelings, beliefs, and behavioural patterns, which eventually affect the sustainability of the assessed neighbourhood. This way, the derived data about the relationship between how residents and their living environments interact and affect each other will be context-specific and empirically evident for the context in question. Therefore, replicating similar living conditions for a comparable socio-demographic group would theoretically create the same dynamics between residents and their environments. My proposed theoretical logic, therefore, is that researchers can use this data to cause a deliberate change in environmental and social conditions in similar contexts to make them more sustainable, using context-specific data on how people and their living environments interact as a collective dynamic system. As discussed in section 3.4., my research model does not require selecting a case study neighbourhood built using the guidelines of a specific NSAT to suggest how to finetune it.

The theoretical proposition I developed leaves researchers with two unknown variables instrumental to the success of my proposed methodology. The first is the exact causes for the impacts documented using community-led POE, and the second is which socio-demographic variables make such correlations between people and their environments remain valid. I intend to find this information using a case study approach and use it to suggest modifications to an initial generic expert-led NSAT to make it more adaptive and sensitive to the dynamics of a specific context. Considering the time limitations of PhD research, such findings could be attainable for one context using a case study for the context in question. However, I acknowledge that the findings of POE are contextually limited, meaning that the specific outcomes are likely to differ from one place to another. To be effective, I need to identify the limitations of my research in order to be able to use it for creating new neighbourhoods.

To identify the variables that affect the generalizability of my suggested methodology of using community-led POE to finetune an expert-led NSAT, this approach needs to be replicated at various contexts to compare the outcomes of the case studies findings. Such a broad aim is unfeasible under the time limitations of a PhD research; therefore, I developed my research design in the form of a robust methodological framework that can be replicated in other contexts. In this methodological framework, I defined a set of criteria for how to effectively select a suitable case study context, how to select a relevant NSAT to localize, what possible tools can be used for conducting POE interviews, and how to analyse the collected data.

This hybrid model was designed to mitigate the problems that arise from separating top-down from bottom-up practices in NSA. In particular, it was designed to maintain the advantages that make top-down tools more convenient to use in practice, which are: catering for environmental aspects of sustainability; relying on quantifiable measures; enabling comparability between different developments and therefore facilitating equity in different contexts; and optimising resources use, which would otherwise be needed to create a custom framework for each local area. The model was also designed to mitigate the disadvantages of weak levels of community involvement and weak local adaptability, which are widely attributed to from lacking of proper linkage between the outcome of bottom-up and top-down sustainability assessment methods.

Given the subjective, contextual, and cultural scope of my research, and to account for ethical and feasibility concerns of bottom-up NSA, I developed seven criteria for designing the methodology of this case study research (discussed in chapter 3.4.2). My proposed framework (discussed throughout Chapter 3) suggested conducting POE interviews with neighbourhood residents to generate a community-led assessment of affordable housing neighbourhoods. The POE was expected to provide experts with credible contextual findings about the needs of the local community and how they are impacted by specific features or qualities in the context in question. Those were then to be used to localise expert-led NSATs to suit communities with similar cultural contexts. I defined credible contextual participatory data as data that best resembles participants' actual beliefs as well as their behavioural patterns in their neighbourhood. I also defined localising an expert-led NSAT as the process of finetuning a generic framework to respond to the needs and constraints of a local context while maintaining an acceptable level of sustainability in broader contexts. I adopted this definition from Yigitcanlar, Kamruzzaman and Teriman's research (2015) on neighbourhood sustainability assessment in developing countries context. Their research defined Neighbourhood sustainability as '...the process of developing a neighbourhood level urban form or built environment that meets the needs of its residents whilst avoiding unacceptable social and environmental impacts both locally and in a broader context.' (Yigitcanlar et al., 2015, p. 2571).

In section 3.3.4, I developed a novel post-occupancy evaluation (POE) framework for interviewing the residents of affordable housing neighbourhoods. The framework evaluates 11 themes concerning urban neighbourhoods' physical and non-physical dimensions. Those were: Aesthetics; Connection to nature; Community facilities; Recreation; Social contact; Identity, belonging and pride; Support and influence; Walkability and accessibility; Housing suitability; Adaptability; and psychological wellbeing. To ensure that the framework is relevant to residents' evaluation, I only included themes that do not require technical knowledge for their assessment.

I derived the themes from five bodies of literature: neighbourhood sustainability assessment; social sustainability; community participation in the urban context; residential satisfaction; and affordable housing neighbourhoods.

Using my developed POE framework, I devised a methodological framework for conducting case study research to use POE for localising initial expert-led NSATs. The following section breaks down the stages I devised for conducting such case study research, which was designed considering the seven research criteria I developed for conducting ethical, feasible, and credible participatory research for localising expert-led NSATs (discussed in section 3.4.2). The sequence of the stages of my proposed theoretical approach, along with key took decisions, and rationales behind making them, are depicted in Figure 4.1.

Reviewed literature:
- Neighbourhood Sustainability Assessment
- Social sustainability
- Community participation in the urban context
- Residential satisfaction
- Affordable housing neighbourhoods

Identified themes:
1. Aesthetics
2. Connection to nature
3. Community facilities
4. Recreation
5. Social contact
6. Identity, Belonging and Pride
7. Support and Influence
8. Walkability and Accessibility
9. Housing suitability
10. Adaptability
11. Psychological wellbeing

Design criteria:
1. To acknowledge the three pillars of sustainability.
2. To be reflective of real-world dynamics.
3. To be ethically obtained
4. To be triangulated for validity
5. To be capable of generating credible community-led data
6. To be time-efficient.
7. To be applicable.

Selection criteria:
1. Relevance to the selected context by being either:
a. Designed for the investigated context.
b. Implemented at the investigated context.
c. Familiar to the professionals working in the investigated context.
d. Examined by the literature to be of significance to the investigated context.
2. Explicitly stating the intended impacts of its indicators.

Literature Review

Define 11 resident-centred neighbourhood sustainability assessment themes

Design a POE framework for new Affordable Housing Neighbourhoods

Case Study Research Methodology

Stage 1 Select Case study Neighbourhood

Stage 2
- Select a relevant expert-led NSAT for the intended context
- Identify which of its indicators are suitable to be reviewed using participatory practices

Stage 3 Conduct POE interviews

Data Saturation not reached

Stage 4 Data analysis

Data Saturation Reached

Result

Design Criteria:
- Can be easily linked to existing NSA literature.
- Relatable to existing POE tools and benchmark datasets.
- To be fast, cost effective, and with minimal labour requirements
- To allow explorative examination of the enighbourhood's effects on its residents
- To yield an accessible study sample

Selection criteria:
1. Comply with the research scope (affordable housing neighbourhoods)
2. Can generate meaningful qualitative POE data
3. Has high likeyhood of effectiveness data processing

Selection Outcome:
Alsayah affordable housing neighbourhood in Muharraq governate, Bahrain

Steps:
- Define Research Population
- Obtain population attributes to set sample stratification: Gender│Age│Educational level│Family size│Ethnic background│Income│Occupation
- Set sampling strategy

Application in Case study:
Population: Adult Residents of Alsaya Affordable housing neighbourhood, Bahrain - Aged 21 and above
Sample stratification: equal ratio of male to female, reducing age profile for the participants
Sampling strategy: Network sampling and snowball sampling

Method for data analysis:
Content analysis and thematic coding

Analytical frameworks for thematic coding:
1. Open end coding
2. Coding based on the POE framework:
   a. Evaluation
   b. Cause of evaluation
3. Coding based on the community-relevant impacts of the selected expert-led NSAT

Corelate the outcomes of the analytical frameworks

Primary Outcome
Refined methodological framework for using community-led POE to localise expert-led NSATs

Secondery outcome
A localised NSA framework for the context of affordable housing neighbourhood in Muharraq, Bahrain

miro

Figure 4.1. A breakdown of the Methodological framework for localising expert-led NSATs using community-led POE

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4.2. Methodological Framework for Designing the Case Study Research

My methodological framework comprises four consecutive stages, which, in total, aim to examine the value of involving the local community members in informing expert-led NSATs to meet the needs of their local environment. Those are:

1) Site selection for the case study.

2) Selecting a relevant expert-led NSAT for the context in question and identifying which of its indicators are suitable to be reviewed using participatory practices. The selected tool is to provide the initial sustainability assessment framework to integrate the outcome of the participatory POE interviews.

3) Conducting individual POE interviews with the neighbourhood's residents to assess the sustainability of the selected affordable housing neighbourhoods

4) Data analysis

In the following sections, I detail the design of each stage, the rationale behind it, and the decisions taken within it. Then, for each stage, I display how I implemented the suggested guidelines in the empirical study conducted at Alsayah affordable housing neighbourhood in Muharraq governate, Bahrain.

4.2.1. Stage 1 - Site Selection for the Case Study:

Stage 1 - Design:

To attempt to localize an initial expert-led NSAT to suit a specific context, one first needs to identify this context. Therefore, the first step in my proposed methodological approach for examining the value of POE in localizing expert-led NSATs is to select a neighbourhood to carry out the case study research. Based on my discussion through the literature review, the selected case study neighbourhood needed to:

1) Comply with the scope of my research: which is affordable housing neighbourhoods.

2) Aid in generating meaningful qualitative POE residents' narratives of their Neighbourhood.

3) Improve the likely effectiveness of processing the collected qualitative data.

Collecting qualitative data can be challenging, especially using interviews (Lucas, 2016), which I intended to use as a data collection method for the POE (justification for this decision can be found in section 3.3.2). One of the reasons for the difficulty of collecting interview responses is that interviews require the respondents to spend a long time to provide detailed accounts of their opinions, which could discourage them from participating. To make participating in such research more appealing, commitment from the participants can be elicited in different ways. One way is to provide incentives to participate in the research, which generally take the form of financial compensation. Despite its impact on increasing participation rates (Stein, 2013), incentives pose the risk of having a conflict of interest between the participants and the researcher. This could happen when incentives encourage participants to provide answers they believe the researchers are looking for. It also questions the ethical approach of the research, particularly when the scope of the research involves a vulnerable population, such as beneficiaries of affordable housing schemes in the case of my research.

With such a population, researchers must ensure that the participants do not feel pressured to take part in the research. To this end, I opted for another strategy to encourage participants to participate. To access the required population ethically and efficiently (in a time-efficient and transparent manner), I devised the following site selection criteria: to select a case study neighbourhood where the researcher has access to an existing social network. This criterion is important for research with critical time constraints, which is typically the case in research and interventions needed for the context of affordable housing neighbourhoods (in addition to the time constraints of PhD research). Otherwise, it is possible to add a stage in my methodological framework where the researcher familiarises (her)himself with the studied population and gradually builds connections with the local community. To conclude this point, qualitative research needs to provide appropriate incentives for participating without raising ethical concerns of causing a conflict of interest or pressuring people into participating. One way to do this is to try to have a connection to the existing social network in the neighbourhood, which would make the participants more willing to take part in the intended research. This justifies selecting a case study where there is a level of relevance between the researcher and the studied population to encourage their involvement.

In addition to the difficulty of collecting qualitative data, this type of data is also hard to analyse. This can be attributed to two factors: 1) the subjective nature of the collected data, which could make them misinterpreted by a researcher who is not familiar with the local culture (Flick, 2016), and 2) the difficulty of remaining objective and not be affected by researcher's biases and own believes (Roulston, 2016). Qualitative research requires a fine line between how distant the researcher needs to be from his studied population. On one hand, (s)he needs to be familiar with

the participants' culture (e.g., norms, values, language, etc.) to be able to interpret their responses with regard to its specific context (Lucas, 2016) but without being too immersed in the culture to the level that prohibits them from encouraging participants to touch upon unconventional threads. This familiarity is also important to establish a level of trust between the researcher and the participants (Richards, C., Blackstock, K.L. e Carter, 2004). Such trust allows the participants to respond without worrying about being judged by the researcher or worrying about being negatively affected in any capacity because of their participation. Therefore, a certain level of familiarity between the researcher and the studied context can provides ethical and instrumental benefits to the carried research.

In addition to concerns about participation rates, ethical and equitable access to the research sample, and researcher's bias and subjectivity, qualitative research of ethnographic nature (one that relates to understanding behaviours that occur within a specific cultural context (Fife, 2005)) can be extremely time intensive. This type of research requires the researcher to build trust and rapport with the study population to make them open up and provide honest responses. The time consumption of this approach could make it impractical to solve urgent problems (such as the ones that exist in affordable housing contexts). This is because research that requires a very long time to collect its data could yield results that are no longer valid at the time of completing the research. The time consumption of qualitative ethnographic research can deter policymakers and researchers from pursuing such an approach, which could explain the scarcity of ethnographic or case study research in NSA even though there is an overwhelming theoretical merit for the ability of qualitative research to provide valuable data to NSA research (Fraser et al., 2006; Hay et al., 2016; Kohon, 2018; RIBA, 2016). Without time constraints, ethnographic researchers could devote as much time as needed to identify with their examined population to be able to reach out to them effectively, as well as to understand their ways of living. But with the urgency of sustainability issues in affordable housing neighbourhoods, NSA researchers need to accelerate the stage of identifying with each context, which is why having an existing relationship with existing social networks in the examined context can prove to be helpful.

To summarise, the selected case study of an affordable housing neighbourhood needs to facilitate the collection and analysis of the needed qualitative data in an ethical, accessible and time-efficient manner. Therefore, it is beneficial for researchers to select a case study to which they have direct access and where the participants will not view them as outsiders. For these reasons and given the time and resource limitations of PhD, I decided to select a case study in the GCC as I identify as Bahraini, Arab, and Muslim. Similar case study selection criteria should be considered for replicating this research, which are: compliance with the research scope and familiarity and accessibility of the researcher(s) to the examined population.

Stage 1 – Application in the Case Study:

After defining 'Researcher's identification with the examined population' as a site selection criterion, I reviewed the websites of the seven identified expert-led NSATs that fall within the scope of my research. I adjusted the search parameters to look for 'Neighbourhoods' or 'Communities' that were built in the 'Middle East'[3]. Initially, I screened the obtained results for 'affordable housing neighbourhoods' and got '0' results. From there, I narrowed the search to neighbourhoods built in any country in the Gulf Cooperation Council (GCC)[4]. I did this because of the cultural identity of the citizens of these countries (Fuccaro, 2000). As I am a Bahraini citizen, selecting a neighbourhood built in the GCC meant that I could interpret the cultural significance of the collected qualitative data with more depth. It would also simplify the process of data collection, particularly since those countries facilitate information exchange between them. Only three neighbourhoods within the GCC were built using either of the considered expert-led NSATs; those were: 1) KAPSARK in KSA which is a LEED-ND certified exclusive research community (LEED, 2020); 2) Msheireb downtown regeneration project in Qatar, LEED-ND certified (LEED, 2020); and 3) Alzahia Neighbourhood in UAE, a middle- to high-income gated community certified by BREEAM communities (BREEAM, 2020).

These neighbourhoods have a narrow resident profile with a dominance of higher-income residents. This makes them less inclusive and, therefore, not relevant as a case study for affordable housing neighbourhoods based on my research scope. Earlier in this section, I established that while it is beneficial to select a case study built on a specific expert-led framework, this criterion was not essential for the relevance of my theoretical model. To select a relevant case study based on my site selection criteria, I aimed to select one in Bahrain which struggles with residents' satisfaction with affordable housing neighbourhoods. In Bahrain, Muharraq governate had the country's largest number of new affordable housing neighbourhoods and the largest ratio of urban growth (Information & eGovernment Authority, 2010). In the background information section, I presented population and housing characteristics for the governates of Bahrain. Based on data availability in Bahrain's census, I examined the following characteristics: gender representation, ethnic diversity, housing type, and household profile (number of residents per housing unit). There, Muharraq presented the highest ratio of ethnic diversity and house type diversity across the governates of Bahrain, while gender and household profile did not differ significantly across governates. The diverse house type and

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[3] I choose the Middle East because it identifies with my ethnic profile., which would facilitate generating and interpreting POE data.
[4] Those include the following 6 Arab countries: Kingdom of Saudi Arabia, Kingdom of Bahrain, United Arab Emirates, Sultanate of Oman, State of Qatar, and State of Kuwait.

residents' ethnic profile of Muharraq made it more relevant for learning lessons about the effect of the current housing practices on the sustainability of their neighbourhoods.

Muharraq governate has several new affordable housing neighbourhoods, so I developed further criteria to select a specific case study neighbourhood. The newest affordable housing project in this governate is East Hidd City (figure 4.2). The whole city (including the infrastructure, facilities and housing units) was recently built to provide different affordable housing services (Ministry of Housing and Urban Planning, 2021a). Although the scope of my research is new affordable housing neighbourhoods, the housing units in this city were allocated to their beneficiaries around the time of conducting my PhD research. Therefore, the city's neighbourhoods were neither fully occupied nor did they provide enough time for the residents to form strong behavioural patterns or communal bonds. The impact of this factor was exacerbated because of the outbreak of Covid-19 pandemic and the restrictions it imposed on the urban lifestyle. Since my research adopts a POE approach, establishing firm perceptions and behavioural patterns was of high significance to the validity of my research; therefore, I excluded East Hidd City from my selection.

Figure 4.2. A recent photograph of East Hidd city. Source: ((Ministry of Housing and Urban Planning, 2021)

After excluding the affordable housing neighbourhoods in East Hidd City, I reviewed the next new affordable housing neighbourhoods, putting in mind that they needed to be occupied within a considerable time before Covid-19 outbreak. In Figure 4.3, I mapped the newest affordable housing neighbourhoods in Muharraq governate as stipulated by Bahrain's Ministry of Works, Municipalities Affairs and Urban Planning (2018). Both neighbourhoods are considered

one affordable housing project officially known as Alsayah Affordable Housing project. The two mapped parts have identical housing units and were allocated to their recipients a few years apart. The locals typically refer to them as the first Sayah, which was allocated to its residents around 2010, and the second Sayah, which was allocated to its residents around 2014. The two sides of Alsayah Affordable housing neighbourhood are separated by a road with moderate car access, and each side has its own community facilities. Due to the similarity of both sides and as they are officially one project, I used both sides as my case study neighbourhood for this case study research.
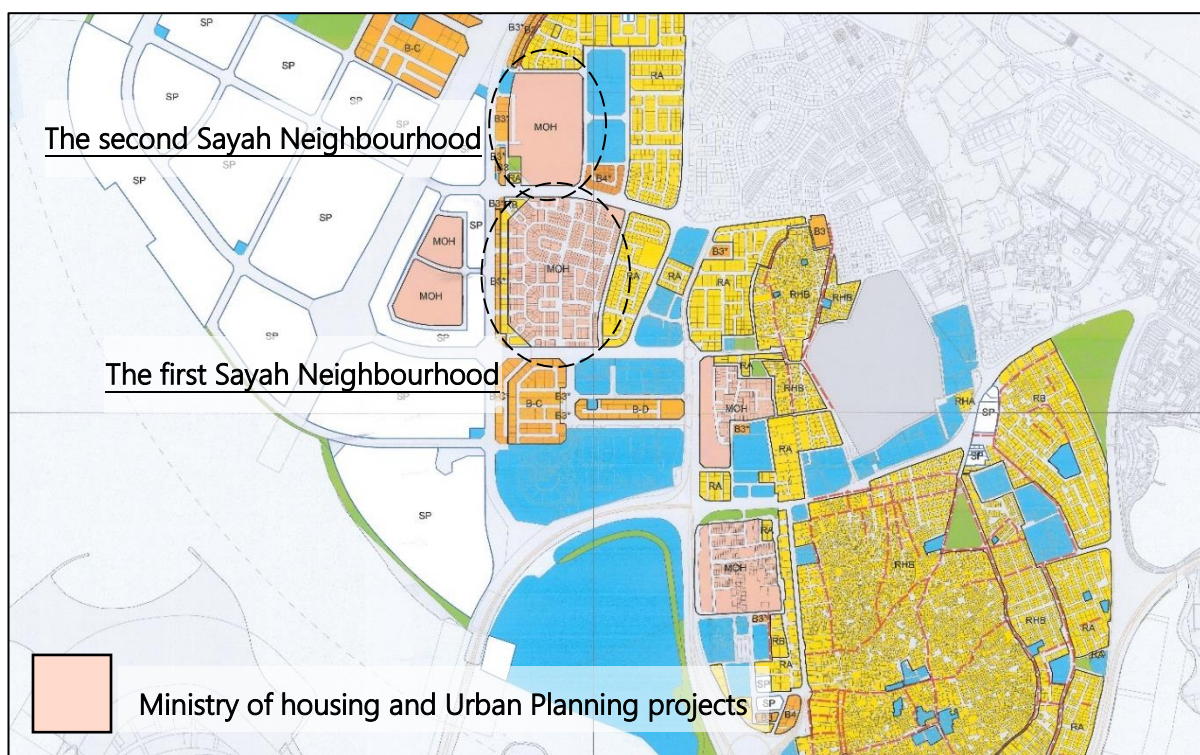
Figure 4.3. Approved classification maps for Muharraq. Neighbourhoods A and B show the newest affordable housing projects in Muharraq city. Source: (Ministry of Works Municipalities Affairs and Urban Planning, 2018), Modified

4.2.2. Stage 2 - Selecting a Relevant Expert-led NSAT for the Context in Question and Identifying Which of its Indicators are Suitable to be Reviewed Using Participatory Practices:

Stage 2 - Design:

As discussed throughout the literature review, to maintain the benefits of expert-led NSATs while facilitating community involvement and local adaptability, I suggested using a hybrid approach that uses community participation to finetune and localise an initial expert-led NSA

framework. After selecting a suitable case study site based on the site selection criteria displayed in the earlier section, the second stage of my proposed methodological framework is to select an expert-led tool that is relevant to the examined context. The purpose of defining an initial expert-led framework is to see if and how community-led POE can finetune it to respond to the needs and limitations of a local context, which would minimise the time and resource intensity of creating a customised framework for each individual context. Based on the theoretical limitations of my proposed model, which were discussed in section 3.4., my research is only relevant to top-down tools that use an indicator-based framework and has scoring in their evaluation system. This limits my options to the following tools according to Sharifi and Murayama's review (2013) of neighbourhood sustainability assessment literature: LEED-ND, EarthCraft Communities (ECC), BREEAM Communities, CASBEE-UD, HQE2R, Ecocity, and SCR. Either one of these tools can be used in my research; however, subtle differences between them can make some tools more relevant to certain contexts and, therefore, easier to integrate with data derived from POE. To narrow down my selection, I added the following tool selection criteria:

1) Relevance to the selected context: this criterion means that the selected expert-led tool used to initiate the research needs to be either:

    a. Designed for the investigated context.

    b. Implemented in the investigated context (either specifically in the selected development or within adjacent areas of similar demographic, climatic, and cultural conditions).

    c. Familiar with the professionals working in the investigated context.

    d. Examined by the literature to be of significance to the investigated context.

2) The intention for its indicators can be identified with clarity and not open to speculations.

    This criterion was set to create a clear reference for comparing participants' POE of their existing environments against the expected impacts of urban features as presumed by experts in existing NSATs. Having an initial expert-led tool that states its aims with clarity and consistency is necessary for linking its framework to data derived using POE. To explain this logic further, my proposed methodology suggests using POE to generate community-based data about the impact of the neighbourhood's urban features on its residents' attitudes and feelings. To be useful,

this data needs to be compared against the claims experts make about the impact of their proposed framework.

In this context, it is important to differentiate between what indicators are set to achieve (indicator's aim, intent, or impact) and the measures used to assess those indicators. Theoretically speaking, implementing the specified measures should be equivalent to achieving the indicators' aim. However, such a correlation cannot be made without empirical evidence to support this claim. I base my differentiation between a criterion's aim and its set measure on documented cases where research showed that similar measures caused advert effects on people across different geographical locations (Buys & Miller, 2012) as in the density example I elaborated in the literature review, where Dempsey et al. (2012) found that high dwelling density caused discomfort amongst residents in the UK but not in Egypt or India. Once again, this example shows how it is essential to understand the contextual meaning of quantitative measures set by experts in generic NSATs.

For example: In LEED_ND, the 'Access to civic and public space' indicator in 'Neighborhood Pattern & Design' dimension is set to enhance community participation and improve public health. This indicator is achieved when 90% of the dwelling units and non-residential use entrances are located within 400 meters of at least one civic and passive use space. The tool, therefore distinctly states what the criteria intends to achieve and claims to build this intention on practical and theoretical studies, and sets a specific measure, which, when met, should achieve its intended aim.

Using this logic, my theoretical preposition was to identify the measures set by the selected expert-led NSAT and the aims they are expected to achieve, and compare those to residents' reporting of how they actually felt and acted in their existing neighbourhoods. The convergence between the existing impacts reported in the POE and the intents expected by experts in the selected NSAT would then be used as a reference to give generic measures a contextual meaning in terms of relevance, effect, and significance. This is why it is necessary to use NSATs with clearly stated intents in order to facilitate conducting the data analysis.

Stage 2 – Application in the Case Study:

Since I selected a case study neighbourhood in Bahrain, I needed to select a relevant expert-led NSAT using the criteria I explained earlier. In Bahrain, LEED ND provides a reasonable

option because it is the primary implemented sustainability assessment tool in the country and the most implemented one in the Middle East (LEED, 2020). Although Bahrain does not have a LEED-ND-certified neighbourhood, this limitation is not significant to my work as I do not aim to evaluate the selected tool's efficiency, but rather, I aim to localise the selected tool using participatory data. As for which of LEED-ND indicators I expected to localise using my suggested hybrid tool, I considered 'environmental performance' indicators that require technical knowledge to be assessed as relevant to expert judgement only and therefore excluded them from the initial analytical framework of my hybrid case study research. One exception was 'environmental indicators' that are likely to affect the social sustainability in the examined neighbourhood (e.g., 'compact development' indicator (USGBC, 2018b), which is likely to affect social networking). The identification of relevant indicators at this stage was only preliminary, and I intended to revisit it at the end of the data analysis stage.

Reviewing LEED-ND project checklist and identifying which of its indicators are relevant for public examination:

LEED for Neighbourhood Development (LEED-ND) has five dimensions and a total of 59 indicators. Each dimension has a different number of indicators within it (USGBC, 2018b). Very few indicators are mandatory for project certification, while the majority are optional and have an allocated total score that is graded individually. The allocated scores for each indicator vary, and the cause of the assigned weight is not very transparent (Sharifi & Murayama, 2013). In its latest version, LEED-ND guidance document was arranged according to 5 themes. The document stated the intention for each indicator and then gave options for how to achieve it. Those options had specific quantitative measures used to score each indicator. The U.S. Green Building Council (USGBC) website (USGBC, 2018a) has a checklist for LEED-ND framework that lists the framework's dimensions, indicators, whether they are mandatory or not, and the allocated points to score each optional indicator. This full checklist is provided in appendix f, table 1.

To summarise, the five themes of LEED-ND framework are (USGBC, 2018b) :

1) Smart location and linkage: This theme include 14 indicators, 5 of which are mandatory. It includes a combination of technical and non-technical indicators that relate to the selected location of the neighbourhood development. An example of indicators that require technical knowledge would be 'Long-Term Conservation Management of Habitat or Wetlands and Water Bodies'. 'Housing and Job Proximity' represent an indicator that is more accessible to the public. The indicators in this theme needed to be screened to determine the ones that comply with my research scope.

2) Neighbourhood Pattern & Design: This theme includes 18 indicators, three are mandatory. It is concerned with the physical and non-physical components of the urban context. An example of non-physical indicators would be 'Community Outreach and Involvement'. While 'Tree-Lined and Shaded Streetscapes' is an example of indicators concerning the physical components of the development. All the indicators of this theme directly relate to the local residents of the neighbourhood; hence they were all kept in the initial analytical framework prepared for this research.

3) Green Infrastructure & Buildings: This theme includes 21 indicators, 4 of which are mandatory. This theme is technical and requires scientific knowledge; therefore, I excluded it from public evaluation. This theme is strictly technical and objective in nature. It involves assessing the development performance in various environmental indicators. Although those indicators could influence how residents feel and act their neighbourhoods; theme 3 uses strict technical measures requiring access to complex scientific data. Therefore, I excluded all its indicators from the initial analytical framework.

4) Innovation & Design Process: This theme includes two non-mandatory indicators that require the knowledge of LEED-certified professionals. Therefore, both were considered irrelevant to public evaluation.

5) Regional Priority Credits: This theme includes four non-mandatory indicators.

Themes 4 and 5 do not have specific measures on how to achieve them. They are evaluated on an individual basis for each submitted project, and assessed by a GBCI review panel. Therefore, I excluded them from the review of my study.

After reviewing the 59 indicators in the LEED-ND scorecard and creating a preliminary decision on which one of them is relevant to the public's evaluation, I reviewed the detailed description of the tool's indicators available in LEED ND version 4 addenda (the latest published version of LEED-ND). From there, I proceeded to identify the indicators' aims or intents. The purpose of doing so was to prepare the tool to be integrated with the findings of the POE interviews. This was to be done by using the indicators 'intent(s)' as search prompts throughout the collected data to see how those were facilitated or deterred in the examined context. That information was expected to update the measures, set to achieve indicators' aim(s) in the original expert-led tool, and make it more contextually relevant.

Preparing the analytical framework for integrating LEED-ND tool with community opinion derived from the POE and the hybrid focus group

'LEED v4 Neighborhood Development Addenda' is systematically structured to detail each Indicator, the Intent behind it, and the requirements for achieving it, as demonstrated in Figure 4.4. The 'intent' represents the aim which the indicator is set to achieve. Except for the mandatory indicators, the 'intents' are expressed as a spectrum where development gets closer or further to achieving a specific aim. I use the words aim, intent and intention interchangeably to refer to this concept. In indicators of an objective manner, the 'intent' is expressed as an objective aim, whereas in indicators of subjective nature, the 'intent' is expressed as a subjective aim. For example, the indicator of 'Solar Orientation' intends to 'encourage energy efficiency by creating optimum conditions for the use of passive and active solar strategies'. Encourage is a broad term that LEED-ND quantify by the requirement 'Design and orient the project or locate the project on existing blocks such that one axis of 75% or more of the blocks is within ±15 degrees of geographical east-west, and the east-west lengths of those blocks are at least as long as the north-south lengths ' (USGBC, 2018b, p. 74). Such technical indicators are expected to be inaccessible and irrelevant to the public; therefore, I excluded the indicator, its intent, and requirements from the initial analytical framework of my research. Despite the decision to exclude those indicators from the scope of my initial data analysis, I intended to review the excluded indicators after analysing the POE data. This final review was designed to verify if the initial decisions to exclude the indicators were valid or if the indicator proved to be relevant to the public.

The term 'Requirements' represent a number of possible measures that can be implemented to achieve the stated aim. Each indicator is graded based on the extent of fulfilling its list of requirements. I use the terms requirement and measure interchangeably throughout this chapter to refer to this concept. The clear structure of the addenda makes it easy to systematically identify what each indicator was set to achieve. This makes the framework ideal for incorporating in a POE exercise as the aims of its indicators are listed and not open for researchers' interpretation. The hypothesis of my research is that fulfilling the stated measures does not guarantee the success of achieving the stated aims. This success is crucial in the instrumental understanding of community participation (participation that improves local conditions). The success can be inferred from two indicators: user satisfaction and gradual change of residents' behaviour towards more sustainable practices. I intended to search for both concepts in the narratives obtained through POE interviews.

I carried the following steps to prepare an initial analytical framework to link LEED ND to the outcome of the participatory data:

1) Determine which of LEED-ND indicators are relevant for community-based evaluation.

2) List the intentions that each relevant indicator was set to achieve.

I repeated this process for each of the 59 indicators of LEED-ND framework. This left me with 12 LEED ND indicators that are relevant to the community members. I used those 12 indicators to prepare the initial analytical framework, which I used for linking participatory data with the expert-led framework. Those indicators are listed in Table 4.1, which I used later for linking the findings of the POE interviews to the existing indicators of LEED-ND. After preparing this table, I moved to the next stage: conducting the POE interviews.

Figure 4.4. A sample page from LEED ND v4 addenda, showing how I screened the 'intents' and 'requirements' to prepare the initial analytical framework

Table 4.1 The initial analytical framework prepared to link the outcome of community participation to LEED-ND framework

LEED ND Indicator[5]	Presumed impact by LEED-ND
1. **Bicycle Facilities**	• Improve public health by encouraging utilitarian and recreational physical activity.
2. **Walkable Streets**	• Improve public health by providing safe, appealing, and comfortable street environments that encourage daily physical activity and avoid pedestrian injuries.
3. **Compact Development**	• Promote livability, walkability, and transportation efficiency and reduce vehicle distance travelled. • Improve public health by encouraging daily physical activity.
4. **Connected and Open Community**	• promote projects that have high levels of internal connectivity and are well-connected to the community. • Improve public health by encouraging daily physical activity.
5. **Mixed-Use Neighborhoods**	• Reduce vehicle distance travelled and automobile dependence, encourage daily walking, biking, and transit use, and support car-free living by providing access to diverse land uses.
6. **Housing Types and Affordability**	• Promote socially equitable and engaging neighbourhoods by enabling residents from a wide range of economic levels, household sizes, and age groups to live in a community.
7. **Access to Civic & Public Space**	• Provide open space close to work and home that enhances community participation and improves public health.
8. **Access to Recreation Facilities**	• Enhance community participation and improve public health by providing recreational facilities close to work and home that facilitate physical activity and social networking.
9. **Visitability and Universal Design**	• Increase the proportion of areas usable by a wide spectrum of people, regardless of age or ability.
10. **Community Outreach and Involvement**	• Encourage responsiveness to community needs by involving the people who live or work in the community in project design and planning and in decisions about how the project should be improved or changed over time.
11. **Tree-Lined and Shaded Streetscapes**	• Encourage walking and bicycling, and discourage speeding.
12. **Neighbourhood Schools**	• Promote community interaction and engagement by integrating schools into the neighbourhood. • Improve students' health by encouraging walking and bicycling to school.

4.2.3. Stage 3 - Conducting POE Interviews:

Stage 3 - Design:

Stage 3 is the data collection stage for the case study research. This stage is designed to collect residents' evaluation of the physical and non-physical dimensions of their neighbourhood's urban context. To conduct this stage, I prepared a POE framework, which I justified in Chapter 3, and summarised in Section 3.3.4. Table 4.2. summarises the POE interview questions used for conducting this research. To carry the POE, researchers must first identify the research population based on the specific research aim. Then, they must devise ways to reach

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[5] To be inferred, not directly asked to participant, or used to design the case study site.

out to a representative sample ethically. After that, researchers must select an interview tool and start conducting interviews. Researchers can choose any medium for carrying out the interviews as long as they enable them to access broad segments of the population, particularly minorities which are hard to reach. In addition, the selected interview tool and sampling strategy must facilitate voluntary and confidential participation. I suggest combining face-to-face and virtual interviews using mobile phone apps or social media platforms or simply via phone interviews. This needs to be determined based on the participant's preference and available technologies in the examined context.

Table 4.2. Interview questions used to evaluate the designed POE framework

Themes	Asked questions	Prompts to use if the participants need assistance with the asked question
1. Aesthetics	What is beautiful in your neighbourhood?	• What do you think about the appearance of houses and buildings in your neighbourhood? • Are there any landscape features (hard/soft) that caught your attention? • What kind of views do you get from the windows in your house?
2. Connection to nature	What elements connect you positively with nature in your neighbourhood?	• Where can you see natural elements around your neighbourhood? • What different types of natural elements can you see around? • Which ones improve the quality of your neighbourhood?
3. Community facilities	Do the local facilities and amenities meet your needs?	• Can you fulfil your daily and weekly needs without having to go outside your local area? • Have the community facilities (schools, parks, play areas, shops, cafés, mosques) been appropriately provided? Are they well maintained?
4. Recreation	Do you have any nearby places you go to for recreational activities or hobbies?	• Where do you go to have a good time near your house? • Are the available places versatile and inclusive (do you see different people using them, do they fulfil the needs of all your family members)?
5. Social contact	Is there anywhere in the neighbourhood where you tend to stop and speak to people regularly?	• Do you know your neighbours? How did you get to know them? • How frequently do you speak to them?

6.	*Identity, belonging and pride*	• Is it easy to distinguish your neighbourhood from the surrounding area? • Do you feel you belong here? Why? Is there anything around that you are proud of?	• How do you feel when you tell people where you live? • Is it easy to find your way (or for visitors) around your local area? • Do your neighbours and the local people around add to the value of your home?
7.	*Support and influence*	Do you feel able to take part in decisions to make things better in your local area?	• Do you know whom to contact if you want to improve something in your area? • Have you ever tried to change something in your area?
8.	*Walkability and accessibility*	Can you move around your area safely, quickly and using different transportation modes?	• Do you have any parking/ traffic problem? • Is it safe for children to play outside? • Can you walk around in the neighbourhood safely and comfortably (pavement, car speed, traffic)?
9.	*Housing suitability*	Does your house meet your (and you family) needs?	• Did you have to make changes in the house to make it suite your lifestyle and family needs? • How similar is the house you are living in to the one you had in your mind? • Do you consider your house affordable, or did it burden you financially in any way? • What would you change in your house or neigubourhood to make it better?
10.	*Adaptability*	Do you want to live here for a long time? Why?	• Can you see your family growing up in this area? • Can the facilities in your neighbourhood accommodate future needs? • Can you modify internal and external spaces for future use?
11.	*Psychological wellbeing*	Does living here make you happy? Why?	• How would you describe your feelings towards your house and neighbourhood? • Are there any elements/locations in the neighbourhood that cause you discomfort or stress? • Do you prefer to live somewhere else? Why?

Overall, qualitative research needs to balance the 'depth' and 'breadth' of its collected data to be able to generate a wide range of data with deep levels of understanding (Lewis & Nicholls, 2014). Although qualitative research is not concerned with numbers, a representative sample needs to have a proportionate representation of the different segments of the community (Niezabitowska, 2018). This means that a research population with a majority of female residents needs to have a research sample with a majority of female participants. A proportionate statistical representation of the studied population enables the researcher to understand the breadth of the collected data, which can translate into gauging the significance of certain opinions in a given context. Two criteria governed the way of approaching the research population: 1) to get a representative sample and 2) to ethically reach out to them, which means participation should happen without coercion, and without causing potential harm to the participants.

To be representative, the sample of qualitative POE research needs to be diverse and inclusive of different segments of the community for two reasons: a) to cover a diverse range of residents' profiles (or attributes) that could affect the given responses, and therefore produce more accurate data (Richards, C., Blackstock, K.L. e Carter, 2004). Care should be given to provide equitable access to the target population (Kashef, 2016). This way, participatory research can fulfil its ethical obligation of democratizing the decision-making process (Rowe & Frewer, 2000). To reach a representative sample, one must first understand the variables or participants' characteristics that affect participants' views. Then, they should try to include participants that identify with each of those characteristics.

Defining the variables that affect participants' views in evaluating their neighbourhood is a complex matter that is not fully understood in NSA literature. It is also one of the aims of this research which is why I needed to enable the questions to reveal aspects that cluster residents' opinions in order to be able to generalise them to other contexts. As a starting point, I resorted to available literature concerning urban neighbourhoods, sustainable neighbourhoods, residential satisfaction, and affordable housing neighbourhoods to map variables that were found to affect residents' evaluations of their living environments. Based on the reviewed literature, several resident attributes could have an impact on their evaluation of their neighbourhoods; those include Age (Oreg & Katz-Gerro, 2006), education (Chen & Lin, 2016; Oreg & Katz-Gerro, 2006), ethnic background (Sasidharan et al., 2005), family size (Joop J. Hox, Mirjam Moerbeek, 2010), Gender (Chen & Lin, 2016), 'income' (Dave, 2011), and 'occupation' (De La Barrera et al., 2016; Oreg & Katz-Gerro, 2006). To understand how those variables could affect the reliability of the findings (validity limitations in other contexts), I recommend including them as optional background information questions in the consent form (I used the terms 'background

information' and 'attributes' interchangeably throughout this chapter since NVivo software uses the term 'attributes' to code background information).

One strategy to ensure having a representative sample is to use sample stratification. Stratification refers to the process of dividing the studied population into subgroups that share similar characteristics (Ritchie et al., 2014). As discussed above, I recommend basing the strata on the distribution of age, gender, ethnic background, education, income, occupation, and family size across the studied population. This way, the collected data could be linked more easily to the findings of existing literature, as those variables significantly affect residents' evaluation of their living spaces. Obtaining those ratios is conditioned upon the availability of those statistics in the examined context. In cases where such information cannot be obtained, it can be more efficient to overlook some of those variables for feasibility concerns.

After defining the stratification of the examined population, researchers need to identify how to ethically approach those strata without making them feel forced to participate and without putting them at any potential risk as a result of their participation (e.g., losing any type of aid as a result of criticizing existing conditions). To avoid coercion, approaching the participants should either be through general recruitment advertisements, or through a trusted acquaintance without any formal capacity over the examined population, or without having a conflict of interest between involved parties. Advertising is unlikely to yield a sufficient number of participants in areas where participation is not a common culture; therefore, I recommend starting with a network sampling strategy.

Network sampling is when researchers get help from an initial mediator to connect them with potential participants (Ritchie et al., 2014). This type of sampling aids in building trust between the researcher and the participants because of having a mutual acquaintance. Trust is critical for conducting interviews as it encourages participants to give honest feedback, making the collected data more accurate. It also facilitates providing detailed narratives by the residents, which increases the depth of the collected data. However, network sampling can produce a very homogenous sample since the participants belong to the same social network and therefore may share a similar profile. This homogeneity could limit the generated data's diversity or 'breadth'. I recommend combining network sampling with a snowball sampling strategy to balance this risk. Snowball sampling is when one participant is asked to connect the researcher to potential participants (Ritchie et al., 2014). This way, the participants are likely to be more diverse than if they approached through the same initial mediator used to facilitate network sampling.

Interviews must be collected until reaching data saturation, which is the state where collecting more data does not produce new findings. According to Ritchie *et al.* (2014), this

happens around the 9th to the 12th interview. Because identifying data saturation requires processing the collected data, the stages of data collection and data analysis frequently overlap in qualitative research. Below, I explain how I applied the guidelines I set for the data collection in my case study research.

Stage 3 – Application in the Case Study:

a) Research Population:

The target population was adult Residents of Alsaya Affordable Housing neighbourhood in Muharraq Governate, Bahrain- Aged 21 and above.

b) Sampling strategies:

Obtaining population attributes to set sample stratification

As I mentioned earlier, background information, including gender, age, educational level, family size, ethnic background, income, and occupation, was considered relevant to residents' evaluations of their living environments. However, in the consent form, I excluded two attributes from the scope of this research even though relevant literature identified them to be influential on residents' evaluation of their living spaces; those were 'income' and 'occupation'. 'Income' was excluded because the participants at the pilot interviews were hesitant to comment on it. It is worth knowing that to be eligible for affordable housing units in Bahrain; the applicant needs to be between 21-50 years old upon application with a family income below £1800. This application expires if the income exceeds £2400 when receiving the residential unit (Ministry of Housing and Urban Planning, 2021b). These figures put all the participants within a similar range of family income and therefore make it possible to exclude information from the background information asked of the participants. As for 'occupation', I excluded this attribute for ethical concerns. I did this because the size of my studied population is relatively small, which means I could jeopardize the anonymity of the participants by referring to their occupations in the analysis.

I contacted the MHUP in Bahrain to obtain statistical figures about the residents' profiles in Muharraq governate, but I did not get a response. This is likely a result of staff limitations due to the Covid-19 outbreak. This restricted me to the published data to understand the characteristics of the Bahraini population in Muharraq governate. To access a representative sample, I aimed to maintain the following proportions across my research sample:

135

- 49.9 % female population (this figure is specific to Muharraq governate, calculated based on the figures obtained from Table 2 presented earlier in the background information chapter (Information & eGovernment Authority, 2010)).
- 50.1 % male population (this figure is specific to Muharraq governate, calculated based on the figures obtained from Table 2 (Information & eGovernment Authority, 2010)).
- A gradually reducing age profile for the participants to be representative of the Bahraini population pyramid shown in Figure 4.5.
- Family size distribution with a majority of 6 residents gradually reduces towards a higher and lower number of residents per housing unit, as depicted in Figure 4.6[6] , which shows the visual distribution of the household size among Bahraini citizens in Muharraq governate.
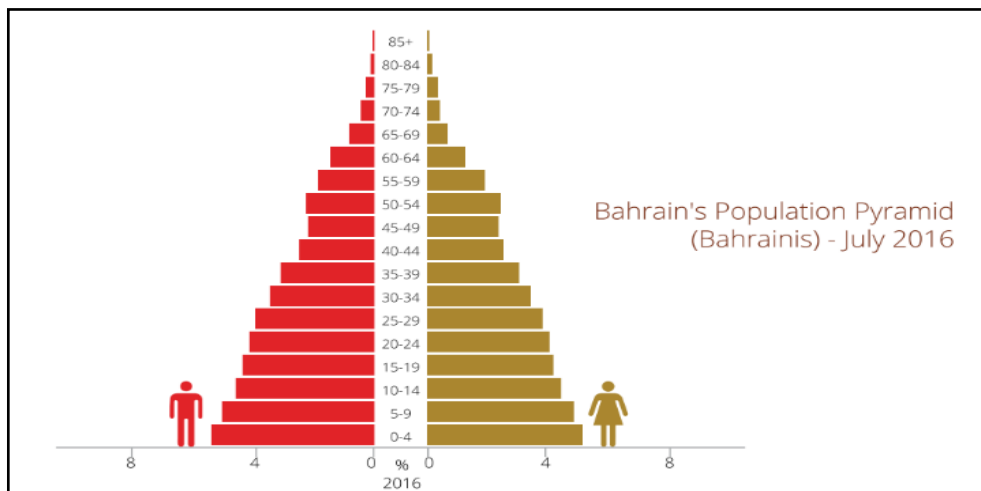
Figure 4.5. Bahraini population pyramid in 2016. Source: (Information & eGovernment Authority, 2017)
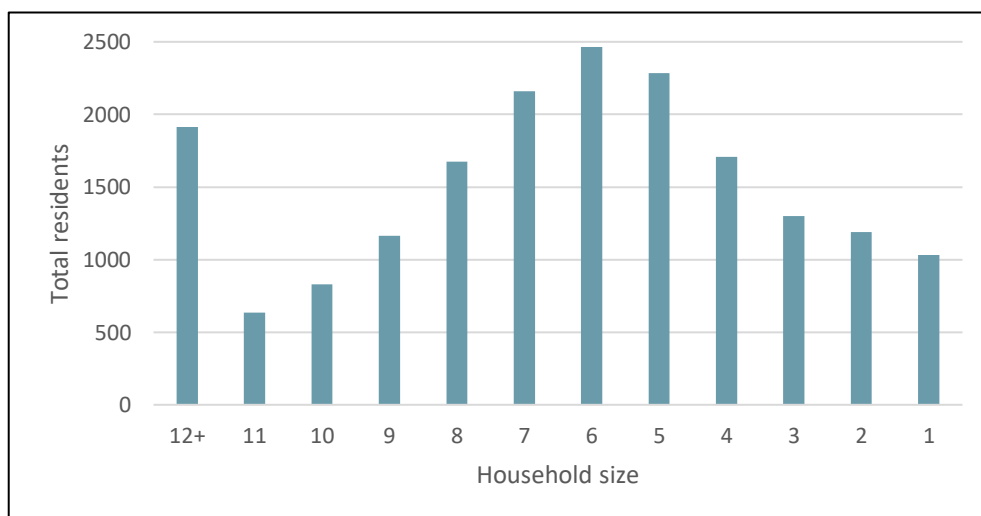
Figure 4.6. The proportion of Household size compared to the total Bahraini population in Muharraq governate

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[6] I used the data on household size in Muharraq governate from table 4 in the background information chapter to generate figure 4.6.

Contacting community members using a combination of network sampling and snowball sampling:

To recruit potential participants, I reached out to the studied population through 3 mediators. The mediators were personal acquaintances who live within Muharraq governate and have social connections with community members in Alsayah neighbourhood. Each mediator belonged to a different social network and had distinct attribute variations (a 35-year-old female, a 68 year old retired male, and a 35-year-old male). To add more diversity, I asked the participants I contacted through the mediators to connect me with other potential participants (snowball sampling). This design meant that I could access a more diverse research sample. Using a combination of network and snowball sampling, I identified 25 potential participants. From those, I contacted 14 on the phone to participate in this research. Most of them were willing to conduct the interview upon first contact, few required rescheduling (mostly female participants), and 2 rescheduled the interview but did not respond to subsequent calls. To ensure that the participants were diverse, I tracked the sequence of contacting the participants, which is mapped in 4.7.

Conducted interviews:

I conducted 12 interviews in total. I planned to revisit this number after analysing the interview transcripts to conduct more if I did not reach data saturation.
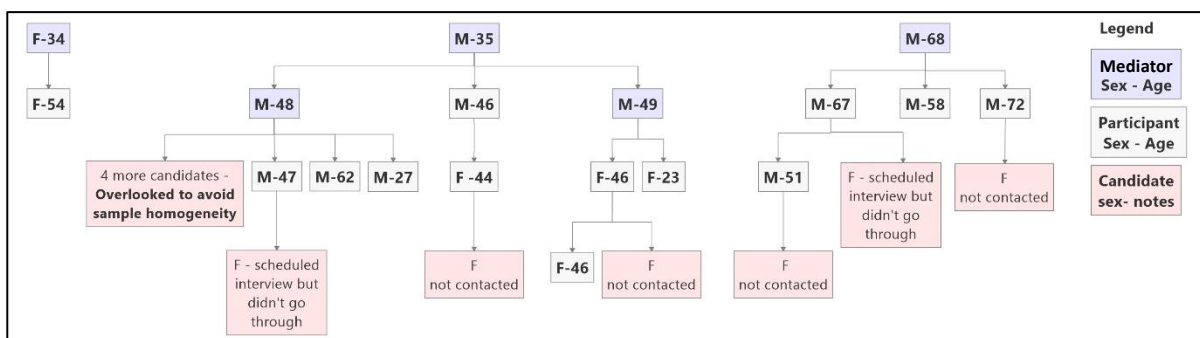
Figure 4.7. Tracking the social network used to recruit participants

4.2.4. Stage 4 – Data analysis:

Stage 4 - Design:

The final stage of my proposed methodological framework is to analyse the collected data. This stage requires transcribing the POE interviews to conduct a content analysis for their text. The transcripts then need to be analysed using thematic coding. This type of data analysis relies on reading the interview transcripts and screening them for any occurring themes to create an analytical framework and infer relevant findings depending on the research question that needs to be answered (Dempsey et al., 2012). The occurring themes then need to be coded using

suitable qualitative data analysis software. I used NVivo software to conduct the coding process. The features of the software required making decisions on how to process the data, including which language to use for processing the primary data (which were mostly conducted in Arabic), as well as setting rules for transcribing and translating the data.

My research aims involved two dimensions, one that needed to allow the findings to be tied to existing expert-led NSATs to aid in localise them, and an explorative one that needed to enable spontaneous identification of the community input in matters related to the social and environmental sustainability of their neighbourhoods.

To balance the explorative dimension with the intentional one in my research, I developed an initial coding framework comprising three non-hierarchical levels. The term non-hierarchal means that the three frameworks did not have a predetermined relationship level, which was to be explored through data analysis. The three analytical frameworks were:

a) Open-end coding, where I identify recurrent themes mentioned by the participants, irrespective of the devised POE framework.

b) Coding based on the devised POE framework, where I identify 'Residents' evaluation' of each of the 11 themes; and the 'Cause of evaluation'.

c) Coding relevant to the selected expert-led NSAT framework:

In this analytical framework, I intended to code any reference to impacts occurring in the assessed neighbourhood that are also considered within the selected expert-led framework to be adapted for the defined context.

It is important to emphasise that the assessed case study neighbourhood does not have to be built using the guidelines of the selected expert-led NSAT. This is because the POE is not intended to evaluate the success of the selected NSAT in achieving its aims but rather to identify how to achieve such aims within the context in question based on reported residents' perceptions and behaviours. The approach for finetuning the expert-led NSAT is to search for the POE narratives for themes related to its impacts and code them accordingly. Then, the cross-reference of the coded impacts against the codes of the two analytical frameworks (fixed and open-end coding framework).

For example, safety is an impact typically required from residential neighbourhoods. According to a tool like LEED ND, creating safe environments is only discussed through fulfilling

the 'Walkable streets' indicator (USGBC, 2018b). Depending on the conditions in a local context, residents might have a different understanding of what affects their perception of safety. For instance, if an area struggles with dangerous topography, safety might be directly discussed in relation to landform. Or, for areas that struggle with proximity to sex-oriented works, locals might closely relate safety to distancing their children from such environments. The perceived fulfilment of required impacts, especially social ones, can be largely subjective. Therefore, defining indicators and measures on how to achieve such impacts using community input is more likely to accurately set effective measures. To benefit from an instrumental approach to promoting participation in NSA, my data analysis method revolves around searching for how to achieve a required impact by understanding the local context, which can then be used to finetune generic expert-led NSATs for the needs of specific contexts.

Stage 4 – Application in the case study:

In preparation for coding the third analytical framework, I had to identify potential LEED ND indicators and impacts relevant to residents' evaluation. This was done in stage 2 (section 4.2.2), which resulted in creating Table 4.1. where I summarised LEED ND indicators and impacts relevant to community evaluation. Using Table 4.1., I identified the intents (or expected impacts) for each of the 12 indicators. I then created a list of keywords for all community-relevant impacts and mapped them against their relevant LEED ND indicators, as shown in Table 4.3. By fulfilling the listed 12 indicators, LEED ND expects 48 impacts to be achieved. Across those indicators, many of the identified impacts are repeated. This repetition can be understood as an interrelationship between numerous factors that eventually create a specific impact. Despite its logic, this inference is not acknowledged by the LEED-ND framework, as each indicator is supposed to be scored individually, irrespective of the others.

Table 4.3. Identifying key impacts from LEED ND indicators relevant to public evaluation

LEED ND Indicator	Presumed impact by LEED ND	Search keywords for impacts
1. **Bicycle Facilities**	• Improve public health by encouraging utilitarian and recreational physical activity.	• Health • Activity
2. **Walkable Streets**	• Improve public health by providing safe, appealing, and comfortable street environments that encourage daily physical activity and avoid pedestrian injuries.	• Health • Safety • Beauty • Activity • Comfort • Walking
3. **Compact Development**	• Promote livability, walkability, and transportation efficiency and reduce vehicle distance travelled. • Improve public health by encouraging daily physical activity.	• Liveability • Walking • Transportation • Distance

			• Activity • Health
4.	Connected and Open Community	• Promote projects that have high levels of internal connectivity and are well-connected to the community. • Improve public health by encouraging daily physical activity.	• Connectivity • Community • Health • Activity
5.	Mixed-Use Neighborhoods	• Reduce vehicle distance travelled and automobile dependence, encourage daily walking, biking, and transit use, and support car-free living by providing access to diverse land uses.	• Distance • Transportation • Access • Walking • Cycling
6.	Housing Types and Affordability	• Promote socially equitable and engaging neighbourhoods by enabling residents from a wide range of economic levels, household sizes, and age groups to live in a community.	• Engagement • Age • Economic • Household
7.	Access to Civic & Public Space	• Provide open space close to work and home that enhances community participation and improves public health.	• Distance • Participation • Health
8.	Access to Recreation Facilities	• Enhance community participation and improve public health by providing recreational facilities close to work and home that facilitate physical activity and social networking.	• Participation • Health • Activity • Distance • Social
9.	Visitability and Universal Design	• Increase the proportion of areas usable by a wide spectrum of people, regardless of age or ability.	• Equity • Ability • Age
10.	Community Outreach and Involvement	• Encourage responsiveness to community needs by involving the people who live or work in the community in project design and planning and in decisions about how the project should be improved or changed over time.	• Responsive
11.	Tree-Lined and Shaded Streetscapes	• encourage walking and bicycling and discourage speeding.	• Walking • Cycling • Safety • Speeding
12.	Neighbourhood Schools	• promote community interaction and engagement by integrating schools into the neighbourhood. • Improve students' health by encouraging walking and bicycling to school.	• Interaction • Engagement • Health • Walking • Cycling

Deleting the repeated impacts resulted in 23 ones for investigation. Those impacts could be clustered into five categories: 1) Positive emotions, 2) Active lifestyles, 3) Connection, 4) Equity, and 5) Flexibility and freedom (figure 4.7). Except for the 'Equity' impact cluster, the remaining four categories were parallel to the themes used in the Social Value Toolkit, which I adopted for developing the POE framework. I used those keywords as search prompts to run a word search query within NVivo software. NVivo has five levels for word search. Using a specific word (e.g. 'Talk'), users can customise the search for either: 1) exact match (e.g. 'Talk'), 2) stemmed words (e.g. 'Talking'), 3) synonyms (e.g. 'Speak'), 4) specialisation (e.g. 'Wisper'), and 5) generalization (e.g. 'Communicate').

I opted for the level 'generalisation' for searching for the impacts listed in Figure 4.8. While the 'generalisation' level yielded too many responses, many of which were irrelevant to the intended impact, this level was more accurate for coding the impacts than the lower 'specialisation' one. To give an example of the coding process for the analytical framework relevant to LEED-ND, I ran a word search for the impact of 'safety' throughout the interview transcripts. This query returned 148 results. After screening them, I ended up with 11 codes relevant to safety. I changed the setting to specialization and got 12 codes. Although the number of references is closer to the 11 codes I ended up having, the results for the 'specialisation' level were not as accurate as the ones I obtained by vetting the 'generalisation' level. Therefore, I recommend starting with generalization and then filtering the results instead of going to a more specific option from the start.
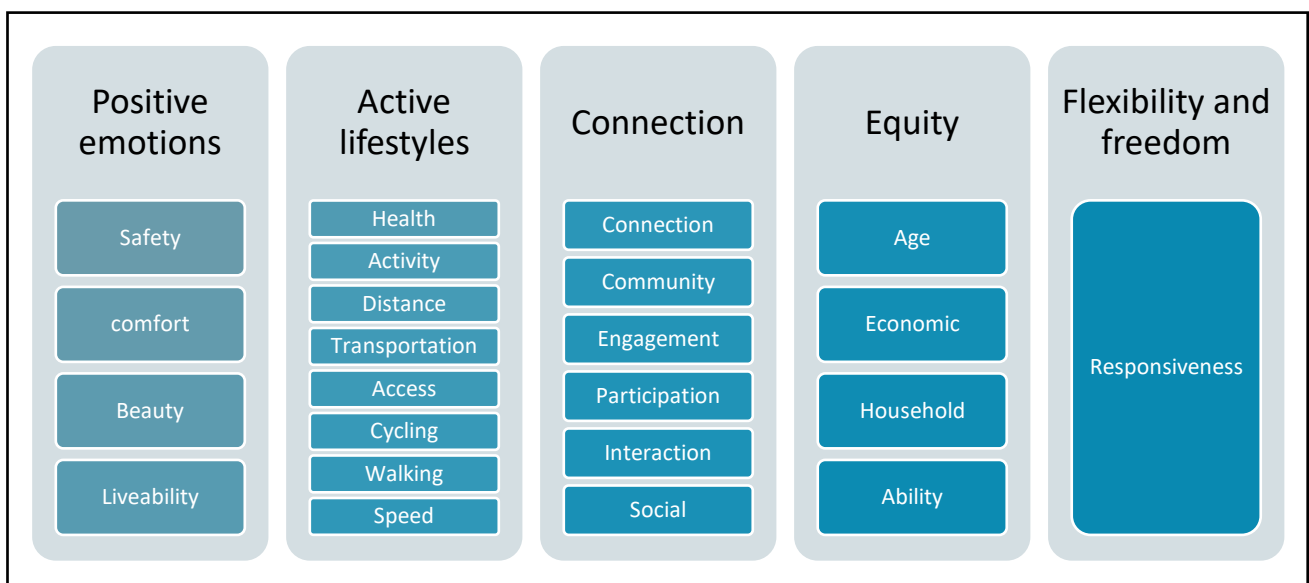
Figure 4.8. Clustering LEED ND impacts relevant to public's evaluation

The final step of data analysis was to overlap the findings of this analytical framework with the findings of the two analytical frameworks based on the POE, which included the open-end coding and the fixed analytical framework coding based on the defined POE themes. The interviews were expected to provide detailed accounts of 1) how residents evaluated each theme (which is equivalent to the terms scoring and weighting[7] in NSATs literature), 2) the concepts that matter to the locals when evaluating their neighbourhoods (or 'indicators' in NSA literature), and 3) the urban and architectural elements and forms that provide or prevent a specific theme (or 'measures' in NSA literature). Those three aspects were designed to mimic the structure of the

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[7] Scoring means how good or bad a certain feature/quality performed; and weighting reflects how important was the discussed theme in relation to other themes.

dominating expert-led NSATs as identified by Sharifi and Murayama (2013). My research was expected to produce a local neighbourhood sustainability assessment framework relevant to the context of Muharraq, Bahrain. However, this framework was regarded as a research by-product and not the main outcome. The main outcome was expected to involve refining the methodological framework I developed for using community-led POE in localising expert-led NSATs.

4.3. Conclusion

In this chapter, I presented my research design in which I devised a methodological framework to use community-led POE to complement generic expert-led Neighbourhood Sustainability Assessment Tools (NSATs) and make them more sensitive to the needs and conditions of a certain context. My research focuses on sustainability assessment in the context of new affordable housing neighbourhoods. The aim of this hybrid framework is to use credible contextual participatory data to aid in localising top-down NSATs to adapt them to the requirements and limitations of specific cultural contexts. I defined localising an expert-led NSAT as the process of adapting its framework to acknowledge the conditions of the local community (considering the limitations of the examined context, the local problems, and the local culture) while maintaining an acceptable level of sustainability in broader contexts. And I define credible contextual participatory data as data that best resembles participants' actual beliefs as well as their behavioural patterns in their neighbourhood.

The research scope (community participation in affordable housing neighbourhoods) had two critical issues that needed to be accounted for: 1) the vulnerability of the researched population (People eligible for affordable housing units); and 2) the subjective nature of the collected data. This required a careful balance between the ethical obligation towards the study sample and the objectivity of the research. To be specific, the study design had to ensure that the data collection tools would not harm the participants in any way because of their participation in the research, but it also had to be meaningful and representative of the participants' honest opinions. I developed a novel POE framework to use for interviewing the residents of affordable housing neighbourhoods. The framework evaluates 11 themes concerning the physical and non-physical dimensions of urban neighbourhoods. Those themes are aesthetics; connection to nature; community facilities; recreation; social contact; identity, belonging and pride; support and influence; walkability and accessibility; housing suitability; adaptability; and psychological wellbeing. To ensure that the framework is relevant to affordable housing resident evaluation, I only included themes that do not require technical knowledge for their assessment. I derived the themes from five bodies of literature: Neighbourhood sustainability assessment; social

sustainability; Community participation in the urban context; Residential satisfaction; and affordable housing neighbourhoods.

The decision to use POE as a data collection method was based on the value of this tool in generating credible empirical evidence on the impact of the urban context on its residents. POE can provide empirical evidence on the impact of the residential environment on the feelings and behaviours of the residents as perceived by them. This feature makes POE more valuable in voicing the public's opinion in participatory research as they actively provide the needed data. POE also minimises the risk of giving speculative answers by the respondents because it is used to describe the impacts that already took place in a real context. Despite those advantages, the data collected using this tool has a limited scope of validity as it applies to a very restricted studied population. Therefore, the design of this research was focused on creating a robust methodological framework that can be replicated in other contexts at the neighbourhood scale. This focus made it essential to understand what creates methodological reliability in POE research.

My proposed methodological framework for using community-led POE to localise expert-led NSATs comprised four stages that need to be adapted for the context in question. These included: 1) Site selection for the case study. 2) Selecting an expert-led NSAT relevant to the examined context. 3) Conducting individual POE interviews with the neighbourhood's residents to assess the sustainability of the selected affordable housing neighbourhoods. and 4) Data analysis. The collected data were to be compared and analysed for validity (analysing what was said through more than one question); and were to be used for understanding the influence of different attributes (ethnographic background, gender, age, family size, educational level and employment), and variables (which were expected to be found when analysing what affects the given answers) to understand the generalisability limitations of the suggested methodological framework.

I selected Alsayah Affordable Housing neighbourhood in Muharraq Governate, Bahrain, as my case study neighbourhood. My defined research population was adult residents (aged 21 and above) of Alsayah affordable housing neighbourhood in Muharraq governate, Bahrain. I used a combination of network sampling and snowball sampling to access a diverse research sample. I used sample stratification in which I set expected ratios for gender representation, household size, and age across my research sample. I set the strata to have a representative sample of the selected population, and I was limited to the available published data about the population profile in Muharraq governate. I carried out a total of 12 interviews, each lasting between 30-60 minutes. Across the various assessed themes, the interviewed participants had the chance to be

fully detached from the pressure of giving their answers in front of others while reporting how they acted or felt within the collaborative context of a neighbourhood. The individual yet embodied nature of the POE interviews meant that the answers could be representative of real-world dynamics while providing a confidential setting that enables providing transparent participants' opinions.

For reasons that I discussed in section 3.4, the validity of my proposed hybrid model is limited to relating participatory POE data to top-down tools that use an indicator-based framework, have scoring in their evaluation system, and use a non-hierarchical sustainability assessment framework (do not consider the interrelationships between their indicators). The last condition was set to assure that the findings obtained from the POE of any neighbourhood (not necessarily built using a specific top-down NSA framework) could be used to finetune a specific expert-led NSAT. This limited the relevance of my research to the following tools: LEED-ND; EarthCraft Communities (ECC); BREEAM Communities; CASBEE-UD; HQE2R; Ecocity; and SCR.

To select one of these tools to incorporate in my empirical study, I developed the following selection criteria which can be used to replicate the research in other contexts: 1) to choose a tool that is relevant to the selected context, which can be achieved by being either: a) designed specifically for the investigated context, b) Implemented at the investigated context (either at the selected development or within adjacent areas of similar demographic, climatic, and cultural conditions), c) familiar to the professionals working in the investigated context, and d) identified by the literature to be of significance to the investigated context. And 2) to select a tool that clearly states the intended aims for each of its indicators.

I set the last criterion to make the selected expert-led NSAT relatable to the findings generated using POE data. In POE, residents' evaluation of their neighbourhood could be linked to certain features (physical or non-physical). This makes it possible to compare the features indicated by the residents to the measures indicated at the top-down NSAT. Based on the former tool selection criteria, I used the LEED-ND framework to investigate the value of my designed framework in localising expert-led NSATs. Even though LEED ND was not used to design Alsayah affordable housing neighbourhood, it is the only tool used in Bahrain to assess the sustainability of new developments (used to evaluate 22 projects in Bahrain up to date) (LEED, 2020) and the most implemented tool in the Middle East with 4221 LEED-certified developments (LEED, 2020).

I used thematic coding as the primary data analysis method. I screened the transcripts for any occurring themes and used NVivo software to conduct the coding process. I analysed the data in three parallel stages. In stage 1, I developed an open-end coding framework where I identified recurrent themes mentioned by the participants, irrespective of the devised POE

framework. In stage 2, I developed a fixed analytical framework based on the themes I defined for the POE framework. In the fixed analytical framework, I identified residents' evaluation of each of the 11 themes and their reported cause of evaluation. Stage 3 involved coding impacts that appeared in the residents' narratives and were also listed as intents for the LEED-ND framework. Community-led POE was expected to provide experts with credible contextual findings about the needs of the local community and the way they are impacted by specific features or qualities in the context in question. Those were then to be used to localise the initial expert-led NSAT to suit communities with a similar cultural context. The relationship between the findings of the fixed analytical framework, the open-end coding framework, and the LEED-ND relevant framework was expected to identify the generalisability limitations of my proposed framework and the ways in which POE can aid in localising expert-led NSATs for specific contexts. The following chapter presents the findings of my case study research conducted at Alsayah affordable housing neighbourhood in Muharraq governate, Bahrain.

Chapter 5: Result of the POE Interviews

The following chapter presents the findings of the Post-Occupancy Evaluation (POE) interviews. The chapter is organised around two main sections. Section 5.2 displays the results for the fixed analytical framework of the POE interviews. For each theme, I display 1) How the participants evaluated their neighbourhood in relation to the theme in question. And 2) The reasons they gave to justify their evaluation. In section 5.4, I present the results of the open-end coding for the POE interview transcripts. There, I display the recurrent themes that emerged across the participants' responses which were not defined in the initial POE framework, and the views expressed in these themes.

5.1. Background information of the research sample

In the consent form, I asked the participants to provide their Age, Gender, Educational level, Family size, Ethnic background (other nationalities that the participant identifies with), and location. The 'location' attribute refers to the side of the neighbourhood the participant lives in (new or old Alsayah neighbourhood). I added this attribute because the case study neighbourhood was built at two stages within a few years apart. The two parts of the neighbourhood are locally known as the New Alsayah (northern side) and the Old Alsayah (southern side), as shown in Figure 5.1. The main difference between the two sides is that the community facilities at the Old Alsayah were not ready when the residents moved in and that it's slightly closer to the sea on the west side. The background information questions were added to the consent form to assess the representativeness of the obtained sample without being invasive to their privacy and to examine the impact of the collected background information on residents' feedback. The responses to these optional questions are summarised in Table .

The sample included participants with diverse background information, which was proportionate with the sample quota I defined earlier to obtain a representative research sample. Those included equal male-to-female ratio, family size with an average of 6 members, lower ratios of participants with very high or very low educational qualifications, and a majority of participants within the age of 40-49. Even though I reached out to participants who could identify with more than one nationality, none of them provided this information. This makes the ethnic background of the participants unknown.
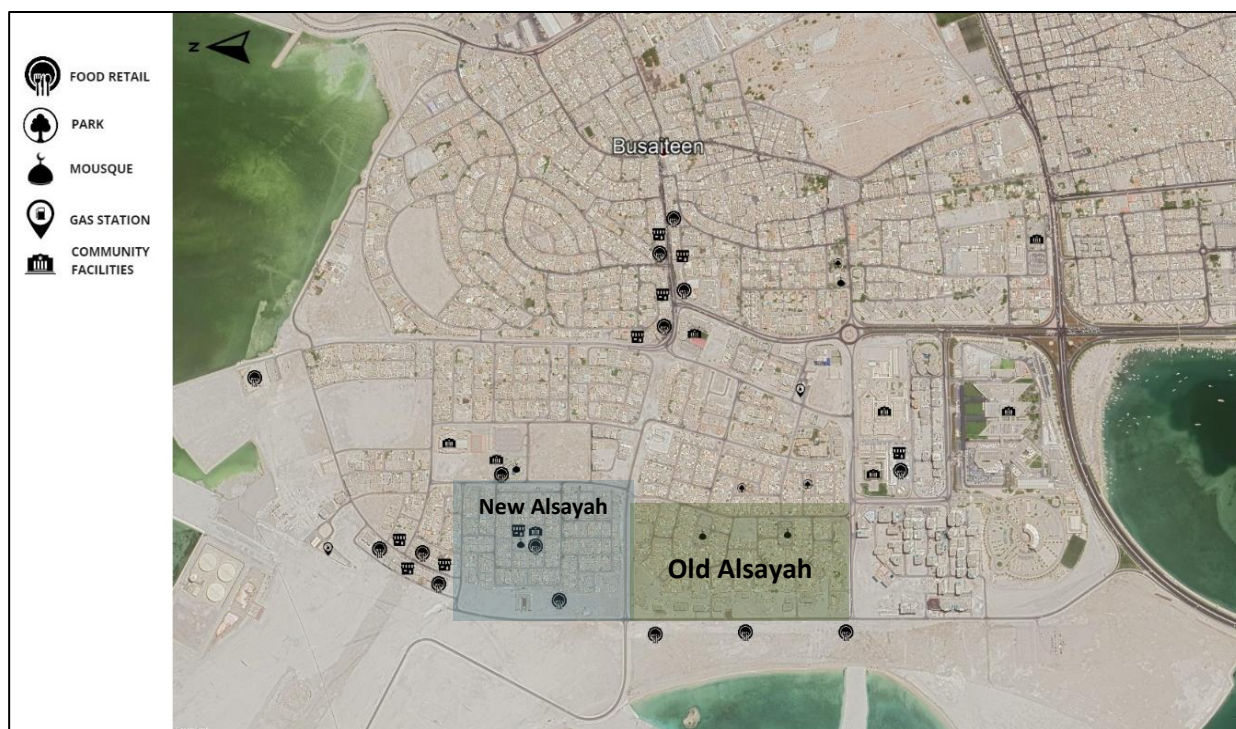
Figure 5.1. Satellite image of Alsayah Neighbourhood marking the key places in it

Table 5.1. Background information of the POE interview research sample

			Background information			
Participant	Age	Educational level	Ethnicity	Family size	Gender	Location
1	40-49	Higher education	Unassigned	5	Male	New Sayah
2	40-49	Higher education	Unassigned	5	Female	New Sayah
3	40-49	Below high school	Unassigned	7	Male	Old Sayah
4	60 and above	Below high school	Unassigned	6	Male	New Sayah
5	60 and above	College Education	Unassigned	6	Male	New Sayah
6	30-39	College Education	Unassigned	5	Female	New Sayah
7	40-49	College Education	Unassigned	6	Male	New Sayah
8	<30	Below high school	Unassigned	7	Male	Old Sayah
9	60 and above	Below high school	Unassigned	6	Male	Old Sayah
10	<30	College Education	Unassigned	5	Female	New Sayah
11	50-59	High School	Unassigned	6	Female	Old Sayah
12	40-49	High School	Unassigned	6	Female	New Sayah

5.2. Result of the Fixed Analytical Framework of the POE Interviews

The result of each theme of the POE framework is displayed in terms of the evaluation given to the theme in question and the cause for the given evaluation (both explicit and implicit). Throughout this section, I refer to two quantitative measures to provide an initial assessment of the themes' significance. Those are 1) Frequency, which is the number of times this theme got repeated throughout the text of the interview. Frequency is expressed as the number of occurrences of the examined content (e.g., theme, word, place, etc.). And 2) Coverage, which represents the extent to which the theme was discussed in comparison to the other themes. Coverage is expressed as a percentage of the concerned text in comparison to the whole text.

After detailing the findings of the 11 themes, I present their relationship to the participants' background information in section 5.3. I ordered the results of the themes starting with ones with higher coding frequency count, which is shown in Table 5. 2. In Figure 5. 2, I break down the coding coverage of the POE themes for each participant. Since some participants are more talkative than others, I displayed the coverage result as a '100% stack bar' for each participant. This facilitates the comparability of the theme coverage across different participants. It also aids in assessing the significance of the themes to the whole sample, regardless of how articulate each participant was. Given the large number of codes within the fixed analytical framework, the following section only presents the findings of the first five codes with highest coding frequencies. I provide the findings of the remaining codes in appendix g. The appendix follows the same structure I used within this chapter.

Table 5.2. frequency counts for the codes of the fixed analytical framework of the POE themes

POE theme	Frequency count
1. Identity, Belonging and Pride	87
2. Aesthetics	68
3. Social contact	66
4. Housing suitability	65
5. Support and influence	60
6. Community Facilities	52
7. Walkability and accessibility	47
8. Recreation	47
9. Connection to nature	44
10. Adaptability	43
11. Psychological wellbeing	37
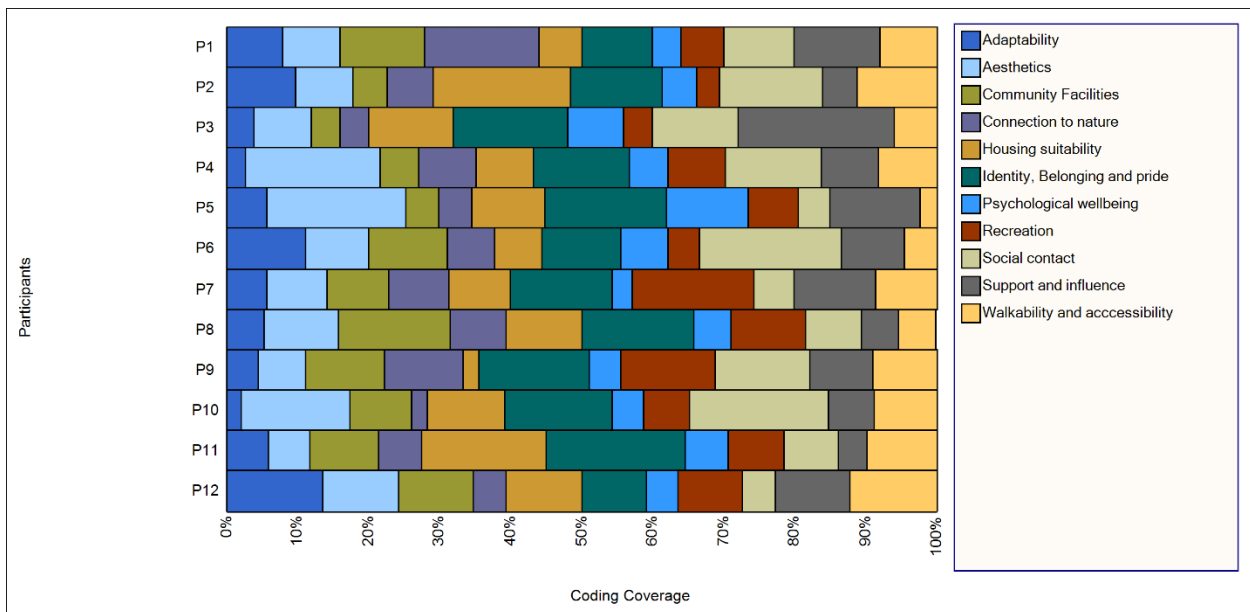
Figure 5.2. Coding coverage of the POE themes for each participant

5.2.1. Identity, Belonging and Pride

'Identity, Belonging and Pride' had 87 coding occurrences across the sample (table 5. 2), making it the most frequently discussed POE theme. Figure 5. 3 shows the coverage percentage for this theme for each participant.
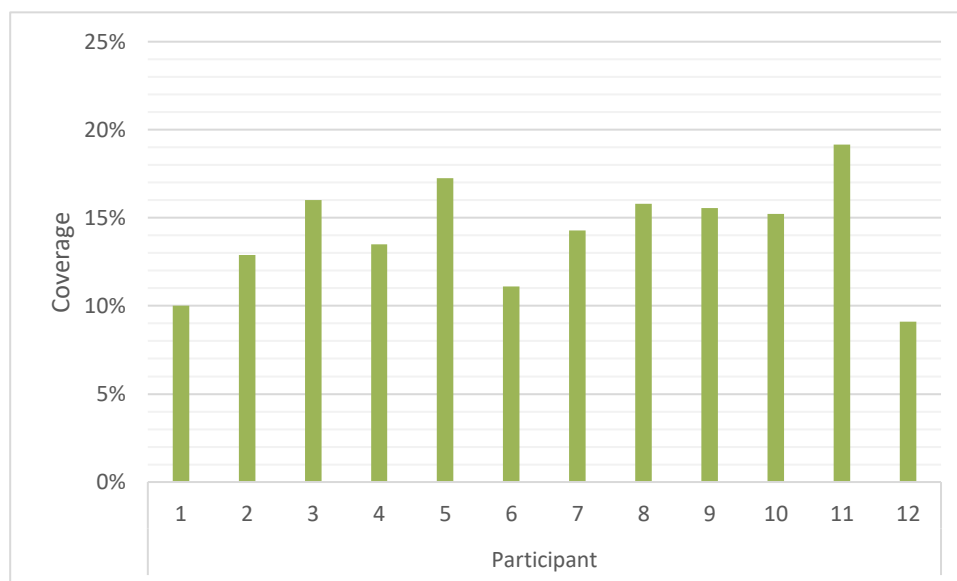
Figure 5.3. 'Identity, Belonging and Pride' theme - Coverage per participant

<u>Evaluation</u>

Except for one participant, the whole sample was pleased with living in this neighbourhood. They clearly expressed the feeling that they belong to a place with a distinct identity, which to them is not common in affordable housing projects.

> Participant: 'Honestly, I always wished for this area.'

Very few participants were hesitant about how they felt at first. Those reported that after a few years of living in Alsayah, they eventually felt like they belonged in the area.

> Participant: 'The beginning was difficult, but the place gets familiar over time.'

<u>Cause of Evaluation</u>

In terms of what makes the area identifiable, there was a general reference to 1) the wide streets and clear road network; 2) available places for daily and weekly services needed within the neighbourhood; and 3) the changes people made to the facades of their houses (which were originally identical).

Respondents who were not originally from the city of Busaiteen quickly attributed the 'Identity' of the area to the physical features of the neighbourhood (primarily the street network). However, those who lived in nearby neighbourhoods before moving to Alsayah found it hard to give a cause for what makes their area identifiable.

> A participant who wasn't originally from Muharraq Municipality: '...it's also because it's small [why their neighbourhood has a distinct character], our neighbourhood is small, probably Qalali is confusing because it's larger.'

> A participant who always lived in Muharraq Municipality: '...it's a nice place...I don't know [chuckles]. The feeling is just there... I am used to going out in the morning for walks. It wouldn't feel nice if I went to another place. I am used to this place.'

Participants living nearby before moving to this neighbourhood also found it harder to explain what makes them feel 'Pride' and 'Belonging to this area'.

> Participant: 'Do not ask a citizen of Muharraq if they like Muharraq.'

'Time spent in the area' was a common cause for justifying the feeling of 'belonging'. Most residents who weren't originally from Busaiteen justified their 'belonging' to the area simply by getting used to it over time. With more discussion, they broke this down to having nice neighbours; having available community facilities nearby, which made them not need to leave the neighbourhood to run their errands; and being used to the modifications they made to their houses.

> Participant: 'It has become our area, our neighbourhood.'

> Participant: 'You adapt after several years in another area ... You have to belong to Muharraq after living in it for this long.'

5.2.2. Aesthetics

Based on Table 5. 2, this theme ranked second with 68 coding occurrences. The dominance of this theme changed across the participants, as shown in Figure 5. 4, with coverage that ranged from 1.48% to 7.76%. Participants were very prompt in responding to this question and required minimal assistance to understand it. They also found it easy to give exact causes for their given evaluations, which were mostly related to the repetition and monotony of the houses' appearance in affordable housing neighbourhoods.
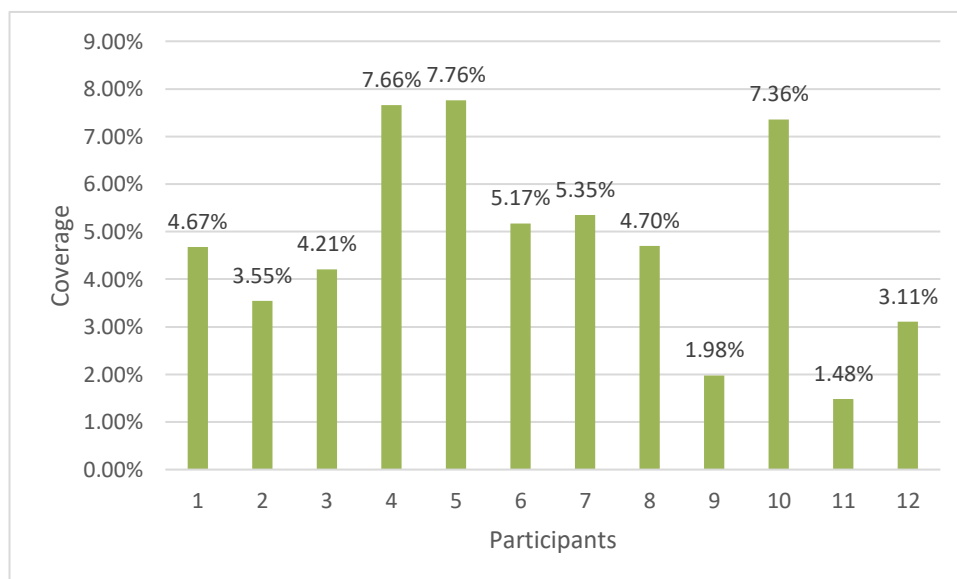
Figure 5.4. 'Aesthetics' theme - Coverage per participant

<u>Evaluation</u>

Three participants covered this theme extensively in their interviews. Out of those, two of them evaluated the neighbourhood's aesthetics positively. Most of the remaining participants evaluated this theme negatively; half expressed extreme dislike for the appearance of their neighbourhood and ~~all~~ other affordable housing neighbourhoods.

> Participant: 'I don't like it at all. Not this project or any other project.'

While the remaining half also evaluated the neighbourhood's aesthetics negatively, they were not disturbed by this and found it to be the norm in such projects.

> Participant: 'It's normal (laughs amusedly). There is nothing.'

<u>Cause of Evaluation</u>

I used a word cloud to display the 50 top-used words by the participants to justify their evaluation of the 'Aesthetics' theme (figure 5.5). Most of those revolved around the appearance of the houses and not the neighbourhood features. The majority of the participants found the identical house facades to be dull and ugly. They also linked the low aesthetic quality to the lack of green elements in the neighbourhood. When answering if there are any beautiful elements in the neighbourhood, one participant responded:

> Participant: Nothing. There even used to be a park opposite our house, but
> they built houses there.'

> Another participant said: 'The problem is that everything looks alike.'

As to why the participants were not very bothered by the reported low aesthetic quality of the neighbourhood, they believed that their neighbourhood had the advantage of having a wide, organised street layout. This feature made the neighbourhood look open and visually pleasing and made them less focused on the houses' exteriors.

> Participant: 'They [the houses] look ok. They are far from each other.'

The participants thought that the aesthetic quality of the neighbourhood improved over time because the homeowners started making changes to their houses' facades, some of which added beauty to the neighbourhood's appearance. They also thought that adding plants to the houses improved the aesthetic quality but thought that those additions were minimal.

Figure 5.5. Word cloud - Top 50 words used by participants to discuss the cause of evaluation for the 'Aesthetics' theme

Although the question implied referring to the physical features of the neighbourhood to discuss its aesthetic quality, the participants who evaluated this theme positively referred mainly to non-physical features. They also attributed specific feelings to the physical features they discussed for this theme. For instance, they thought the neighbourhood layout looked nice because it was dense and reminded them of the traditional Bahraini neighbourhood. Also, they believed density caused frequent informal encounters between the neighbours, which to them was beautiful. Participants also reported that as a response to Covid19 outbreak and the restrictions on accessing indoor facilities, several small business owners started a food truck business by the beach. To them, those looked nice, especially since it started attracting people to the beach.

> Participant: 'I will base this on culture: our culture here in Bahrain, Muharraq particularly … The area feels familiar … It is as if you are talking about old neighbourhoods because the houses are dense, so whenever someone leaves their house when a woman leaves her house, she meets her neighbour, and a man would meet his neighbour. Because our housing system in Al-Sayah is dense, you get a sense of intimacy of old areas.'

5.2.3. Social Contact

Being on good terms with the neighbours was important to all participants, and their satisfaction with their neighbours improved their evaluation of the 'adaptability' and 'psychological wellbeing' themes. However, participants differed in what they considered 'good' social contact.

<u>Evaluation</u>

Participants referred to three criteria when evaluating social contact: 1) frequency of contact, 2) duration (length of encounter), and 3) type of encounter (formal or informal). The evaluation criteria are summarized in Figure 5. 6, along with a sample of responses used to identify them. Most participants preferred informal contact (casual encounters outside their houses) regardless of their personality style (introverts or extroverts). Most Introverts evaluated the 'social contact' positively. Some believed it was weak but were still satisfied with it. Introverts were conscious of their personality style and explicitly referred to it when evaluating this theme. However, extroverts did not specify their personality style, but they mentioned features that can put them in this category. The difference between the two personality styles was mainly in the preference of extroverts for 'longer' and more 'frequent' encounters. Residents' background information affected their evaluation of this theme (this is detailed in section 5.3). Male participants reported higher levels of social contact than female participants, yet they were still less satisfied with its level. The result of the evaluation of this theme is summarised in Figure 5. 7.

Frequency of encounters

Participant:

'The thing that bothers me in the area is that people are not that close. They don't chat as often. It feels secluded. The area seems a little quiet.'

Duration of encounters

Participant:

'Not really, no we don't visit each other. We just exchange greetings by the mosque.

Type of encounters

Formal (planned) or informal (casual)

Participant:

'It's just 'Salam' [greetings], nothing more.'

Figure 5. 6. Extracted resident criteria for evaluating 'Social contact'
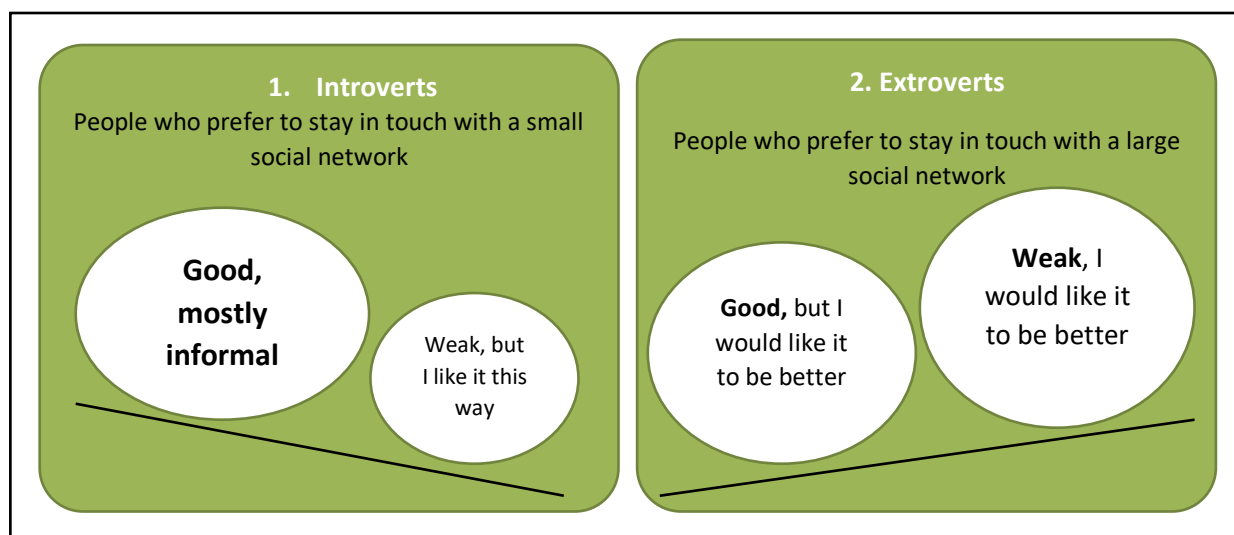
Figure 5.7. 'Social contact' - Evaluation summary

Cause of Evaluation

I used a word cloud to set the scene for the justifications given by the residents to evaluate the 'social contact' theme. Figure 5. 8 displays the top 100 words used by the participants to discuss this theme. The word search was filtered to include social networks, places of social contact, and time characteristics of social contact (when, how long, and how frequent). Most of the words refer to outdoor spaces, with the word 'mosque' dominating the coded responses. Although mosques are primarily indoor halls used for praying, most of the responses referred to the outdoor area nearby the mosque (not formally belonging to it). The activities associated with this space referred minimally to prayers and mostly to chats and casual greetings. The word 'groups' also stands out. This was primarily used to reference virtual WhatsApp groups created by the neighbours, which is probably inflated because of the outbreak of Covid19 and the restrictions on face-to-face contact.

Gender played a main role in categorising the responses given for 'social contact'. Male participants reported having higher levels of 'informal encounters' in the neighbourhood than females. Most respondents mentioned that the encounters mainly happened on the way to the mosque. In Islamic teachings, men are obliged to attend five congregational prayers at the mosque[8] every day (which is optional for women). This explains why males reported higher levels of casual encounters. Females (particularly working mothers of younger children) significantly reported having lower levels of informal encounters. Regardless of being introverted or extroverted, both genders reported appreciating and needing to have casual encounters with

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[8] Five short prayers by sunrise, noon, afternoon, sunset, and evening.

their neighbours. However, extrovert females mentioned formal encounters (such as arranging visits to their neighbours) more frequently than casual ones.

Figure 5. 8. Word cloud - Top 100 words used by participants to discuss the 'Social contact' theme

The main causes for low encounters 'frequency' (after overlooking the effect of Covid19 outbreak) were: personal preference; not having a reason or time to go outside the house; and not using the neighbourhood services as often (especially in the old Alsayah where the facilities were built after the residents' moved in. As for the duration of the encounters, this was related to the interest level of the encountered neighbours, as well as the availability of a space suitable for having a chat. Those results are summarised in Figure 5. 9.

Frequency

Not having a reason or time to go outside the house

A working mom:

'I didn't have a chance to meet them because I rarely go outside. I'm busy with my job and with my kids' schools, I don't really have time to meet anyone.

Not using nearby community facilities

A retired male participant:

'We don't even have a cold store here (participant laughing), so we can't just run into someone nearby.'

Personal preference

A male participant:

'I have a majlis at home. I welcome all neighbours, but not everyone like to come'

Duration

Absence of a suitable space for catching up

A retired male participant:
'I know the ones [neighbours] around us. We sit together [by the door] if the weather is nice... there is a sitting area made by my neighbour in front of me. He made a sort of garden'

Personal preference

Female participant:

'They [neighbours] also pay each other visits in the morning. They were also kind enough to visit me, but I don't go out often.'

Figure 5. 9. Causes of low encounter 'Frequency' and 'Duration' – summary and sample of responses

5.2.4. Housing Suitability

Evaluation

Only one participant was satisfied with the housing unit he received and reported that he did not need to make any modifications to the house. Participants who evaluated this theme positively were strictly referring to the house after they modified it. Several participants reported that the house met their needs after modifying it, but they still consider it a temporary residence.

> Participant: *'We modified the house when we moved in. We adjusted it based on our needs. we changed things, added things, added many spaces... We renovated it; we actually renovated the whole house.'*

The only participant who evaluated this theme positively reported that the housing unit he received is significantly better than his former residence, as he used to live in a single room with an ensuite. Residents who evaluated this theme negatively referred to recurrent physical problems, as depicted in Figure 5. 10, which were the very small areas of bedrooms and living spaces, and the insufficient number of bedrooms and bathrooms to the typical Bahraini household size. They were also disturbed by the fact that they had to make extensive changes to the whole house, and they reported that many of the modifications were in violation of municipal regulations. They believed that without those unauthorized modifications, the housing unit would not have met their family needs.

Figure 5. 10. Word cloud - Top 50 words used by participants to discuss the 'housing suitability' theme

> Participant: 'Look, what's bothering us about the house is the municipality and housing ministry... They don't allow us to make our house however we wish. They have many conditions.'

Several participants reported having to house members of their extended family with them, including parents or married offspring. They did so for one of two reasons, either to help take care of their parents or grandchildren (those who have working mothers); or to help their family

financially by sparing them the rent expenses. To do so, many residents had to modify the house to an apartment layout and extensively increase the number of bedrooms, which is a violation of the building code in affordable housing areas. Those also reported that the parking in their area started to be problematic because of the increased number of cars per house, especially since cars are the primarily used mode of transportation in Bahrain.

> Participant: 'It [the house] doesn't cover our residential needs. My kids, my son, who got married, is living with me. So I made some changes in it [the house].'

5.2.5. Support and Influence

Most of the participants regarded support and influence as a formal process and discussed it based on their experience with formal authorities (mostly the local municipality or the Ministry of Housing and Urban Planning). They also perceived it as a process for solving problems, not for influencing positive change based on the community's needs. Only one participant discussed the informal dimension of this theme and what the neighbours can do to make changes in their neighbourhood.

Evaluation

Most of the participants were negative about the current state and the prospects of support and influence in their area. Another form of negative evaluation was in the common indifference towards this theme or the satisfaction with a very low level of support and influence.

> Participant: 'We can take part in affecting decisions in the area. But if we couldn't, that's also fine.'

Very few participants were positive in evaluating this theme and believed they could easily and effectively influence the decisions in their area. They also provided examples of changes they made in the area, which were mostly to solve service problems.

> Participant: 'It happened [making changes] When we were building our house if our neighbours were cleaning with water, it'd reach my house and get mixed with the mud and dirt. It got messy... I contacted our municipal representative. And he kindly responded immediately.'

Residents' negative evaluations of this theme were mostly reported when they had a negative experience when reaching out to authorities to solve problems in their area. Some believe that locals aren't aware of their rights and responsibilities, which makes 'support and influence' quite difficult to understand outside the realm of formal processes.

> Participant: 'Yes [I contacted authorities to report a problem], but nobody did anything for us, to be honest, regarding the accumulating water, we had to do something ourselves.'

> Participant: 'When you house residents, you need to inform them about their rights and responsibilities.'

Those who reported positive 'support and influence' experiences had direct contact with the elected municipal council via social media using a WhatsApp group. The group was public to all residents, but not all of them knew about it, especially the age group of 60 years and above and the ones with 'below high school' educational level. Gender did not affect the given responses, although female participants were slightly less confident in responding to this question than males. Some even viewed reaching out to influence the decision in the area as a negative or intrusive act.

> Female participant: 'I really never had to do that [take a role in making changes in the area]. I am a very peaceful person, introverted; I don't involve with others.

Only one participant discussed the informal aspect of support and influence and believed that as a community, the locals should take an active role in improving their neighbourhood (especially the more financially capable ones) as a way to pay back the community.

> Participant: 'They [local municipality] planted the area, and at one point, they said they had a water problem, you know, few workers and the Coronavirus situation and so. The water tanker did not come to water [the park]. We watered the park. We took water from our homes... We did that because it is our area.'

5.3. The Relationship Between the Collected Background Information and the POE Themes

Below, I display the relationship between the background attributes of the participants and the 'content' and 'coverage pattern' for the top five ranked POE themes (based on coding frequency). The background information I examined were age, gender, educational level, family size, and location. For maintaining the legibility of this chapter, the following section only displays the correlations that had significant bearings on the findings. Those background information included age and gender. The discussion of the relationship between the top five ranked POE themes and the remaining background information: educational level, family size, and location can be found in appendix h.

5.3.1. The Relationship Between 'Age' and the Five Top-Ranked POE Themes.

The hierarchy chart in Figure 5. 11. displays the age of participants against the coding coverage for the aforementioned themes, along with a sample of residents' responses to selected themes. For the Support and Influence' theme, while the coverage differed significantly across the different age subgroups, the content remained relatively similar. The main finding is that while most of the participants referred to formal authorities to discuss 'support and influence', residents 'aged 60 and above' were the only ones to refer to informal processes of support and influence. They were also the only ones to identify distinct social networks within the community that they were either aware of or belonged to and discussed how their presence affected the area.

> Participant 'age 60 and above': 'We try to achieve these things in the area. Let me tell you about something that happened in the neighbourhood. We had a brother, and it happened that his son got cancer. He did not complain, but we know his financial status and the difficulty of the situation. Those in the neighbourhood who could help around the hospital did. Those who could help him financially did. Those who were able to support him and stand along with him in some things did. They rushed to help him. I don't know how to explain it, but you should be able to understand.'
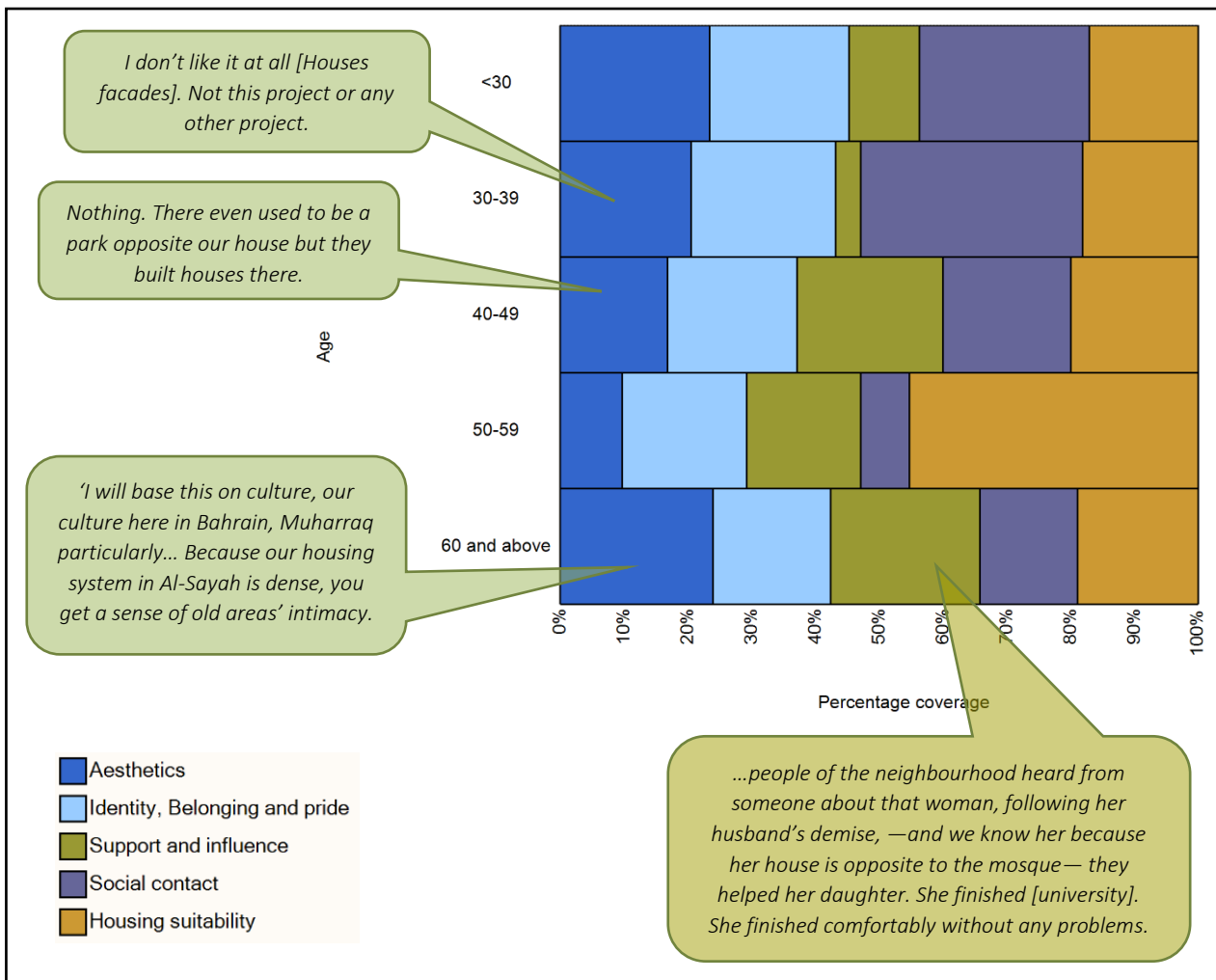
Figure 5. 11. Coverage Hierarchy Chart by age for the top 5 ranked POE themes, and selected samples of responses

The coverage of the 'aesthetics' theme was higher for younger age groups and slightly decreased as the respondents' age increased (figure 5. 11). This percentage increased again to 24.17% for residents aged '60 and above', who had the highest coverage for this theme. As for the content, although most of the participants across the various age group were relatively negative in their evaluation, the focus of their justifications differed slightly as their age increased. Younger respondents focused more on the appearance of the houses to evaluate the neighbourhood's aesthetic quality, while the older ones brought up justifications that related to the neighbourhood features (such as the presence of green elements and the layout of the streets). Participants aged '60 and above' also referred to non-physical features to explain the aesthetic quality of their neighbourhood.

> Participant 'age 60 and above' explaining what is beautiful in their
> neighbourhood: 'I will base this on culture, our culture here in Bahrain,

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> Muharraq particularly... Because our housing system in Al-Sayah is dense,
> you get a sense of old areas' intimacy.'

'Age' did not affect either the content or the coverage of the 'identity, belonging and pride' theme. Although the coverage of 'Social contact' was significantly different across the various age groups (figure 5. 11), this had no implication on their evaluations or their given justifications. The same applies to the 'Housing suitability' theme, which was significantly more discussed by the age group of '50-59', yet, the content of the residents' narrative was relatively consistent across all age subgroups.

5.3.2. The Relationship Between 'Gender' and the Five Top-Ranked POE Themes

As presented in Figure 5. 12, male participants provided their feedback with a more uniform coverage across the five themes than female participants. The main difference between the two genders was in the increased focus among females on 'Housing suitability' and 'Social contact' at the expense of the 'Support and Influence' theme. The evaluation of the themes was generally consistent across male and female participants, but the two genders differed in the level of interest and the given justifications for the themes' evaluation.

While males were persistent in their expressed opinions (either explicitly positive or negative), females displayed a shift in their evaluation of the 'Housing suitability' theme over time. Females were conscious of this change of evaluation, where they viewed the 'housing suitability' as very bad initially, which shifted to good after they made changes to their houses. Females constantly referred to time spent in the area, which made them develop a sentimental value towards the house. Female participants were also more elaborate and specific in recalling the modifications they made in their houses.

Female participant: 'It [the house] has three rooms on the first floor and a small living room on the ground floor. It's very small. And there is another small living room. That's it. It was too small. The rooms were small.'
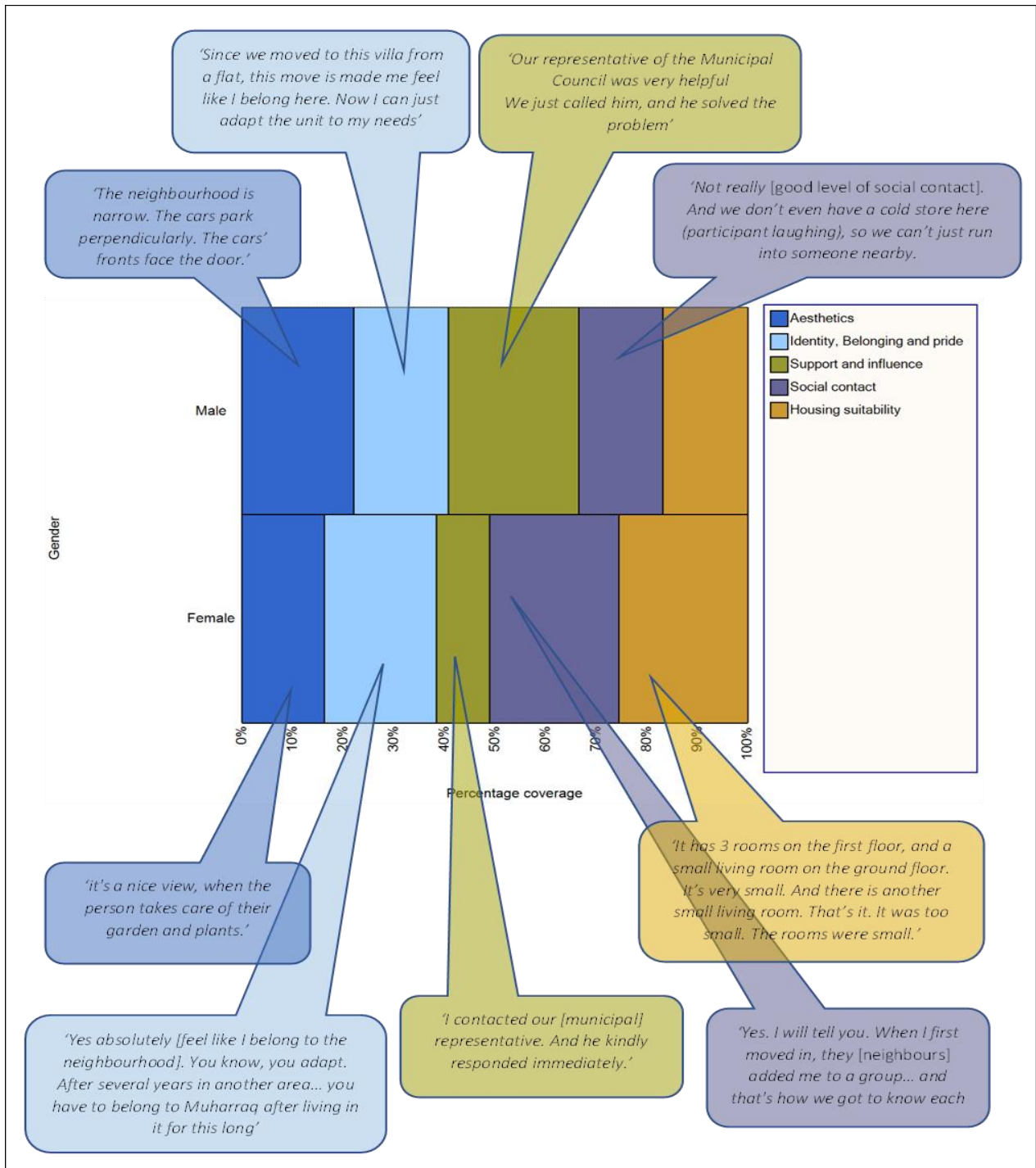
Figure 5. 12. Coverage Hierarchy Chart by gender for the top 5 ranked POE themes, and selected samples of responses

Although both genders evaluated the 'Aesthetics' theme negatively and reported that the identical house facades were the main reason for that, females were more willing to overlook the neighbourhood's aesthetic quality once they became satisfied with their own house aesthetics.

> Male participant: 'The neighbourhood is narrow. The cars park perpendicularly. The cars' fronts face the door.'

> Female participant: 'There is nothing beautiful in affordable housing projects. They are all the same. Ours is better because the houses are more spacious.'.

Females were more leaning towards elaborating on the interior and exterior features they modified in their houses, while males focused more on the neighbourhood's physical features. This was also evident when elaborating on the effect of natural elements on the aesthetic quality of the neighbourhood. Female participants discussed the green elements within the house property, while males discussed the public parks in the neighbourhood.

> Male participant: 'We do have a nearby park. It's quite small, but it's fine.'

> Female participant: 'It's a nice view when the person takes care of their garden and plants.'

The 'Support and influence' theme was significantly more discussed by male participants, with 25.78% coverage compared to only 10.67% by females. Although males showed more interest when discussing this theme, the content of residents' narratives remained similar across the two genders. As for 'Identity, Belonging and Pride', this theme had a similar coverage and content by both males and females. However, just as in the 'Housing suitability' theme, females referred again to the time spent in the area as a factor that influences their belonging. When it comes to 'Social contact', this theme was significantly more discussed by female participants, with a coverage of 25.54% compared to 16.53% for males. Although the theme was evaluated similarly by both genders, females mentioned formal or planned encounters more than casual ones, while males focused on casual encounters on the way to various community facilities. Refer to Figure 5. 12 to view the coverage and response samples of the reported findings.

5.4. Results of the Open-End Coding for the POE Interviews

The open-end coding framework included any recurrent themes that were not identified in the fixed analytical framework of the POE interview. I also coded the themes that were brought up by the participants in places other than their intended place in the interview (e.g., bringing up issues related to 'Walkability and Accessibility' in the theme of 'community facilities' or discussing 'connection to nature' while answering the question related to 'aesthetics'). The open-end coding of the POE interviews generated 17 themes which were casually brought up by the participants while answering the interview questions[9]. Those are presented below in order of highest coding frequency:

1. Physical Features.
2. Mode of transportation.
3. Feelings.
4. Problems.
5. Equity.
6. Activities.
7. Personal traits and preferences.
8. Opinion on social behaviour.
9. Ways of Getting to know others.
10. Frequency of usage.
11. Social network.
12. Identified places.
13. Ways to change attitudes and perceptions.
14. Significance of the discussed theme.
15. Awareness.
16. Changed perceptions and attitudes.
17. Factors influencing major life choices.

Figure 5. 13 shows the coding frequencies for each theme of the open-end coding framework. The themes that had significantly higher frequency occurrences were 'Physical Features', 'Mode of transportation', 'Feelings', and 'Significance of the discussed theme'. The frequency details for these themes are presented in Table 5. 3, and their findings are discussed below in order of highest frequency.

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[9] Refer to Appendix j. table 1 for themes (codes) definitions.
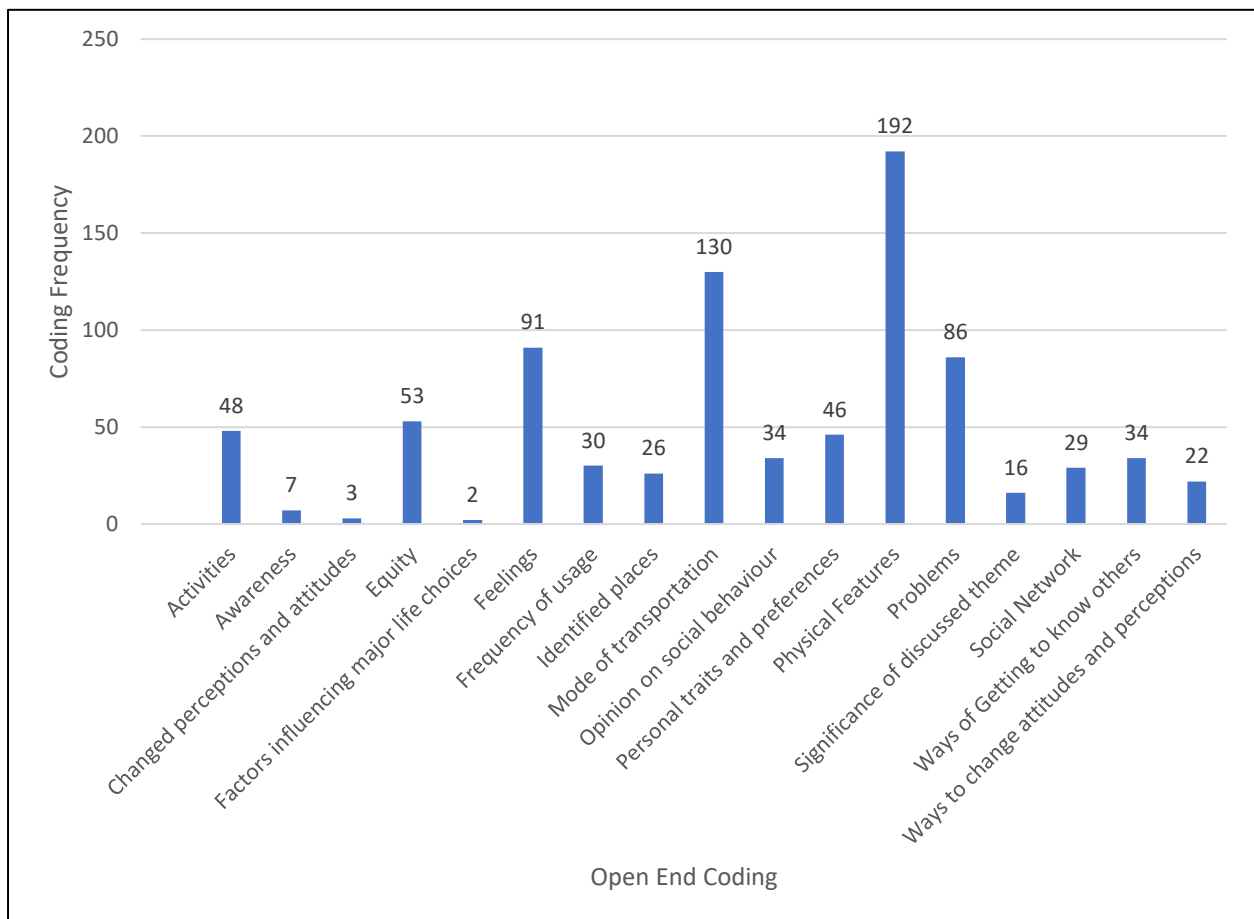
Figure 5. 13. Coding frequency of the open-end Coding of POE interviews

Table 5.3. Open-end coding references for each participant at the POE- Heat Table

Open-end coding Framework Themes	Participant												Total
	1	2	3	4	5	6	7	8	9	10	10	12	
Feelings	7	7	8	0	30	10	12	3	5	2	4	3	91
Mode of transportation	13	9	17	4	8	21	14	6	5	6	13	14	130
Physical Features	40	13	17	7	26	20	12	12	6	6	12	21	192
Problems	0	0	13	3	10	4	20	8	3	8	13	4	86
Colour coding ranges from darkest to lightest, with darker shades representing higher frequencies.													

5.4.1. Physical Features

The theme 'Physical features' was the most discussed one by the participants, with a total of 192 occurrences. I defined this theme as 'Reference to specific physical features in the built

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environment that cause a specific impact to the participant'. In addition to its high frequency, this theme was present in all participants' responses, as shown in Table 5. 3.

Figure 5. 14 shows a word cloud of the 50 top-used words by the participants when discussing this theme. The used words had equal focus on the scale of the 'neighbourhood' and the 'houses'. There was also a significant reference to 'people' in general and 'children' in particular when discussing this theme. Words like 'room', 'change' and 'feel' were also dominant across the discussion of the physical features of the neighbourhood components.

Figure 5. 14. Word cloud of 50 top words used by participants when discussing the 'Physical Features' theme

5.4.2. Mode of Transportation

The second frequently discussed theme was 'Mode of transportation' with 130 occurrences. I defined this theme as 'Choices and reasons behind the selected way of transportation'. The majority of the respondents discussed walking and cycling either for recreational or exercise purposes. However, a word cloud for the top frequently used in this theme shows that those mentions were minor in comparison to the word 'car', as depicted in Figure 5. 15. The figure also shows that 'mosques' and 'stores' were frequently brought up when discussing selected modes of transportation. The content analysis for the codes of this theme shows that 'mosques' were more associated with walking, while 'store' was more associated with cars.
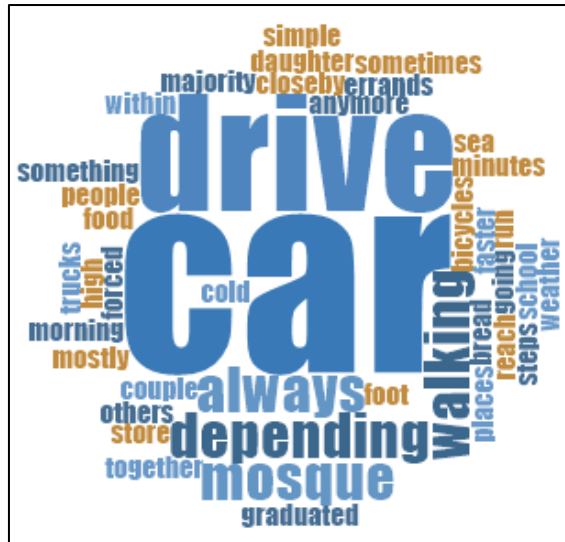
Figure 5. 15. Word cloud of 50 top words used by participants when discussing the 'Mode of Transportation' theme

5.4.3. Feelings

The next theme was 'Feelings' with 91 occurrences. I defined this theme as 'Discussed or implied personal emotions'. While this theme accounts for many codes within the open-end coding framework, around one-third of them came from the same participant, as depicted in Table 5. 3. Feelings related to the neighbourhood, in general, were slightly difficult to define by the participants. This was expressed through sentences like: 'I don't know [chuckles]. The feeling is just there.' The same applies to the cause they gave for their expressed feelings as in the following quote: 'I don't know how to explain it, but you should be able to understand'. The top words used by the participants to discuss this theme are displayed in Figure 5. 16. The expressed feelings revolved around three topics which were 'neighbourhood density', 'residents' ethnographic background', and 'the design of the provided affordable housing unit'.

Figure 5. 16. Word cloud of 50 top words used by participants when discussing the 'Feelings' theme

Neighbourhood density

The most expressed feeling about the neighbourhood density was the comfort and happiness that the residents felt because of the relatively large distance between the opposite rows of houses. Figure 5. 17 shows a recent photograph of Alsayah neighbourhood, which demonstrates this distance. The residents' comfort was expressed in opinions like: 1t actually gives you privacy and spaciousness. It's not like if you open the door of your house and immediately see your neighbour. Not that there is a problem with that, but it's nice to have this space in front of the house. Men have a chance to get in touch with their neighbours, and women have a chance to visit their neighbours too, so it's nice.'

Figure 5. 17. A photograph taken for Alsayah Affordable housing neighbourhood

The ethnographic background of the residents

The residents in Alsayah neighbourhood were particularly satisfied with the neighbours living in their area. A male participant said about the neighbourhood: 'We lived amongst kind neighbours, and we moved amongst others good and kind neighbours. Nothing felt different. We all love each other around'. Participants were hesitant, though explicit, in saying that they were comfortable because their neighbourhood had a very small proportion of recently neutralised citizens.

They expressed this by saying things like: 'They're nice and friendly. Yes, they're neutralised Syrians and Yemenis. They're nice and friendly, but we don't get along that well. Just greetings.'

Another said: 'I was worried about those things. I worried about my kids mixing up with the wrong people.'.

Feelings related to the design of the house

Almost all the participants expressed the same range of emotions about the design of the affordable house they obtained, especially in relation to the size and provision of the spaces. Those feelings were discomfort with the initial design, minimal privacy for the residents because of the number of rooms and bathrooms, and appreciation of the homey feeling of a small house.

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One female participant made many changes in her house to enlarge the spaces and provide separate rooms for her kids. Following these changes, she was contemptuous of her house, especially its cosiness of it. She said: 'I don't know if you will get it, but sometimes the smaller house is more cosy, homier.'.

Another participant said while justifying the need to enlarge and increase the spaces in his house: 'You give me this minuscule house [sarcastic term used] and expect me to live in it?'

In a similar view, a male participant discussed how he wanted his kids to feel in their house by saying: 'I gave them all their privacy. Every one of them has their own room and bathroom.'.

5.4.4.Problems

Although the POE interview did not have a question designed to enquire about the problems in the neighbourhood, the 'Problems' theme was the fourth most discussed theme by the participants with 86 coding occurrences (table 5. 3). I defined the 'Problems' theme as 'issues raised by the respondents that cause physical or emotional discomfort. As shown in Figure 5. 18, participants used words like 'neighbourhood', 'neighbour', and 'people' frequently when they discussed the problems they have in their residential neighbourhood. Both sides of the neighbourhood (the Old and New Alsayah, as referred to by the residents) had a water accumulation problem caused by the natural slope of the area and the lack of an efficient drainage system.

Figure 5. 18. Word cloud of 50 top words used by participants when discussing the 'Problems' theme

One of the participants in the New Alsayah said while answering a question about 'identity, Belonging, and Pride': 'If my neighbour washes his car] the water reaches the entire neighbourhood. When you wash your car, you should be careful. Use a little water. Some people use a lot and mess up the entire neighbourhood.'.

Another participant from the Old Alsayah said when discussing the 'support and influence' theme: '…Just the sewage, their drainage is not convenient. You shouldn't bring trucks to empty the septic tanks. It's a new neighbourhood. It should have had a sewage system and not tanks that get emptied by trucks. I don't know why the engineers did this. How long would you keep such an old system? You know we have an issue that the area is slightly sloped, so if someone cleans his car, all the water comes down and accumulates here.'

The word 'park' was also used a lot when discussing problems, but that was mostly by the same participant. She referred to her problem three times while responding to three different interview questions. She expressed her opinion by saying: 'Do you know what is bothering us? It's not just me. Do you know what's bothering the entire neighbourhood? … The park in the middle… I didn't want the house because of the park. Our house is opposite the park, and we're very bothered… I have called the police several times because they [children/teens] were starting fires at night. They broke my daughter's car window. Ever since the community police arrived, they stopped doing stuff at the park.'.

Another participant referred to the same problem while responding to the question about recreational facilities. He said: 'Well, umm … We even reported them to the police. They come and, umm… they use… what can I tell you, they sniff glue. And this place is for kids, so they stopped them from coming here. The municipality was very helpful, Almannai, our representative of the Municipal Council, was very helpful. We just called him, and he solved the problem. They don't come here anymore.'.

5.5. The Relationship Between Background Information and the Top-Ranked Themes of the Open-End Coding

The following section displays the relationship between the participants' collected background information (or attributes) and the top-ranked open-end coding themes. The results are displayed based on the content and the coverage of the themes within each attribute and sub-group of attributes (e.g., age in general and specific age groups). To ensure that the theme coverage is comparable between the different subgroups, the coverage for each theme is

expressed as a percentage of the total codes for the analysed sub-group. Therefore, the results for the coverage are visually represented using a '100% stacked bar' chart. The 'content' results are discussed within the text and expressed visually through sample quotes that are overlapped with the stacked bar (Figure 5. 23). For maintaining the legibility of this chapter, the following section only displays the correlations that had significant bearings on the findings. Those background information included age and gender. The discussion of the relationship between the top five ranked POE themes and the remaining background information: educational level, family size, and location can be found in appendix i.

5.5.1. Age

The hierarchy chart in Figure 5. 19 displays the age of participants against the coding coverage for 'Physical Features', 'Mode of transportation', 'Feelings' and 'Problems' themes. The Age group 'below 30' and '50-59' had a similar coverage pattern. While groups of '30-39', '40-49' and '60 and above' presented another pattern. Despite the different coverage patterns across the age groups, the expressed feelings were generally consistent, as shown in the response samples in Figure 5. 23.

'There is just a puddle in front of us.'

'The spaces in some areas were unreasonably small.'

'I don't want to sound racist but... they are not accustomed to our culture'

'We're very bothered by the park. If they turn them into parking spaces, it would be much better.'

'The only problem we have is parking space. Everyone is complaining because of it.'

'Yeah, it's a little busy there [the commercial road near by]. The area there is very cramped. Even Busaiteen road that has many shops is also cramped and busy'

'The area is safe and quiet... this makes the area feel comfortable.'

For me happiness relates to satisfaction. Personally, I get satisfied easily, so living in a house of mine makes me happy. But there is also ambition. Ones want a bigger house, better location, more rooms, more facilities, a bigger yard with plantation space... I only want more for my family, but I'm satisfied with what I have for me.

I love it a lot. I really really love Busaiteen (strongly). It's very nice.

'You know, here, we don't even lock our doors, we keep everything open. It's very safe here'

Feelings
Problems
Physical Features
Mode of transportation

'I am used to going out in the morning for walks.'

'Some places we walk to, others we drive to.'

'We mostly use the car. Even for something as simple as bread.'

[my kids] graduated high school and they drive. They don't walk anymore... we only drive.'

'I don't really walk around; I always use the car.'

<30
30-39
40-49
50-59
60 and above

0% 10% 20% 30% 40% 50% 60% 70% 80% 90% 100%

Percentage coverage

'We expanded a lot.'

'The spaces in some areas [in the house] were unreasonably small.'

'The width of the streets gives you enough space in front of your house so it's not very close to the street.'

'We expanded many things, not a little. We changed it entirely.'

'Give me a yard and a garden, where I can water the plants a little and drink a cup of tea in the yard and place a small table and a chair.'

Figure 5. 19. Hierarchy Chart: Open-end Coding by Age, with a sample of responses for each segment

Age and Physical Features

Although the expressed opinions were generally consistent, the different age groups focused on different aspects of their neighbourhood's physical features. Both age groups of (40-49) and (60 and above) provided more details about the adjustments they made to the spaces in the house (especially rooms and living rooms), as well as adding an extra ensuite to have a separate room

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for each child. While the age group of '50-59' provided more details about the changes they made to their house facades.

> Participant (60 and above): 'I built [flats on the first and second floor] for the boys. I had to turn the yard into a garage; I had to build flats. I built my other son a flat on top.'.

Age and Mode of Transportation

Again, the participants provided similar remarks on their preferred mode of transportation (which was primarily cars). However, the age group of 'below 30' discussed in more detail the walkability in their neighbourhood and walking for recreational or exercising purposes. The discussion of walkability was minimal in the remaining age groups.

> Participant (below 30): 'Many people walk by the sea.' And 'I am used to going out in the morning for walks.'

> Participant (40-49): 'There is nothing close by that my daughter can walk to. We have to use a car.

> Participant (60 and above): 'I don't really walk around. I always use the car.'.

Age and Feelings

As the age of the sample increased, their focus shifted from expressing feelings related to their houses to ones related to their area in general.

> Participant (60 and above): 'I like it when people ask about each other. It makes an area nice. Sitting in a corner in the fireej [local word for neighbourhood]. Chatting, and so on. I like it like that.'.

Age and Problems

Age had no impact on the problems discussed by the participants.

gender had a strong impact on the coverage and content of the discussed themes. The result of this relationship is presented in Figure 5. 20.
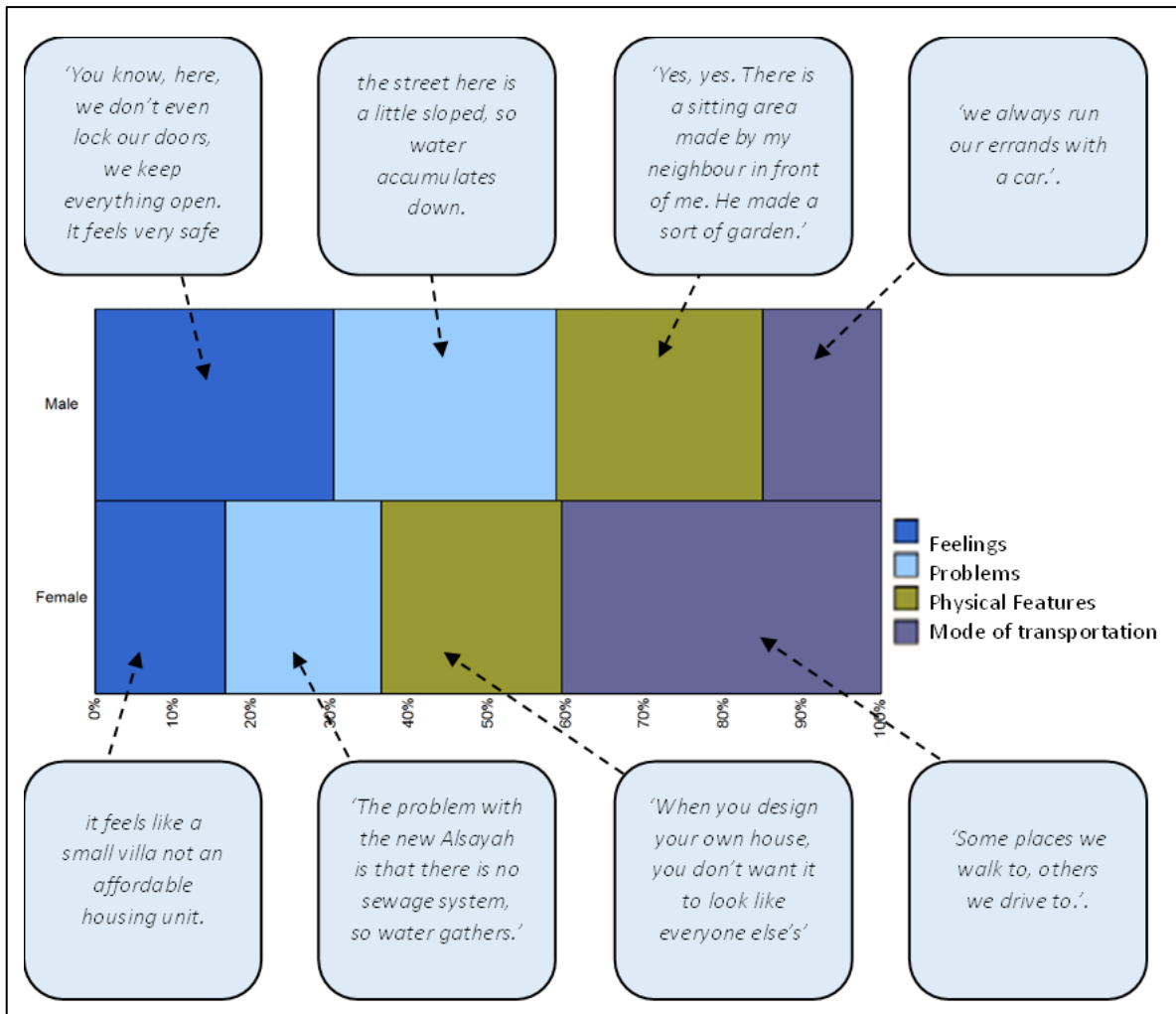
Figure 5. 20. Hierarchy Chart: Open-end Coding by Gender, with a sample of responses for each segment

Gender and Physical Features

While 'physical Features' had a similar coverage across the two genders, the focus on male participants was more towards the features at the neighbourhood scale. Females, on the other hand, focussed on the physical features at the scale of the housing unit, both for indoor and outdoor spaces. This is represented in the views below, as well as in Figure 5. 20.

> Male participant: 'Yes, yes. There is a sitting area made by my neighbour in front of me. He made a sort of garden.'

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Female participant: 'When you design your own house, you don't want it to look like everyone else's.'

Another female participant: 'Smaller house is cosier, homier. A small house is sometimes a blessing. Everyone is around you. A big house can be chaotic, everyone in his own room and own space, but in a small house, you always feel like your family is close to you.

Gender and Transportation

Females talked more about walking in the nearby areas. In contrast, males talked mostly about driving.

Female participant: 'No, we walk. It's just a couple of steps.'.

Male: 'We always run our errands with a car.'.

Gender and Feelings

In terms of feelings, both genders reported similar feelings around the discussed themes (e.g., perceived privacy because of the large space in front of the house or feeling annoyed by the lack of community facilities in the early years of the project). There was, however, a significant difference between the coverage and focus of the 'Feelings' theme by the two genders. Males discussed 'Feelings' more extensively than females (30% coverage across males compared to 16% across female participants). Male participants focused throughout the discussion on how the neighbourhood elements made them feel.

Male participant: 'You know, here, we don't even lock our doors. We keep everything open. It feels very safe here.'

Female participants focused more on how they felt because of the features of the housing units. Even when they discussed elements at the neighbourhood scale, such as density, females mostly expressed their opinions in terms of how such elements made them feel from inside the house.

Female participant: 'If there is someone behind [referring to dense housing layout] … you feel surrounded from all areas. It feels suffocating… you can't enjoy the backyard.'.

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Gender and Problems

Male participants discussed the 'problems' theme with more coverage (28% for males compared to 19% for females), as shown in Figure 5. 24. The coverage difference did not affect the content of the theme, which discussed the same issues of sewage system; the difficulty of living with neighbours of mixed ethnic backgrounds; the inconvenience of the small size and layout of the housing unit; the lack of places to add green elements; and the dense parking at some areas of the neighbourhood. Figure 5. 24 provides a sample of the common responses found in the 'Problems' theme based on the participant's gender.

> Male Participant: 'If I give someone a housing unit knowing that they will change it, why don't I, from the start, well, there's supposed to be communication between a person and the contractor, or for the sum to be given to the beneficiary, not given to them, but give the beneficiary the freedom to choose. '

> Female Participant: 'Everybody has different needs. I cannot create a single model for all needs. There must be change. Why do you build things if you're going to change them in the end? There should be an in-between mechanism because reality suggests that after all these studies, everybody is changing and demolishing [units]. So why pay twice?'

5.6. Summary

The research sample included 12 participants with a diverse range of background information which facilitated the representativeness of the sample for the selected population (adult residents of Alsayah affordable housing neighbourhood). The attribute of 'ethnic background' was not provided by any participant, which indicates that the participants either only identified with the Bahraini nationality or chose to withhold this information. The participants' evaluations for the 11 themes of the POE analytical framework were generally consistent. Significant variations in residents' narratives were mostly in the causes they gave to justify their evaluations, while the evaluation itself remained relatively similar across the sample. Gender was the main attribute to affect the provided residents' narratives, followed by age.

The open-end coding resulted in a framework consisting of 17 themes which were: Physical Features, Mode of transportation, Feelings, Significance of the discussed theme, Equity, Activities, Personal traits and preferences, Opinion on social behaviour, Ways of Getting to know

others, Frequency of usage, Ways to change attitudes and perceptions, Identified places, Awareness, Changed perceptions and attitudes, and Factors influencing major life choices. Female participants focused more on the features of the housing unit to elaborate and justify their responses, while males focused slightly more on the elements at the neighbourhood level. The most significant social network to the respondents were members of the extended and nuclear family, while neighbours as a general social network were essential in evaluating respondents' psychological wellbeing and willingness to stay longer in the neighbourhood.

The findings presented in this section were isolated for the POE analytical framework and the open-end coding framework. They were also isolated in terms of how they were affected by the respondents' background information. In the following section, I introduce the 'overlap' quantitative measure, where I discuss the significant interrelations between the themes of both analytical frameworks, as well as the participants' attributes. The results are also examined in relation to the larger body of neighbourhood Sustainability Assessment literature in general and to LEED-ND assumptions and recommendations in particular. The discussion section explores the possibilities and limitations of using participatory POE data to adapt generic NSATs to the needs of specific cultural contexts. The section also finetunes a number of LEED-ND indicators and suggests ways to improve its efficiency in achieving community-relevant aims for the context of Muharraq governate, Bahrain.

Chapter 6: Discussion

This research was developed to explore the role that community participation can play in complementing expert-led Neighbourhood Sustainability Assessment Frameworks (NSAFs). The research question was how researchers could use community-led POE data to aid in localising expert-led NSAFs to suit specific cultural contexts. POE is primarily used as a tool for evaluating the success of a development in achieving its stated design aims. The discussion of this method in neighbourhood sustainability assessment (NSA) literature is often brought to verify the assumptions of NSAFs as it can generate empirical data on how people respond (in terms of feelings and behaviours) to living in a specific context.

Despite the accuracy of POE in documenting the impact of living in the examined environment, the validity of its findings is contextually limited. This means that while the findings of POE are reliable in devising intervention plans for existing neighbourhoods, their reliability can be contested in new neighbourhoods. So, when it comes to designing new neighbourhoods, how can we anticipate (with high likelihood) the efficiency of those frameworks in achieving their stated sustainability aims? Especially around subjective issues that are not consistent in every context (e.g., privacy, psychological wellbeing, etc.). At what conditions do such socio-spatial correlations remain valid? What constitutes a context? And since POE findings are extremely context specific, how can we use the knowledge gained by this method to develop new neighbourhoods?

A main cause for the limited validity of POE findings is that it is extremely difficult to identify the cause of the documented findings accurately. Subjective experiences are seldom the result of a singular cause and can be affected by the interplay between multiple physical and non-physical factors at a specific time. They can also be influenced by the past psychological and sociological making of groups and individuals. Therefore, to better understand this causation or the conditions under which they operate, it is imperative to untangle the various physical and non-physical factors that could be at play in an urban setting and how they contribute to creating a specific impact. To provide such a narrative, I used semi-structured, open-end interviews to carry out the POE case study of Alsayah new affordable housing neighbourhood in Muharraq, Bahrain. The theory behind using this method was that POE could provide empirical data on the impact of living in a specific context on the residents and that interviews can provide a deeper understanding of the causes of the reported impacts. This would provide information on how to use community-led POE of existing neighbourhoods to design new ones.

This type of evidence-based forward thinking can be extremely complex as it deals with numerous potential variables. Still, designers and planners are obliged to make informed decisions on how to design environments that are likely to achieve certain aims. This puts untangling the human experience at the core of urban and architectural research to enable practitioners to minimise the gap between the intended outcomes of a design framework and reality. Community-led POE data can provide context-specific information that could feed into reviewing expert-led NSAFs, which could make these frameworks more contextually relevant. The two processes (top-down and bottom-up) need to have clear channels of communication to approach sustainability holistically (environmentally, socially, and economically). Without this dialogue, Neighbourhood sustainability assessment could be torn between experts' idealism and the public's unawareness of the bigger picture.

The case study findings can be clustered into two main categories depicted in Figure 6.1), those include 1) context-specific findings used for localising LEED-ND for the context of affordable housing neighbourhoods in Muharraq, Bahrain, and 2) broader findings related to exploring the ability of community-led POE to localise generic expert-led NSATs for specific contexts. The latter set of results is closely tied to refining the methodological framework I designed for localising expert-led NSATs using community-led POE. The context-specific findings of the POE activity can be classified as 1) Reported evaluations for the fixed themes of the POE framework, 2) causes for the reported evaluations, 3) Open-end themes that capture issues which the residents considered relevant in relation to how they evaluate their neighbourhoods, and 4) mediators that influenced the three earlier categories of findings. Those context-specific findings were then put into practice and used to suggest ways to finetune the LEED-ND framework to make it more responsive to the needs and limitations of Muharraq governate, Bahrain.

Those context-specific findings are then utilised to refine my devised methodological framework for using community-led POE to localise expert-led NSATs and to understand the generalisability and limitations of this framework. The main classification of findings is captured in Figure 6.1. In the following section, I discuss those community-led findings by examining their relationship to existing assumptions and recommendations of expert-led NSA literature and to the recommendations of the twelve community-relevant indicators of the LEED-ND framework, which I identified earlier in the methodology chapter, which was summarised in table 4.3.

To carry the discussion systematically, I introduced the 'coding overlap' quantitative measure to aid in exploring significant interrelationships between the various analytical frameworks. I define coding overlap as the intersection between the contents of two or more codes. The following section discusses the overlap between the results of both analytical

frameworks of the case study (open-end coding and fixed POE framework), the variables that mediated them, and how they relate to existing NSA literature. Those overlaps are viewed with the intention of understanding how various components of the neighbourhood environment interact, the generalisability of these findings, and how they can be used to localise existing expert-led NSAFs to suit specific cultural contexts. In section 6.4, I end up cross-referencing the analytical framework developed based on LEED ND impacts (summarised earlier in table 4.3) to the findings of the community-led POE interviews. The discussion is used to present a finetuned version of a number of LEED-ND indicators to make them more responsive to the context of affordable housing neighbourhoods in Muharraq, Bahrain.
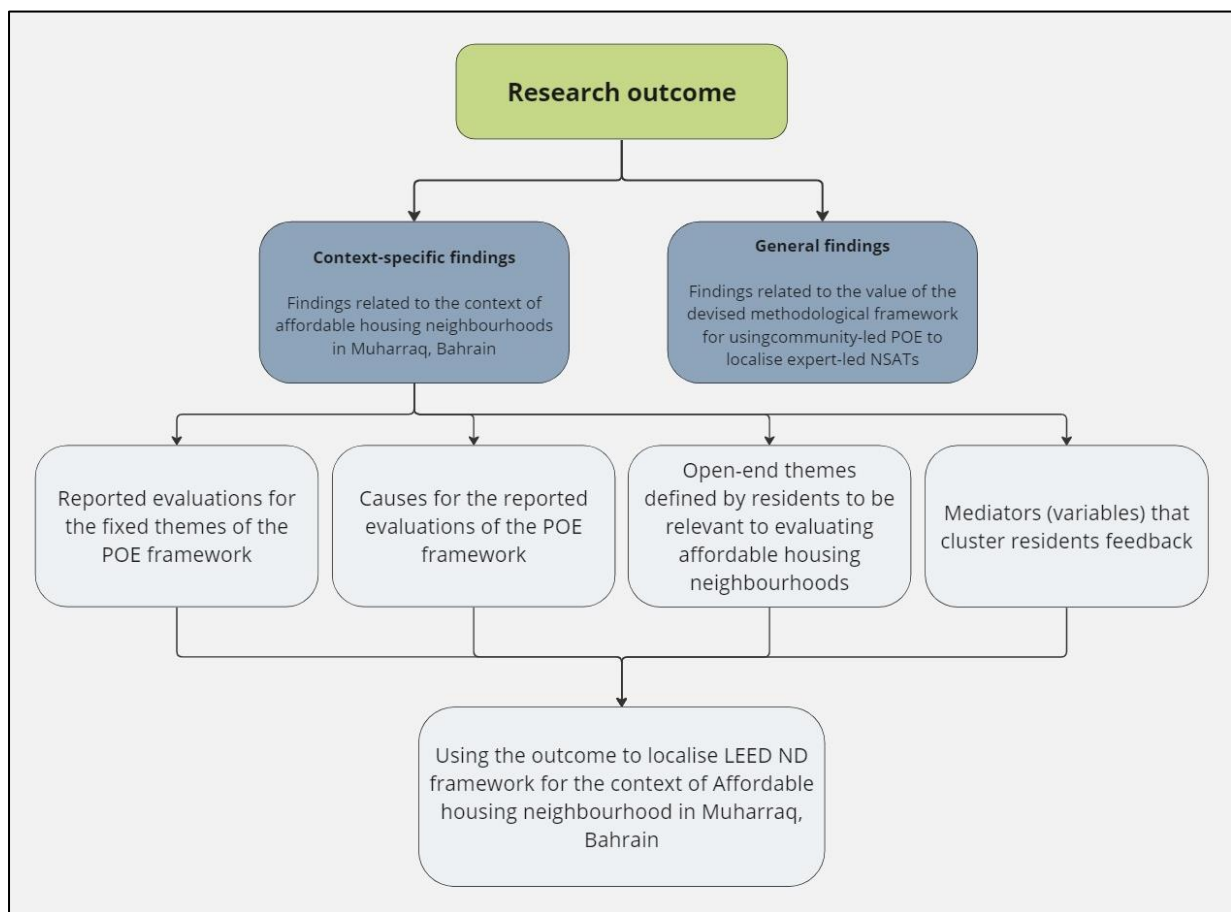
Figure 6.1. Classification of the discussed research outcomes

The open-ended coding framework, I employed in this research, played a pivotal role in facilitating an in-depth analysis of the qualitative data gathered from the community-led POE interviews. This framework allowed for the categorization of data into distinct yet interrelated themes, enabling a nuanced understanding of the residents' perspectives and experiences. The coding process was not just about organizing data but about uncovering the underlying patterns and meanings within the responses. The flexibility inherent in the open-ended approach was crucial in capturing the richness and complexity of the residents' evaluations, ensuring that their

voices were not only heard but also accurately represented. This methodological choice underpins the validity of the study's findings, allowing for a detailed exploration of how the residents' experiences and perceptions align with or diverge from the established LEED ND indicators.

6.1. Variables that Influenced the Direction, or Extent of Evaluation

In the literature review section, I identified variables that were found to influence the residents' evaluation of their houses and neighbourhoods. The influence can either affect the direction of evaluation, meaning wither it pushes it towards the positive or negative side, or the extent, which refers to how high or low an evaluation is. Based on identified factors from the literature review, the availability of residents' profile information in Bahrain's census, along with ethical concerns for privacy and potential impact on participants, I set the collected background information to include: 1) Age, 2) Gender, 3) Educational level, 4) Family size, and 5) Ethnic background (other nationalities that the participant identifies with). I added 'location' as a sixth variable since the residential units in Alsayah neighbourhood were given to the beneficiaries at two stages, which I named 'Old Alsayah' and 'New Alsayah' as frequently called by the residents[10]. These variables were systematically collected from all participants by asking them to provide the information confidentially while filling out the consent form. However, their provision was optional.

In addition to the controlled variables of the residents' background information, the participants brought up other factors that influenced their evaluation of the neighbourhood. Those were coded thematically as a part of the open-end coding analytical framework presented in section 5.4. Those were partially or fully covered in the following themes of the open-end framework: 1) feelings, 2) problems, 3) Personal traits and preferences, 4) Opinions on social behaviour, 5) social networks, 6) Ways to change attitudes and perceptions, 7) Significance of discussed theme, 8) Changed perceptions and attitudes and 9) Factors influencing major life choices. The difference between the variables that influenced residents' evaluation and 'causes of evaluation' is that variables changed the impact of the reported cause by the same participant. This indicates a change of evaluation over time, or under altering circumstances while maintaining the same causes for the initial evaluation (e.g., changing jobs while staying at the same house).

One of the main factors that influenced the results was the time spent in the area. Length of stay has always been associated with positively influencing the social aspects of the residential

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[10] The difference between the two stages is explained in section 4.2.1

environment, especially in terms of place attachment (Manzo & Perkins, 2006) and residential satisfaction (Baum et al., 2010). On the positive side, people were less critical of the problems they faced in their neighbourhood after living in the area for a few years. I overlapped the coded themes that involved time with the fixed POE analytical framework codes and the open-end coding one. I used content analysis to examine the overlapping codes; the analyses showed that time had a stronger effect on reducing the perceived impact of neighbourhood problems after forming good social bonds with the neighbours. Residents who formed stronger and larger social networks frequently discussed how they no longer mind the few problems of the neighbourhood and would rather stay in the area where they are comfortable with the neighbours.

On the negative side, residents' narratives showed that the more time they spent in the neighbourhood, the less likely they were to change their developed behavioural patterns. This pattern was detectable after factoring the 'location' variable across residents of the New and Old Alsayah. Both neighbourhoods have identical housing units and a similar layout with community facilities located in the centre and one side of the neighbourhood parameter. The main difference between the two is that basic facilities (such as grocery stores, barber shops, and laundromats) were not ready when residents moved into the old neighbourhood, while they were available and operating in the new one. When overlapping time-related codes with behavioural ones, the addition of 'location' showed that the residents of the old neighbourhood had to use the car to go to a nearby commercial road for daily and weekly needs. This pattern remained even after building closer facilities, as residents reported being accustomed to using the further commercial road.

'Time', therefore, particularly the 'length of stay' in the neighbourhood, had a clear impact on adapting to living in a certain area through developing social networks, forming steady behavioural patterns, and being less troubled by the neighbourhood's physical problems. From an environmental perspective of sustainability, this shows the potential of new neighbourhoods in fostering change towards pro-environmental behaviour. This is because the collected data shows that residents were willing to cope with features of the neighbourhood that were introduced at the early stages of settling. Chiu (2003) describes such findings as the social conditions under which pro-environmental behaviour can be facilitated. From a social perspective, the impact of some concepts within social sustainability improved with more passage of time (e.g., developing stronger social networks, identity and belonging, increased satisfaction and liveability). However, both aspects (environmental and social gains) were relatively conditioned upon being satisfied with the neighbours and their profile.

The strongest factor that affected the residents' acceptance of their neighbours was their ethnic background. Of all the discussed residents' profiles, their ethnic background was the only feature that affected the exclusion of others from one's social network. While this behaviour might look antagonistic and contradicts the equity principle of social sustainability, it documents an attitude that cannot be overlooked when planning sustainable neighbourhoods, especially with the dominating landscape of international immigration. It might be tempting to overlook the opinion of the majority when they report being uncomfortable with the presence of other ethnic minorities as it manifests a direct antagonistic attitude. However, although equity is one of the few undisputed concepts in social sustainability, it is not as straightforward as it sounds.

The practice of excluding ethnic minorities by the majorities is not a new one, nor is it specific to a particular social context. While the ethnic groups may change based on the context, the potential tension between them remains universal. This behaviour has been documented by the promoters of the social identity theory (Jaśkiewicz & Wiwatowska, 2018), which states that majorities tend to blame minorities for their problems. Out of idealism, several studies in social sustainability insist on the diversity of the residents (Missimer et al., 2017a). However, such a diverse community might start to lose its identity to the level where no one feels like they belong, neither majorities nor minorities.

Concerns around the effect of diversity are not uncommon in place attachment literature (Lewicka, 2011), where researchers documented cases where community diversity lowered the residents' place attachment levels (Oliver, 2010); and trust and happiness among residents (Stolle et al., 2008). In fact, it is more likely that minorities will be the ones who suffer more from the perceived exclusion or potential antagonism, no matter how settled it might be. The tension of living in an environment where one doesn't feel like (s)he belongs can dramatically lower the life quality of those groups and individuals, which would negatively affect the social sustainability of the area. In the US, Oliver(2010) reported that Black, Asian and Latino populations tend to group in separate neighbourhoods, which could indicate their attempt to escape the inconvenience of being forced into living in diverse communities. Though unintentional, the imposed diversity can lower the life quality of ethnic minorities. This makes us question whether diversity requirements in NSATs facilitate equity in reality, or if they merely provide points in assessment reports.

This should not implicate that unethical social behaviours should be overlooked for the sake of avoiding problems or enhancing liveability. However, it shows that concepts of social sustainability cannot be approached with an idealistic view, and it should always factor in the human behaviour aspect. It is undeniable that the environmental and social problems that urban neighbourhoods face can be largely attributed to practices that need to be changed. But people

often avoid change and tend to find ways around imposed measures to resort to their preferred ways of living (Vallance et al., 2011). Clark (2005) documented such an adverse impact in some cities that started putting parking fees to discourage the use of cars, where instead, residents started driving further to shop at places that do not have a parking fee. Imposed social and environmental measures can be more easily avoided by people with higher socio-economic status, who could opt for a location change or other ways to maintain their preferred lifestyle, which could deepen the gap in social equity between different classes of society.

Such a dilemma shows that imposing seemingly positive measures without acknowledging how people behave in their local environment can, and evidently did, cause more harm than good in some cases. Still, changing the way we design our environments and behave within them is imperative for overcoming many of the social and environmental problems we have in urban neighbourhoods. The design of sustainability frameworks can use community-led POE practices to acknowledge and consider the established behavioural patterns of locals in their environments. There should be more awareness of the time factor and the way it aids in promoting pro-sustainable behaviour, as well as sustaining the changed practices. Based on the findings of the conducted case study, changing people's environmental behaviour was easier at the early stage of settling in their new neighbourhood, while changing their social behaviour and feelings required a long time and was linked to building a strong social network in the area.

In addition to the time consideration for promoting changing the behaviours and perceptions of the locals, age also played a role in facilitating and sustaining change. Younger demographics demonstrated more cases of developing new practices such as taking morning walks by the sea or cycling around the neighbourhood. However, for older demographics, change dramatically affected their comfort and liveability, and was less likely to alter their habits. For instance, walkways are a relatively new type of public urban space in Bahrain. Those are paved areas allocated primarily for walking, but they often have a small playground for children and some green elements. Most of these spaces are not strongly connected to the urban fabric as they require driving to reach them. They also have a large, allocated parking space. The case study neighbourhood had a nearby beach with food trucks and a further walkway by the sea, as mapped in Figure 6.2. While most of the residents acknowledged the presence of those places in their responses, the younger participants were more likely to attribute positive evaluations to them and link them to activities they do there.
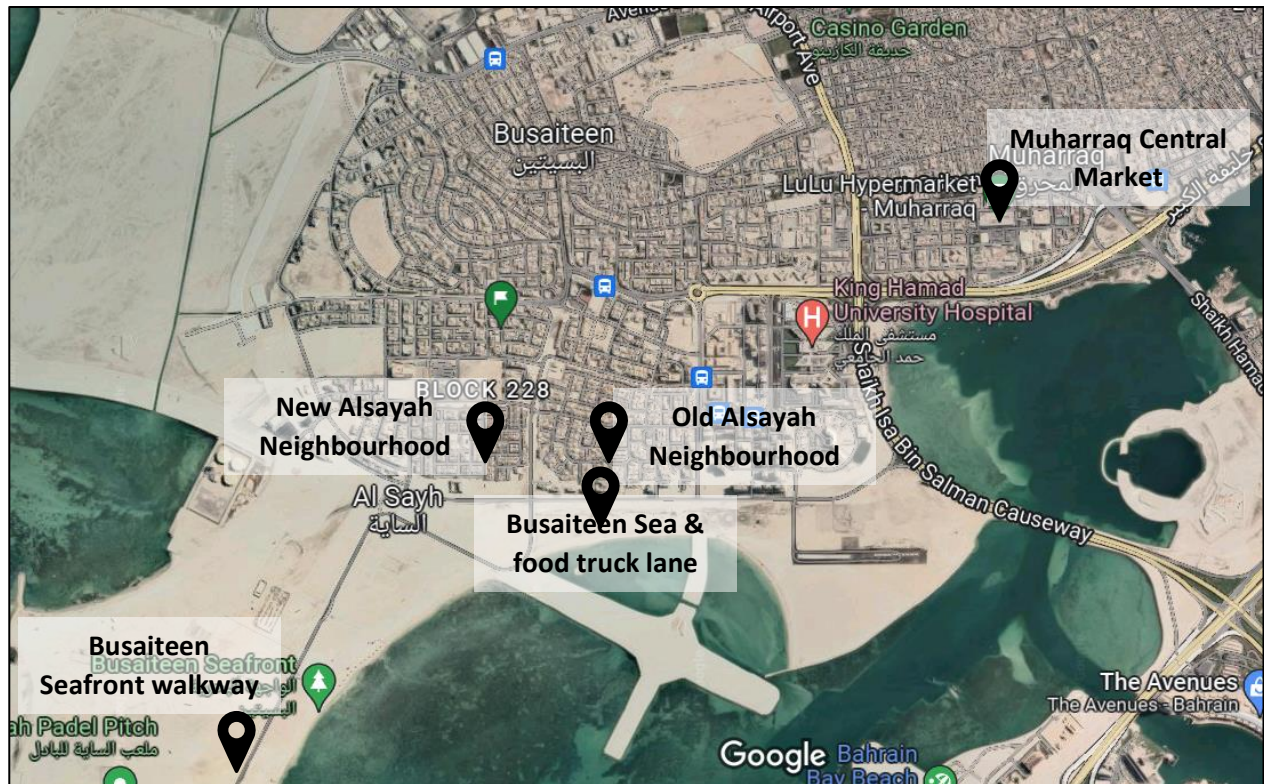
Figure 6.2. Mapping of some reported places associated with social contact

Younger participants also had a different understanding of natural elements in a neighbourhood. When asked to evaluate the connection to nature in their neighbourhoods, younger participants frequently mentioned the sea as a feature that created a positive feeling in the area and was more aware of the public open spaces. Older participants, however, focused more on natural elements within the house property. They viewed it more as a private feature and thus constantly evaluated their connection to nature in relation to the trees or bushes planted by the neighbours in their front yards. When reminded about the beach and the seafront walkway, several older participants (age 60 and above) mentioned that they look nice, but they don't use them because they are far and difficult to reach. In a simple deduction, this can appear as an accessibility issue with concerns about the inclusion of older demographics. However, overlapping the codes of the POE framework and the open-end coding ones revealed deeper layers of meaning.

The same older demographics who dismissed the impact of the seafront walkway because of its distance reported that they go to the central market to run their errands. Central markets are one of the oldest forms of shopping places in Bahrain that are specialised in selling fresh products. Many of those products are locally produced and subsidised by the government to lower their price for the public. The codding overlap showed that the central market was coded in the social contact question, where older participants happened to run into their retired friends

who also ran their errands in the mornings. Using Miro collaborative visual website, I mapped places that were mentioned in the residents' narratives. It is clear that the central market is further than the walkway, as shown in Figure 6.2. Residents also reported that they need to use their cars to reach it, not to mention that the users of this large space are expected to walk for far distances within the market. These notes show that the accessibility issue is more significant for this facility. However, this did not make older residents stop going there.

It could be argued that the function of both places (central market and seafront walkway) is different, and thus the significance of the accessibility issue cannot be compared between the two. However, the frequent mention of meeting friends with the word 'central market' shows that it serves a social and recreational purpose that is as significant as its utilitarian use. This reinforces my suggestion that older demographics are less likely to accept new forms of urban spaces, especially when they are bounded by social practices. Hansen & Gottschalk's (2006) review of mobility in older demographics reflected a similar observation. There, they documented several cases where when older people wanted to downsize their houses, they mostly moved to houses that were slightly smaller than the house they were downsizing from. With this observation in mind, the use of qualitative data in my case study research, therefore, demonstrates how people are more critical of the problems of spaces they are not accustomed to. And how the feelings of the older population are more prone to being negatively affected by new urban features.

Time, problems, and social issues coincided several times across the residents' narratives. Residents of all ages seemed to be less critical of the functional problems in the neighbourhood after living there for a few years. For instance, many of the residents mentioned that the neighbourhood had a drainage problem. They reported having a slight slope in the neighbourhood which made the water accumulate on one side, which was very disturbing for them. Although the problem remained unsolved, they said that it doesn't bother them as much now that they are friendly with the neighbours and have grown to like the area. As the physical features of the neighbourhood have not changed, the only things that changed to the participants with time were making modifications to their own houses, getting used to living in the area and creating social bonds. This demonstrates that being satisfied with the social features of the neighbourhood could facilitate tailoring some functional inconveniences, which shows a potential interplay between social sustainability and research in facilitating pro-environmental behaviour.

Among the social constructs, gender was a dominant variable that mediated the evaluation and direction of evaluation for the POE themes. Gender was more closely related to clusters of similar opinions than was educational level or family size. For instance, female

participants were more appreciative of the area after making modifications to their houses. Their mention of feeling happier and like they belong to the neighbourhood happened after a few years when they changed parts of their housing units to meet their family needs. Males, on the other hand, were first concerned about the area and then about the features of the housing unit. Satisfaction with neighbours and with housing units were both contributing factors to feeling satisfied with living in the neighbourhood and belonging to it. This is not unexpected, considering several studies concerning housing satisfaction reported the same features (Abass & Tucker, 2018; Buys & Miller, 2012). However, seeing this from the retrospective stance of POE gives it empirical validation. Particularly that the residents were interviewed using open-end questions, which eliminates the potential of leading their response in any way.

The identification of background information that mediates the different clusters of responses can play a significant role in enhancing the effectiveness of NSAFs. Using such data can lead consultation practices towards engaging with the concerned population for the issues that matter to them. This would make consultation deduce more impactful measures for the context in question, which would enhance the effectiveness of the implemented framework. For instance, this case study research started with a sample stratification deducted from engaging with sustainability literature. But except for gender and age, the remaining background information suggested by the literature did not seem to influence the residents' feelings or behaviours.

The use of qualitative research and the direct human interaction between the researcher and the participants in a confidential setting offered a unique chance to notice the topics that the residents abstained from engaging with. For instance, while educational level and family size were simply overlooked from the discussion of various themes, ethnic background seemed to trouble several participants during the discussion. Many participants made an effort to bring up ethnic background issues and specific nationalities and mentioned how they don't mind interacting with them. While expressing their opinion, participants expressed repetitive non-verbal clues such as taking deeper breaths, hesitation, or changing their tone. Some even tried to obtain more information about me before sharing some of their views. Through this type of nuances, I managed to identify that for Muharraq, differences in religious sect (being Sunni or Shiite) did not affect the sense of belonging and the development of social networks. However, potential tension occurred between the majorities and the nationals of three ethnic minorities. It was also evident that while the tensions between different ethnicities existed, majorities knew the ethical obligation, or to the social one to the very least, to try to mask it or overcome it. While such findings can feel disturbing, it is exactly this type of data that seems to be missing from the generic expert-led NSAFs.

The findings show that the different themes of sustainability do not necessarily correlate positively with each other. This coincides more with the opinions expressed in social sustainability research, as in the work of Dempsey et al. (2012) and Howley et al. (2009), than in environmental sustainability, as in the work of Carmona et al. (2010). The area of environmental sustainability that supports the same finding is the area of pro-environmental behaviour (Steg & Vlek, 2009). This field suggests that to approach sustainability, researchers need to develop a better understanding of how to facilitate change towards environmentally friendly behaviour, which would entail understanding how and why people behave in their environments in a certain way. The findings also suggest that prioritising bottom-up approaches in sustainability assessment could resort towards facilitating liveability or satisfaction more than sustainability. While satisfaction contributes to wellbeing (Quick & Devlin, 2018) which is a component of social sustainability, it does not necessarily entail supporting ethical or sustainable practices.

Satisfaction, however, can play an important indirect role in affecting environmental sustainability. Communities seem to have a minimum threshold of comfort beyond which they are likely to resist change; or be forced to accept it with severe distress. Sense beneficiaries of affordable housing neighbourhoods have fewer mobility options; they can be subject to more discomfort because of imposing sustainability measures compared to other segments of the community. This questions the equity of such attempts towards approaching sustainability. To approach sustainability holistically and ethically, the suggested sustainability measures need to be tailored to the needs of the involved context using a combination of top-down and bottom-up methods, which is also known as hybrid sustainability assessment (Fraser et al., 2006). The top-down involvement needs to cater for environmental issues and set acceptable levels of social conduct. This approach is more sensitive towards sustainability for the sake of future generations or inter-generational equity. In contrast, the bottom-up involvement is more sensitive in identifying social issues and issues that affect the existing generation or intra-generational sustainability. The communication between the two needs to be through a lens of environmental sustainability, where findings from community involvement should be directed towards facilitating pro-environmental behaviour.

Overall, sociodemographic aspects were more significant in affecting residents' behaviours and feelings than personal differences or preferences. The impact affected the magnitude and direction of the evaluation of various themes. Though the concepts of expert-led sustainability assessment literature remained relevant (such as identity, belonging and pride; and social contact); the way those themes needed to be approached was not necessarily consistent. Age and gender were the main variables that influenced sustainability concepts in the context of

affordable housing neighbourhoods in Muharraq, Bahrain. However, the relevance of those variables needs to be verified for other cultural contexts.

6.2. The Interplay Between the Open End-Coding Framework and the Fixed POE Framework

To give the findings a deeper context and to understand how the themes of both analytical frameworks interact, I cross-referenced the coded themes of the POE framework with the themes of the open-end coding one. To prepare the data for this query, I merged the content of the 'evaluation' and the 'cause of evaluation' of each theme of the POE framework. The purpose of doing this was to avoid the risk of double counting some of the codes, which would wrongly exaggerate the interpretation of the findings. I visualised the result as a heat table, as shown in Table 6.1, with darker shades representing higher coding overlap and again as a 3D matrix (Figure 6.3). This cross-referencing (or matrix coding as called in the query function in NVivo software) offered a unique opportunity for understanding the interrelationships of the different components of the examined affordable housing neighbourhood. The context-specific findings were then examined against the prevailing views within NSA literature, which were detailed in the literature review chapter. They were also examined against the 12 isolated indicators of LEED-ND, which I defined as relevant to public examination (table 4.3). Table 6.1. shows the percentage of intersection between the coded text of the POE themes against those of the open-end coding framework.

In quantitative data, coding overlaps are considered statistically significant when they have a minimum of 5% overlap (Frost, 2022). While those rules are not verified for qualitative data, they are the nearest benchmark that can be used to assess the significance of the coding overlap in this research. Therefore, I considered codes with overlap $\geq$ 5% to be of statistical significance. Based on this, only codes with this percentage of overlap will be considered for further discussion in this chapter. According to Table 6.1., 65 coding overlaps fulfilled this condition. With so many interacting themes with statistical significance, I set the discussion criteria to only include the themes that had at least 25% coding overlap and have been mentioned by no less than 50% of the participants.

The discussed overlapping themes are listed in Table 6.2., where they are organised in order of highest coding overlap. The top four coding overlaps of the POE framework were all with the 'Physical Features' theme of the open-end coding one, which highlights the importance of physical features in evaluating various aspects of urban neighbourhoods. Two coding overlaps were picked up by all the participants: 'Housing Suitability' and 'Physical Features'; and 'Community Facilities' and 'Identified Places'. While the later overlap only had an 18.91%

intersection, I kept it in the discussion because it appeared to be significant to all participants. I started the discussion with those two overlaps and then went through the rest based on the highest overlapping percentage.

I extracted the overlapping occurrences for each discussed coding overlap using the 'export cell' option in NVivo12. NVivo orders the exported cells based on the sequence of the interviews, which could jeopardise the anonymity of the interviewees. To avoid this, I rearranged the occurrences for each pair of themes in a table in order of the highest overlap percentage for each participant. I performed a content analysis for the content of these tables to explore the nature of the overlaps and whether the participants' attributes played a role in the given responses. The full accounts of occurrences of the overlapping themes are detailed in appendices h. and i.

Housing Suitability and physical Features

'Housing suitability' of the POE framework and 'Physical Features' from the open-end coding framework coincided in the discussion of 100% of the participants, with 45.71% coding overlap (30 occurrences), as shown in Table 6.2. The distribution of the 30 occurrences as given by the participants is summarised in Table 6.3., which also shows the participants' background information. The highest coverage was by a female participant who talked about those two themes for 5.7% of her full interview, with nine coding occurrences. Followed by another female participant who talked for 3.97% of her text with eight coding occurrences. Then, two male participants discussed those themes for 1.66% and 1.25% of their text. Interestingly, these two close percentages were covered by a significantly different number of coding occurrences of 4 and 1, respectively. The comparison between the overlap percentage and the coding occurrences shows the importance of selecting a meaningful quantitative measure to direct the analysis. For the purpose of analysing the overlap, the percentage of overlap had a stronger significance than the number of occurrences.
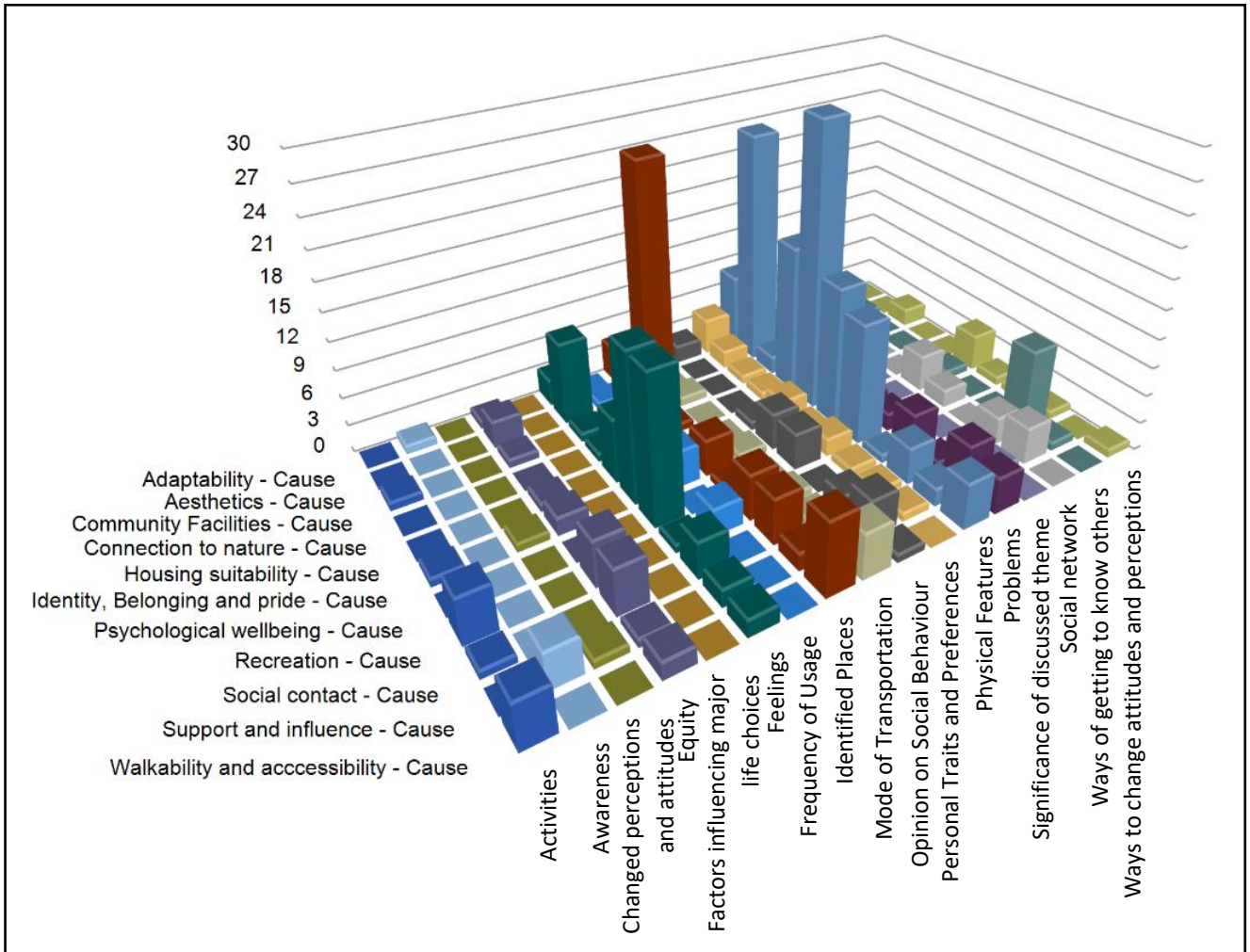
Figure 6.3. Open-end Coding Framework intersections with the Causes given for the fixed POE Analytical Framework

Legend

☐ Themes discussed by 100% of the sample

☐ Theme discussed by at least 50% of the sample, overlap ≥ 25%

Open end coding framework – themes ordered by highest frequency	—	Aesthetics	Social Contact	Housing suitability	Support and Influence	Community Facilities	Walkability and Accessibility	Recreation	Connection to Nature	Adaptability	Psychological Wellbeing
Physical Features	18.02	50.06	7.66	45.71	11.31	24.29	10.31	0.57	36.82	30.4	18.11
Identified places	3.61	7.77	8.58	0.2	2.1	18.91	11.35	13.32	0.2	7.51	1.41
Feelings	11.97	19.09	0	5.74	13.49	7.66	4.06	2.57	21.3	14.01	20.51
Problems	20.19	3.2	0	12.7	28.64	14.77	12.71	16.94	11.46	13	18.18
Equity	9.98	8.57	4.83	12.16	12.04	2.76	12.92	26.93	0	5.86	2.18
Activities	1.36	0	18.65	0	0	3.59	19.69	11.04	2.13	3.48	3.24
Personal traits and preferences	3.21	4.34	6.58	7.6	3.84	7.73	2.4	5.8	13.79	11.45	6.62
Opinion on social behaviour	13.5	0	5.08	9.02	15.81	3.86	3.44	9.51	7.1	0	11.21
Ways of Getting to know others	4.83	1.94	29.64	0	1.02	0	0	0	0	5.95	3.81
Frequency of usage	3.75	1.83	3.91	0.34	0	5.59	4.48	5.33	1.01	4.67	1.76
Social network	1.99	0	7.83	1.28	2.03	2.35	0	0	1.42	0.09	2.11
Mode of transportation	0.5	0	0.58	0	0	3.11	9.58	1.9	3.45	0	0
Ways to change attitudes and perceptions	5.92	0.91	3.91	1.47	0	2.9	8.13	4.85	0	1.65	9.37
Significance of the discussed theme	0.5	2.29	2.75	0.83	5.15	2.48	0	0	0.2	0	1.48
Awareness	0	0	0	2.94	4.57	0	0	1.24	0	0	0
Changed perceptions and attitudes	0.5	0	0	0	0	0	0.94	0	1.12	0	0
Factors influencing major life choices	0.18	0	0	0	0	0	0	0	0	1.92	0

POE analytical framework – themes ordered by highest frequency

Themes from the POE analytical framework	Themes from the open-end coding analytical framework	Percentage of content overlap
Aesthetics	Physical Features	50.06
*Housing suitability	Physical Features	45.71
* This coding overlap was picked up by all the participants		
Connection to Nature	Physical Features	36.82
Adaptability	Physical Features	30.4
Social Contact	Ways of Getting to know others	29.64
Support and Influence	Problems	28.64
Recreation	Equity	26.93
**Community Facilities	Identified places	18.91
** This coding overlap was added to the discussion because it was picked up by all the participants		

To explore the nature of the content of those occurrences and whether the participants' attributes play a role in the given responses, I extracted and analysed those occurrences based on their content[11]. Several physical features were discussed in relation to housing suitability, most of which were connected to area considerations. Most of the participants attributed the negative evaluation of housing suitability to their original house size (before making modifications). The discussed physical features in relation to housing suitability were small house size, small room sizes, insufficient rooms, lack of sufficient bathrooms, low quality of finishing materials, and insufficient storage space.

The modifications done to the houses were to enlarge living rooms and bedrooms, increase the number of bedrooms, have more ensuites, and enclose some of the outdoor spaces to increase the total built-up area of the house. The area was also increased by building extra upper floors. While all participants were interested in the relationship between 'physical features' and 'housing suitability', females showed more interest in this relationship and provided more detailed accounts of it. The participants were content with their housing suitability after making changes to the house layout and increasing the number and areas of rooms. The focus on room numbers and areas in more dense neighbourhoods is not specific to Bahrain. Ge & Hokao (2006) had a similar finding when they examined residents' preferences for residential lifestyles in two cities in Japan. They found that residents in more dense areas were more concerned with the house area and the number of rooms than those in lower-density neighbourhoods. Although the relationship between neighbourhood density and floor area per person does not have to be

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[11] Refer to appendix k. table 1. For a full list of the overlapping occurrences between these two themes.

proportionate, Dave (2010) found that most dense neighbourhoods provide smaller living areas per person. She also reported that in developed countries, the perception of density negatively affected the residents' perception of the amount of living space they have.

The area of living space per person was also found to affect residential liveability (Thomas et al., 2011), especially for spaces related to entertaining, storage, and daily living. All of these were among the physical features identified by the participants of the case study as originally lacking. Interestingly, even though enlarging the house area at Alsayah improved the residents' evaluation of their 'housing suitability', later answers showed that the expansion ended up causing some sort of negative 'feelings' and reduction of 'psychological wellbeing'. Many residents reported that they needed to give up some of the outdoor space of the original house layout to expand their houses. This made them lose potential green and leisure space, which made them feel somewhat disappointed. Features of density, smaller property area and lower liveability feelings are not specific to Bahrain. In a participatory study in Denmark, Thomas et al. (2011) used simulation to examine the effect of different types of densification strategies on residents' perception of density. In one of the simulations, participants were shown their original houses, with slightly smaller outdoor areas. Oddly, most of the participants evaluated the reduction as being significant and affecting their living needs. Using simulation, the perception of area reduction was not proportionate to the actual area reduction of the property. The loss of outdoor space by the residents of Alsayah created a similar feeling of insufficient space.

Densifying the urban layout as well as indoor living space per person comes with an inevitable effect on the lifestyle people are accustomed to. From an environmental perspective, density is claimed to enhance liveability and social contact due to increased accessibility and walkability (Howley et al., 2009). However, participatory studies repeatedly show that density is correlated with lowering residents' evaluation of liveability. Dense neighbourhoods are also frequently viewed as temporary residences (Thomas et al., 2011). If people are constantly trying to leave dense neighbourhoods, researchers need to start questioning the sustainability of these layouts after factoring in the impact of human behaviour. To improve the liveability of dense neighbourhoods, researchers need to gradually introduce dense layouts while allowing for the needed behavioural change to take place.

One strategy could be to densify urban areas but enlarge the indoor living area per person. This would still approach part of the environmental and economic gains of densification while minimising its documented negative social impacts. Also, more research is needed in relation to the architectural design of residential spaces in dense urban neighbourhoods. While there has been a great shift in the urban form of residential neighbourhoods, the architectural

design of the dwelling units did not change at a similar pace. Many residents still appear to be nostalgic for the idea of a large house with a private garden. For residents to be satisfied with their housing, this image needs to be replaced by designers with one that can exist in a dense neighbourhood. Based on residents' feedback in the discussed studies, the private outdoor garden seemed to have a strong potential for facilitating this transition.

Community Facilities and Identified places

The only other theme overlap discussed by all participants was between the 'Community Facilities' and 'identified places' themes, with 18.91% text overlap (Table 6.2.). The most significant outcome of this overlap was listing and prioritising important community facilities according to the residents. I ran a word frequency query and excluded the words that did not refer to a specific place or a category of places (e.g., shops). Figure 6.4. shows a word cloud result for the previous query. I referred to the extended context[12] of the responses to interpret the content of the figure. After conducting content analysis, I prioritised the facilities based on the frequency of their mentioning (Table 6.3.) and then clustered them into their relevant type. The mentioned facilities by the residents in the order of their frequency were Cold stores[13], Bakers[14], Laundromat, Shops, Beach, Commercial Road, Mosque, Busaiteen, Food Trucks, Greengrocer, Health centre, Barbershop, Pharmacy, and Alhelli (a local supermarket).

Figure 6.4. Word cloud for the most frequently mentioned words
in 'identified places' and 'Community facilities' themes

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[12]   Refer to appendix k. table 2. For a full list of the overlapping occurrences between these two themes.
[13] The local term for grocery stores in Bahrain
[14] In Bahrain, bakers refer specifically to non-automated local bakeries that sells government subsidised flat bread among few other products.

Table 6.3. The most frequently mentioned words by the participants in the 'identified places' and 'community facilities' themes

The initial outcome as obtained by NVivo		Edited outcome after grouping relevant categories based on analysing the text context	
Word	Count	Word	Count
Cold stores	8	Cold stores	8
Baker	4	Shops	8
Laundry	4	Baker	4
Shops	4	Laundry	4
Beach	3	Beach	4
Commercial	3	Mosque	3
Mosque	3	Food Trucks	2
Busaiteen	2	Greengrocer	2
Food Trucks	2	Health centre	2
Greengrocer	2	Barbershop	1
Health centre	2	Pharmacy	1
Barbershop	1	Supermarket	1
Pharmacy	1		
Alhelli (a local supermarket)	1		

Using my research findings, I compared the community facilities needed for residential neighbourhoods with the ones listed by three other references. The reference selection criterion was to include highly cited work within the area of NSA based on expert judgement and community-based data. Two references were based on expert judgement, which was the LEED-ND framework (USGBC, 2018a), and Dempsey et al.'s review (2011). While one was based on community judgement by Gordon et al. (2000). I categorised the facilities found within NSA literature based on their type into seven categories: 1) Daily/Weekly services, 2) Worship, 3) Recreation, 4) Health care, 5) Services, 6) Educational facilities, and 7) Cultural facilities.

In Table 6.4. I listed all the facilities reported by the three former references in addition to the findings of my case study. To simplify the comparison between the type of facilities recommended by each reference, I placed the listed facilities within their relevant category. It is worth mentioning that both my work, as well as Gordon et al.'s (2000) 'Poverty and Social Exclusion Survey' focus on affordable neighbourhoods. In comparison, the two expert-led references discuss neighbourhoods in general without excluding affordable housing neighbourhoods from their recommendations. The references also were developed in different cultural contexts, two of which were in the UK, one in the US, and one in Bahrain, as marked in Table 6.4.

The table shows that each type of reference (expert-led or community-led) focused on a different type of community facility. Both community-led references (this POE research as well as Gordon et al.'s Survey (2000)) overlooked 'Educational facilities' and 'Cultural facilities', whereas the expert-led ones focus on them. This focus was inferred by the large number of facilities listed by the two expert-led references that belonged to those two categories. This could relate to the 'pyramid of needs' theory that explains how people who lack basic needs overlook higher-end needs (Kenrick et al., 2010). This means that within affordable housing context, the public is more likely to refer to basic facilities and overlook more refined ones such as cultural ones.

This outcome reinforces the hypothesis I presented in the literature review that equity in sustainable neighbourhoods can be better approached using a hybrid framework created by combining the recommendations of experts and locals. I presented this hypothesis in the literature review based on the belief that limited-income people are less likely to be concerned with recreational facilities (such as green spaces) and would probably be concerned with more basic needs, such as safety, and housing affordability. As a result, I hypothesised that neighbourhoods planned mainly through public participation programs could risk being less equitable in terms of responding to higher-end needs (e.g., recreational, cultural) than the ones developed based on expert judgement. This outcome contradicts the prevailing belief within social sustainability literature, which suggests that prioritizing community participation creates more equitable neighbourhoods (Maginn, 2007; Sharifi & Murayama, 2013).

In addition to the significance of the approach of developing NSAFs (expert-led or community-led), table 6.4. also points to a potential impact of the context in which the framework or study was conducted on its recommendations, especially in terms of listing specific important community facilities. This remark can be seen when viewing the 'worship' facilities listed in Table 6.4. This category was only picked up by LEED-ND (developed in the USA) and my research (conducted in Bahrain), while it was overlooked in both Gordon et al. (2000) and Dempsey et al.'s work (2011). Both references that overlooked worship facilities were conducted within the context of the UK, which could explain why both studies overlooked the same category. Between this observation and the former one, table 6.4. suggests that it is advisable to identify the needed neighbourhood community facilities in a particular cultural context using a combination of expert-led and community-led methods.

Table 6.4. A comparison between the community facilities recommended by four different references

Type of community facilities	Identified community facilities by each reference			
	Community-led references		Expert-led references	
	This PhD research	Gordon et al., 2000	Dempsey et al., 2011	LEED-ND
	Bahrain	UK	UK	USA
Daily/Weekly services	Cold stores		Corner shop	
	Shops			
	Baker			
	Laundry			
	Greengrocer			
	Supermarket	Supermarket	Supermarket	
	Barbershop			
Worship	Mosque			Place of worship
Recreation	Food Trucks		Pub	
			Restaurant/café/takeaway	
	Beach		Public open/green space	Public Park
			Sports/recreation facility	
			Community Centre	Community or recreation centre
Health care	Health centre	GP surgery	Doctor/GP surgery	Medical clinic or office that treats patients
				Adult or senior care (licensed)
			Facility for children	Childcare (licensed)
				Social services centre
	Pharmacy	Chemist	Chemist	
Services		Post office	Post office	Post office
		Bank/building society	Bank/building society	Government office that serves public on-site
				Police or fire station
Educational facilities			Primary school	Education facility (e.g., K—12 school, university, adult education centre, vocational school, community college)
			Library	Public library
Cultural facilities				Cultural arts facility (museum, performing arts)

To do so, I ran a word search within the participants' responses for the word 'Mosque' using a customised NVivo query. To facilitate interpreting the data, I displayed the result in the format of a word tree, as shown in Figure 6.5. While the image is static here, I can use NVivo software to click on any part of a sentence to retain the path of the full sentence and extend the text within the original transcript if needed. Using this analysis method, I found that participants rarely referred to the mosque as a place for prayer. Instead, the mosque as a place was more used to identify the surrounding outdoor urban area, which does not belong to the mosque technically. Participants frequently mentioned it while discussing various forms of social contacts, such as seeing other neighbours or having a casual chat with a friend about how they happened to be going there.

Figure 6.6 depicts a mosque located at the centre of the old Alsayah neighbourhood, showcasing the open parking spaces surrounding the structure, where most of the social contact occurs. The reference to mosques as a place that facilitate social contact was evident even in the responses of female participants, who are culturally not expected to go to the mosque for prayers. Females typically go to the neighbourhood mosque for an Altaraweeh prayer, an optional prayer conducted in the evening during the month of Ramadhan only. Other than that, only men are expected to go to the mosque for five short daily prayers. Despite the significant difference in the frequency of using the mosque between men and women, both reported that this facility affected their social contact or how they evaluated other aspects of the neighbourhood throughout the year.

Identifying the social value of urban places is receiving increasing research interest, which is needed to catch up with the escalated interest in social value in policy agendas (Hatleskog & Samuel, 2021). Hatleskog & Samuel attempted to map eco-social assets in Reading, UK, through a series of mapping workshops conducted with various segments of community members. The project concluded that focal buildings, including worship places, played a significant role in facilitating community cohesion (Hatleskog, 2020). Although the study did not identify how exactly worship places play this role, it demonstrated that the locals associated those spaces with feelings of community cohesion. This does not necessarily reflect that places of worship are frequently used, but it demonstrates that they play a role in improving the social qualities of the area. This could explain why worship places were not significant in the context of the UK based on the references used in Table 6.4. The work of Dempsey et al. (2011) and Gordon et al. (2000) attempted to list community facilities that provide a needed function for the neighbourhood, whereas Hatleskog and Samuel's research identified places that are associated with positive social impacts.
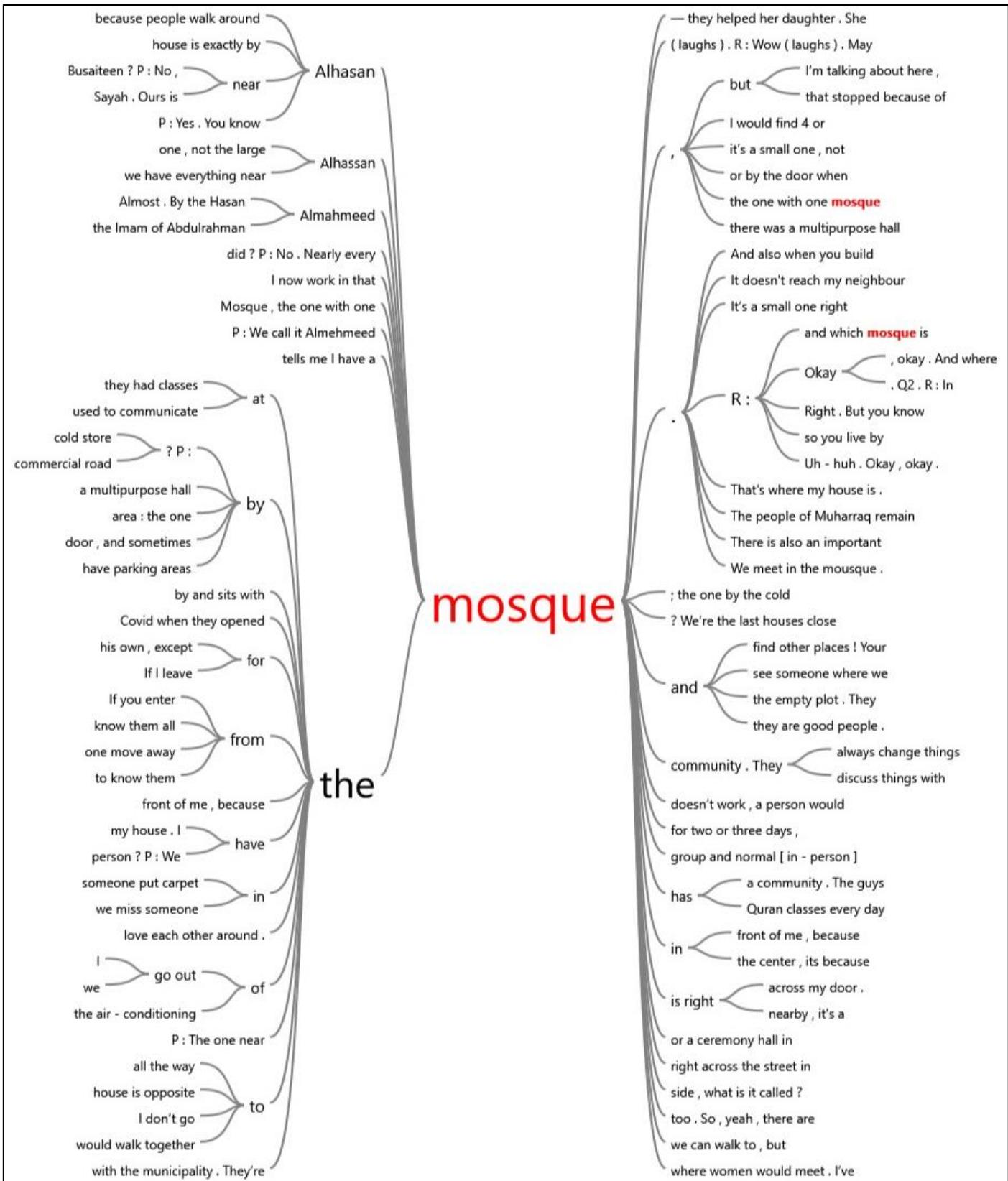
Figure 6.5. Word-tree for all the occurrences of the word 'Mosque' within the respondents' transcripts

This note reflects two issues, one which is specific to community facilities and another that relates to the larger context of qualitative research. The first remark is that the impact of community facilities that the locals consider important goes beyond fulfilling their functional needs, as they appear to play a strong role in facilitating the development of a sense of community. Such impacts are more likely to be only understood by people who have access to the culture of the examined context. The second remark is that the emphasis on qualitative research methods in urban studies can present a distinct advantage in uncovering emerging themes and patterns within the data that quantitative methods may overlook. Although quantitative data appear to have stronger validity because of their ability to generate a large amount of data, they can easily overlook the nested nature of the components of the urban environment.

Going back to the listed community facilities, all references mentioned 'health facilities' (table 6.4.). This makes sense as healthcare facilities are among the basic needs of any healthy community. The only difference is that the expert-led references mentioned those with a higher level of specification, such as elderly care facilities and childcare. Once again, this shows areas where expert-led research can lead to better equity by identifying the minorities that exist within all contexts, such as women, elderly children, and people with disabilities. Maginn (2007), however, notes that experts are likely to overlook the requirements of ethnic minorities who live in particular contexts, as experts are distant from the place's culture. Again, this remark shows the advantage of using hybrid methods for developing NSAFs.

In the 'recreation' category, all references mentioned different types of places, except for Gordon et al.'s (2000) 'Poverty and Social Exclusion Survey'. During this POE research, Gordon et al.'s focus on affordable housing neighbourhoods, it is likely that the research population for this POE is more financially capable than the one of the 'Poverty and Social Exclusion Survey'. It is worth mentioning that many of the criteria for being eligible for an affordable housing unit in Bahrain have been changed in the past years to limit the people entitled to this service. This means the participants of this study probably have higher financial abilities than future beneficiaries of affordable housing projects in Bahrain. This aligns with my formerly discussed hypothesis, where I theorised that people with higher financial abilities are likely to consider recreational spaces or spaces that fulfil higher-end needs than people with more limited income.

The last two categories of facilities are 'services' and 'Daily/Weekly services'. I separated these two because the latter category was far more specified by the participants of the POE interview than in the other three references listed in Table 6.4. The respondents identified 'Cold stores', 'Shops', 'Baker', 'Laundromat', 'Greengrocer', 'Supermarket' and 'Barbershop' within the services. While the remaining references merely mentioned 'corner shop' and 'supermarket'. Previously I mentioned that the overlap between the 'Community Facilities' from the responses of the POE theme and 'identified places' of the open-end coding provided a detailed list of the type of services a specific community needs. This remark is aligned with the level of detail the participants provided in the POE interview, which was lacking in the reviewed quantitative participatory survey and the two expert-led research.

Aesthetics and Physical Features

The overlapping codes starting from this pair of themes and onwards, have been discussed by at least 50% of the participants. The overlap between the 'Aesthetics' theme of the POE framework and the 'Physical Features' of the open-end coding had the highest overlapping percentage, with 50.06% overlap (table 6.2.). This result is rather expected as the question about neighbourhood aesthetics asked about the elements that the residents found to be beautiful in the area. The implication of physical features in the question phrasing makes the correlation between the two themes insignificant, as the residents were somewhat led towards this direction. What is interesting, though, was the repetition of similar elements by most of the participants[15]; and how those elements overlapped with the 'Feelings' theme of the open-end coding framework.

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[15] Refer to appendix k. table 3 for a list of coding overlaps between 'Aesthetics' and 'Physical Features'.

As discussed in the results section, the participants frequently referred to the wide neighbourhood streets as a beautiful element in their neighbourhood; and to the identical houses' facades and lack of green elements as a visually unpleasant feature. Figure 6.7 displays a sample of aesthetically pleasing features positively evaluated by participants, including wide streets and pavements, along with the presence of green elements. While figure 6.8 demonstrates areas of the neighborhood that feature such negatively evaluated elements. The figure highlights a part of the neighbourhood where the original facades remain unaltered, and no form of greenery has been introduced by residents.

Figure 6.7. Exemplifying positively evaluated aesthetic features, including broad streets and pavements, and the presence of some greenery.

Figure 6.8. Unaltered original facades and absence of greenery in a section of the neighborhood, reflecting negatively perceived elements.

Although participants quickly identified elements that they perceived as aesthetically positive or negative, street width was the only feature they associated with explicit, strong, and exclusively positive feelings. A word search of 'Street Width'[16] within the 'Feelings' code of the open-end framework showed that it was associated with five feelings which were privacy, comfort, intimacy, familiarity, and elegance (figure 6.9.). To explore its further correlations, I ran a word search of 'Street Width' against all the codes of both analytical frameworks. In addition to 'Feelings', street width also coincided with 'Identity, Belonging and Pride', 'Ways of Getting to Know Others', and 'Social Contact' themes. Street width served two purposes as inferred from residents' narratives: it provided an informal social space where one could run into the neighbours, and created a buffer zone that provided privacy for each house against the opposite row of houses. The balance between these two functions provided the reported feelings of comfort and intimacy that the residents felt.
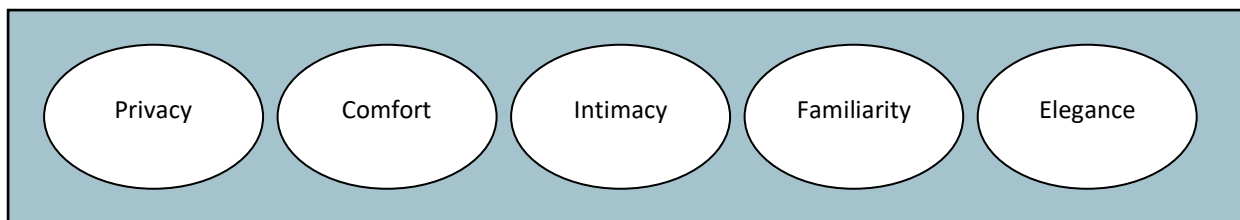
Figure 6.9. Feelings associated with street width as reported by the participants

The respondents seemed to use 'street width' as the primary indicator of how crowded and dense the compact neighbourhood felt. In part, this correlation is related to the family dynamics in affordable housing neighbourhoods and the common mode of transportation in Bahrain. With the reliance on private cars due to weak public transportation and the stigma of using them, it is conventional for every adult in a Bahraini house to own a car. As reported by the respondents, many owners of affordable housing units modified their property to include extended family members (such as grandparents and married offspring) to help them alleviate tenancy financial burdens. While modifying the houses in such neighbourhoods to an apartment layout is against building regulations, doing unauthorised interior modifications remains a common practice by homeowners. Since each unit is provided with one parking space within the property, as shown in Figure 6.10.; the increased number of families and adults in each housing unit dramatically increased the number of cars parked outside. This created a chaotic and overly crowded feeling in the neighbourhood, which is the reason why respondents used parked cars and street width to assess beauty, spaciousness, comfort, and privacy.

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[16] Word search query was extended to include stemmed words and synonyms.

Figure 6.10. Prototype of an affordable housing unit in Bahrain

Interestingly, the respondents frequently discussed the perceived density of the neighbourhood to discuss neighbourhood comfort and beauty, even though none of the interview questions enquired about density. Density constitutes one of the main streams in NSA literature both for the environmental and social dimensions (M. Jenks et al., 2000). from a top-down environmental perspective, dense, compact, and mixed-use neighbourhoods are sought as a solution for lowering CO_2 emissions by reducing the need to move for far distances (Carmona et al., 2010). Carmona et al. also argues that dense neighbourhoods increase the chance of informal encounters, which enhances social contact and contributes to improving social sustainability in a neighbourhood. This positive impact of density is contested in the discourse of bottom-up social sustainability literature (Dempsey et al., 2012). Dempsey et al. documented cases of density in various cultural and geographic contexts and demonstrated how similar measures had drastically different impacts on liveability in those places.

This triad of density, social sustainability, and environmental sustainability appeared in the findings of this bottom-up case study research. Sheirazi and Keivani (2018) defined two interchangeable measures for density in the Social sustainability of urban neighbourhoods: people per area unit and buildings per area unit. However, in the case of Alsayah neighbourhood, residents repeatedly used cars per area unit as a density measure and seemed to overlook the number of people or buildings from consideration. This raises the question of whether density

measures are truly interchangeable or if they bear different significance in different contexts. The case study findings suggest that not only does the density threshold differ from one context to another but also that the measure for density seems to have a contextual dimension. The findings also suggest that the perception of density, and not the absolute measure of physical density, has a stronger effect on various social qualities of affordable housing neighbourhoods. This is consistent with views that distinguish liveability from sustainability in NSA literature (Howley et al., 2009). Still, physical density is the measure used by advocates of compact cities to facilitate environmental and social gains. Nevertheless, repetitive results from participatory studies show that density needs to be operationalized differently for the environmental and social pillars of sustainability.

In terms of the relationship between the LEED-ND framework and the overlap between the 'Aesthetics' and 'Physical Features' themes, the content addressed four indicators that were also present in the LEED-ND framework. Those were: 1) Walkable streets, 2) Compact developments, 3) Connected and open community, and 4) Tree-lined and shaded streetscapes. From the LEED-ND perspective, those indicators were primarily provided to reduce the reliance on cars and improve walkability, which in turn would improve environmental quality and physical health. However, from the residents' perspective, those measures were brought up in accordance to improving liveability and life quality by creating a beautiful and airy space that does not feel too crowded. At first glance, it seems as if the positive impact of compactness presumed by LEED-ND was contested by the locals in Alsayah neighbourhood, who believed that they felt better because the area did not feel dense. However, it is important to emphasize that what the residents described as positive was the low perceived density and not low physical density.

Dave (2011) had a similar conclusion while examining the impact of density on social sustainability in cities of developing countries, using Mumbai as a case study. Her research demonstrated that the form; design; layout of the built environment; the extent of mixed uses in the neighbourhood; and residents' socio-demographic variables were essential in affecting the perception of density in the neighbourhoods of Mumbai. She also found that the measures she defined for social sustainability were better addressed in neighbourhoods with a low perception of density, as opposed to the ones that had a low population or building density. For the case study in Alsayah neighbourhood, the perception of density was affected primarily by the street width, cars parked outside the houses, and the privacy one feels from their own house. With the evident benefits of compactness on environmental sustainability (Carmona et al., 2010), the perception of density seems to be a promising area for minimizing the tradeoffs between social and environmental sustainability. This requires encouraging bottom-up research for operationalising perceived density measures in various cultural contexts.

Connection to Nature and Physical Features

These two themes had 36.82% coding overlap (table 6.2.), which again is not surprising because of the phrasing of the interview question. The most discussed natural feature[17] was the plants put by the homeowners in their front yards or in front of the boundary wall of their houses, which surpassed the reference to public parks in the neighbourhood. Although the housing units built by the MHUP had an open space allocated for a small front or backyard, most of the residents reported adding this space to the indoor area of their house to accommodate the functional needs of their family. While this practice violates the building code for this zone, it remains a frequently exercised one, which leaves the homeowners with a narrow space for planting (as mapped in Figure 6.11.).

Figure 6.11. Usual expansions made to the typical house plan as mapped using residents' responses

Interestingly, many participants mentioned this planted space again while discussing the 'Identity, Belonging and Pride' theme of the POE framework. With the identical houses' facades, the plants helped the residents identify each house and gave a distinct identity to the area, which

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[17] Refer to appendix k. table 4. for a full list of the overlapping occurrences between these two themes.

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made it easily recognizable, as shown in figure 6.12. This recognition gave the residents a sense of belonging as well as pride because of the aesthetic appeal of the neighbourhood. Normally, residents of affordable housing neighbourhoods in Bahrain use the paved space in front of their houses for parking their cars and therefore end up with no green elements in the neighbourhood.
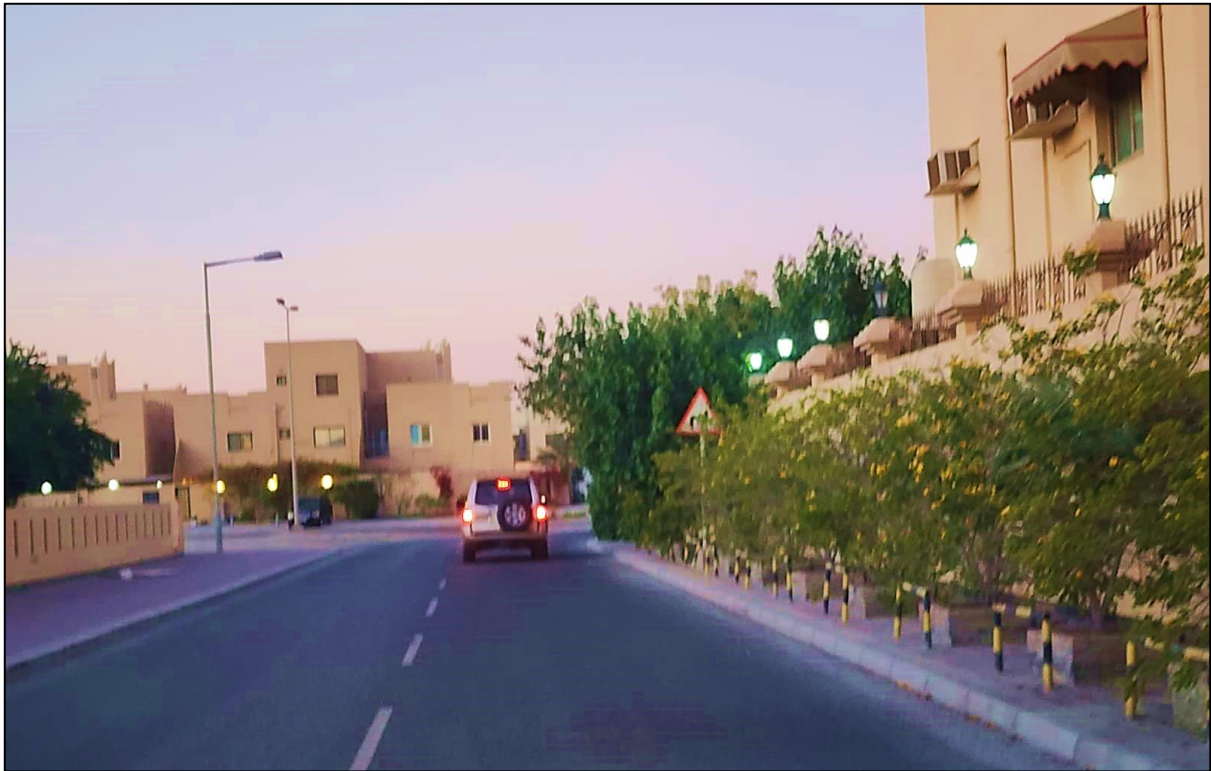
Figure 6.12. Wide streets and pavements in Alsayah affordable housing neighbourhood utilised for planting, enhancing aesthetic appeal and providing identity amidst monotonous facades

What differs in Alsayah neighbourhood is that the paved sidewalks outside the house were slightly wider than in other affordable housing neighbourhoods in Bahrain, which provided extra space for parking and planting. As the sidewalks are outside residents' property and do not take from their potential living space, they frequently showed a willingness to take responsibility for it even though it was not owned by them. It is worth mentioning that while this space does not belong to the house owner, the culture in Bahrain considers this area as an extension of the house, and neighbours are not permitted to linger or park their cars there without taking permission from the house owner. The frequent mention of the front space between the houses in several themes of the POE framework highlights the cultural importance of this element to the context of affordable housing neighbourhoods in Bahrain.

'Tree-lined and shaded streetscapes' and 'walkable streets' are also indicators of the LEED-ND framework. Those indicators aim to reduce urban heat and create an attractive space for walking and bicycling (USGBC, 2018b). LEED-ND provides two options for shading the streets,

either by tree lining the building Blocks or by creating any shading structure for the sidewalks, with the exemption of alleys from consideration. This implies that shade, and not the provision of trees, is the main purpose of this indicator; and makes the provision of plants a responsibility of the formal authorities only. The findings of the case study differ in two ways from the assumptions of LEED-ND. The first is that residents believed that tree-lining the inner alleys and sidewalks had a stronger effect on the aesthetic quality of the area than planting the perimeter of the whole block, and the second is that the residents were more impacted by the presence of trees and not the mere provision of a shading surface. In addition to those, mapping residents' responses (refer to figure 3. in the appendix g) shows that most walking took place within the central part of the neighbourhood, especially in the areas close to one's own house and not the block perimeter which LEED-ND focuses on.

The case study findings align with the assumptions of the revised Residential Environment Assessment Tool (REAT 2.0). The tool was originally designed for the context of regenerated social housing neighbourhoods (Tatiana et al., 2012). Its aim was to monitor the neighbourhood quality and its long-term effect on residents' health and life quality. The main difference between this neighbourhood audit tool and others is that REAT 2.0 considers both: private spaces (property level) and public spaces (street level) of a neighbourhood to measure its quality (Poortinga et al., 2017). The structure of REAT 2.0. is shown in Table 6.2. as adapted from the tool's website (Tatiana et al., 2012). The tool measures natural elements in a neighbourhood using the greenery in public spaces and purposefully planted greenery in front gardens. From those, residents of Alsayah strongly relied on plants in front of their houses to measure the connection to nature in their neighbourhood. In a case study conducted in Cardiff, Poortinga et al. (2017) found a strong correlation between the score the neighbourhoods received using REAT 2.0 and the level of residents' attachment to the neighbourhood. This resonates with the finding from Alsayah case study, where residents partly attributed 'Identity, Belonging and Pride' to the plants grown by the residents in their houses.

Table 6.5. Structure of REAT 2.0. (REAT, 2012)

	Street level	Property level
Neighbourhood Condition	Litter in public spaces	Property maintenance
	Condition of public spaces	Garden maintenance
	Vandalism/graffiti	External Beautification
Natural Surveillance	A clear view of the street	A clear view of windows and doors
Natural Elements	Greenery in public spaces	Trees in front gardens
		Purposively planted vegetation in front gardens

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<u>Adaptability and Physical Features</u>

The fourth highest coding overlap was between the 'Adaptability' of the POE and 'physical features' of the open-end coding, with an overlap of 30.4% (table 6.2.). Upon reviewing the content of the overlap[18], I found that the main reason for considering moving to another neighbourhood was opting for a house with a larger living space or for wanting to add leisure spaces to the house (e.g., a larger garden, a sunroom for the winter, etc.). From an environmental perspective, this result is concerning as it shows a culture of avoiding compact and dense neighbourhoods which have lower carbon footprints. This issue is even more pressing for Bahrain because of the limited land availability and the increasing population (Ansari, 2009), which makes moving towards more dense neighbourhoods an inevitable necessity.

Bahrain, as with other highly populated countries, needs to plan and mitigate the trade-offs between the environmental benefits of dense neighbourhoods and their life quality. This issue has a strong equity concern, as shifting to smaller spaces will affect people with lower economic levels more than other segments of society. If affordable housing neighbourhoods will keep shifting to a more compact form, how could this be done without compromising the life quality of the residents? Theoretically, this can be achieved in two ways. The first is to examine ways to mitigate the negative impacts associated with certain physical features, which involves controlling their measures at tolerable levels. This type of approach received an increasing research interest within social sustainability research, especially in terms of defining acceptable thresholds of density in various social contexts, as in the work of Dave (2010) and Dempsey et al. (2012). It can also be found in research liveability research within Neighbourhood sustainability literature, as in the work of Thomas et al. (2011) and Howley et al. (2009).

The second approach for creating liveable compact neighbourhoods is to find ways to make the negative impacts associated with certain physical features more tolerable. This points to a research area of great potential but one that is not widely discussed in urban sustainability literature. Serin et al. (2018) call this impact the 'forgiveness factor', which refers to the phenomenon where people appear to be willing to overlook some poor qualities in their living environment as long as they are getting another kind of payback. In Alsayah case study, resident narratives showed some evidence towards acknowledging this effect. Responses could be clustered around a number of factors that helped the residents overlock the small area of the spaces they live in. Those included: 1) remaining close to other extended family members (e.g., parents, married offspring, etc.); 2) developing a social network within the neighbourhood; 3)

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[18] The full content is provided in appendix k. table 5.

getting used to living in the area, which was correlated with the time spent living in this area; and 4) being at close proximity to where they work.

The latter three factors have some research validation in other contexts, such as developing a stronger relationship with neighbours (Buys & Miller, 2012), length of stay (Manzo & Perkins, 2006), and proximity to work (Gargiulo et al., 2018). While the first, 'being in close proximity to family members, ' seem to have a more contextual dimension. For instance, Fransson & Teeland (2004, cited in Hansen & Gottschalk, 2006:36) did not find this feature relevant in deciding where to live in Sweden, while it was important in the UK (Shelton & Grundy, 2000). Understanding and operationalising the 'forgiveness factor' in different contexts could play a great role in facilitating the shift towards more environmentally and socially sustainable urban settlements. For instance, in the case of affordable housing neighbourhoods in Bahrain, homeowners were willing to sacrifise living area because of their desire to stay close to their adult children. Theoretically speaking, researchers could use qualitative research to identify social gains that would make residents cope with unpreferred physical features, such as higher residential densities.

'Social Contact' and 'Ways of Getting to Know Others'

The overlap between 'Social Contact' and 'Ways to Know Others' offered a unique opportunity for understanding the type of places and activities that facilitate social contact and the level of contact they enable. While people differed in their preferred level of social contact based on their personality style (introverts or extroverts as inferred from their discussion of personal preferences), all of them associated positive feelings with having some level of social contact, especially in terms of feeling 'Identity, Belonging and Pride'. The overlapping coding occurrences between the two themes[19] show two ways of getting to know others: intentional and unintentional (figure 6.13.). Intentional contact happens when a person purposefully approaches another to establish some type of contact, while unintentional one happens when a person is carrying out any activity and run into a resident.

Male participants reported having several opportunities for unintentional contact over the course of their residency. This means that they had a chance to get to know others when they moved, and this opportunity has continued ever since while conducting their daily activities. The main place that offered this opportunity was the mosque and the outdoor spaces leading to it. As many male residents walked to the mosque around prayer time, they had a chance to meet and exchange greetings. Women, however, reported a much lower level of unintentional

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[19] Full list of occurrences can be found in appendix k. table 6.

encounters, especially working mothers with younger children. They attributed this to not having enough time between their jobs and taking care of their family. The most frequently mentioned way of getting to know others by females was to formally introduce themselves to their new neighbours. After that, most of them kept in touch mainly virtually through WhatsApp groups. Following formal introductions in the early years of moving, females reported that they rarely run into other neighbours except while driving their cars, which classifies as a distant encounter (figure 6.13.). This limited chance of close informal encounters seemed to hinder the ability to work mothers to form a strong social network because they did not have the time or the willingness to intentionally pursue social contact.
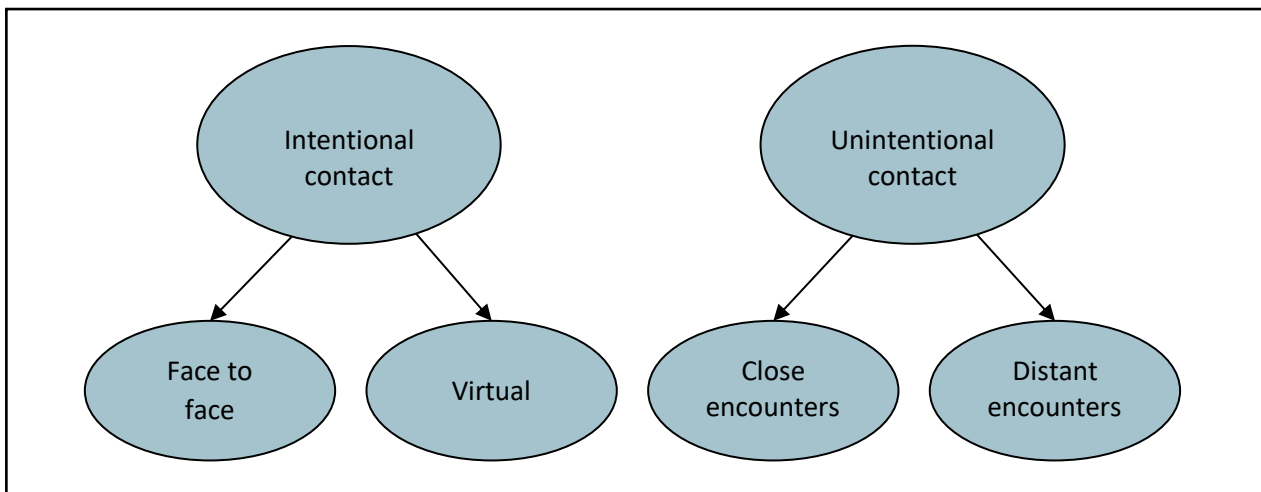
Figure 6. 13. 'Ways of getting to know others' as inferred from the interview transcripts

Research in environmental psychology looked into the dynamics between the strength of social bonds, length of staying in an area, and place attachment (Lewicka, 2011). While there is abundant empirical evidence for the positive relationship between the three dimensions, Lewicka reported that the details of how those interact over time are not thoroughly investigated. In one of the few research projects that studied this effect, Harlan et al. (2005, cited in Lewicka, 2011:216) showed that while the length of stay is a positive predictor of the strength of social bonds and place attachment, most of the bonds happen in the few early years of settlement. This finding is similar to the reported behaviour of females at Alsayah neighbourhood, especially that of working moms.

Feelings of attachment to a place and a community seemed to form with close encounters where one has a chance to pause and talk to his/her neighbours, which correlated with the use of civic and recreational spaces. This should make us question the effectiveness of the mere provision of such facilities in their success in fulfilling their desired aims. In LEED-ND, 'Access to Civic and Public Space' and 'Access to Recreational Facilities' were one of the few indicators explicitly listed for their social benefits, especially in terms of facilitating community participation

and social networking (USGBC, 2018b). However, the case study findings show that the provision did not necessarily facilitate those benefits. While all the community facilities listed by the residents were equally available for both genders, their social impact was far more evident for males than for females. This mainly happened because they failed to accommodate the lifestyle of females in the case study neighbourhood.

‘Support and Influence’ and ‘Problems’

The overlapping coding occurrences between ‘Support and Influence’ and ‘Problems’[20] said more about the former theme than the latter. While the reported type of problems varied from physical (e.g., sewage, parking, etc.) to social (e.g., lack of cohesion), residents repeatedly referred to formal authorities and processes to mitigate both types of problems. They held bodies like ‘The Ministry of Housing’, ‘Muharraq Municipality, and ‘police departments accountable for sorting any problem they had, including social ones (except for one participant who acknowledged and reported social acts of support and influence). The respondents showed a very limited sense of responsibility towards the community or belief that one’s participation can make a difference (commonly known as the sense of empowerment in participatory research), which is problematic at several levels for the sustainability of affordable housing neighbourhoods.

Affordable housing neighbourhoods naturally host a vulnerable population with limited financial abilities. While they do not necessarily count as a minority, this segment is prone to being marginalised in the process of decision-making. The residents’ narratives showed examples where vulnerable segments of the community were able to reach out to authorities and sort out their problems efficiently. This provides evidence that the process of involvement is available for those who seek it, but it does raise concerns about the accessibility of those processes and the appropriateness of the implemented instruments. It also highlights the need for developing social capital where the groups share common values and networks that enable them to take an active role in preserving and improving their environment.

The discussed overlap between ' Support and Influence ' and ‘Problems’ themes intersected with one indicator of the LEED-ND framework, which was ‘Community Outreach and Involvement’. This indicator is set to respond to the needs of the community by involving them in the planning and design stage of the development (USGBC, 2018b). While this is the only stated aim for this indicator, Manzo & Perkins (2006) found that community participation at these stages improves the sense of empowerment, which is closely related to the concept of social capital. Building social networks at this stage of development and involving the community in a

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[20] Refer to appendix k. table 7. for a full list of the overlapping occurrences between these two themes.

collaborative act can develop a common sense of belonging and responsibility towards fulfilling the set aims. However, such aims should be stated explicitly in NSA tools. This is important if researchers want the social dimension of sustainability to be acknowledged as an intrinsic aim of sustainable development and not only as a positive by-product.

<u>'Recreation' and 'Equity'</u>

The overlap between these two themes demonstrates the advantage of integrating top-down and bottom-up approaches of NSA in a hybrid activity. The combination of the two approaches can aid in understanding the socio-spatial dynamics as they interact in the examined context. Using the case study data, the coding overlap between the 'Recreation' and 'Equity' themes[21] demonstrated seven residents' characteristics that were discussed in isolation from the remaining population and who were not benefiting properly from the provided recreational facilities. Those were: 1) Women, 2) Children, 3) Mothers, 4) Girls (which referred to school-aged females), 5) Elderly, 6) Expatriates (which frequently meant naturalized citizens), and 7) People with lower economic income (exact income undefined). While top-down frameworks commonly identify the broad categories of females, elderly, and ethnic minorities as groups that need careful inclusion measures, qualitative POE interviews managed to break these categories down to more specific groups as relevant to Alsayah neighbourhood, as well as identify some of the specific spatial or operational issues they are struggling with.

Such findings should be used to complement or operationalise the generic equity measures defined by expert-led NSATs in order to enhance their inclusivity and hence their equity. For instance, in the LEED-ND framework, 'Regional Priority' is an optional indicator that, unlike the other indicators, has no defined measures to operationalise it. The specified 'intent' for this indicator is 'To provide an incentive for the achievement of credits that address geographically specific environmental, social equity, and public health priorities.' (USGBC, 2018b, p. 87). Using the POE interviews showed that females, for instance, cannot be grouped under one large category, as females of different demographic attributes had different difficulties. This is why I separated women, mothers, and school-aged girls into three different categories.

For Alsayah residents, seeing women, girls and children in open public spaces was always brought up as a positive indicator for various features such as the neighbourhood's accessibility, safety and inclusivity. Women, therefore, seemed to be expected and encouraged by the community to use those facilities. The main problem women faced was that working mothers had very limited time for leisure activities during the weekdays. And as the Bahraini community

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[21] Refer to appendix k. table 8. for a full list of the overlapping occurrences between these two themes.

is more protective of younger females than younger males, mothers reported not feeling comfortable letting their school-aged daughters go unaccompanied for leisure activities within the neighbourhood (compared to boys of the same age). As working mothers reported having no time for leisure activities, the problem extended to younger girls. For this context, regional inclusivity measures could therefore investigate ways to provide more time for working mothers, which could need physical or organisational solutions (e.g., providing daycare services within the work environment).

In addition to the 'Regional Priority' indicator, the overlapping data between 'Recreation' and 'Equity' coincided with three other indicators of LEED-ND, those were 'Access to Civic & Public Space', 'Access to Recreation Facilities', and 'Visitability and Universal Design'. In terms of indicators' aims that can be evaluated by the community members, the indicators were set to improve the inclusiveness of the facilities, community participation, social networking, and public health by facilitating physical activity (USGBC, 2018b). While the aims of the indicators seem to be inclusive, the defined measures were only operationalized in relation to people with physical disabilities. For example, the 'Visitability and Universal Design' indicator of LEED-ND states the following broad intent: to 'increase the proportion of areas usable by a wide spectrum of people, regardless of age or ability' (USGBC, 2018b, p. 48). However, the measures set to achieve this aim are only relevant to people with physical disabilities.

The framework also gives the option to address inclusivity issues in any of the following types of spaces: houses, bedrooms and bathrooms, or kitchens. This means that fulfilling the measures for any of the former spaces grants the project a full mark for that indicator, even though it might be overlooking all remaining spaces and all other minorities from consideration. This gap between the intent of the indicators and the measures set to achieve it and the optional nature of the benefiting minorities should make us question the relevance of such generic frameworks in responding to the needs of minorities in specific cultural contexts. And whether implementing them really aids in approaching sustainability or just adds a veil of validity by having an internationally acknowledged sustainability certificate.

The content of the two LEED-ND indicators, 'Access to Civic & Public Space' and 'Access to Recreation Facilities', can also be read in relation to the overlapping content between 'Recreation' and 'Equity' of Alsayah case study. In LEED-ND, the indicators simply instruct to provide some generic recreational facilities, such as outdoor spaces within a specific proximity to houses and workspaces. Providing those spaces automatically grants the developers more points, which suggests that the space provision successfully fulfils the indicator's intent. But when viewing this assumption in accordance with the case study findings, one can see that space provision was

not necessarily correlated with benefiting from it, particularly for females, as discussed earlier in the overlap between 'Social Contact' and 'Ways of Getting to Know Others'. On a LEED-ND scoring sheet, this unequal benefit would pass unnoticed because recreational facilities are equally provided for both genders. Such an observation can only be noticed and understood through qualitative Post occupancy evaluation because it offers the opportunity to overlap narratives about different components of the built environment.

For more understanding of how those components overlap, I carried the same structure of overlapping the codes, but this time within the themes of the open-end analytical framework. Below is how they interact and how their findings relate to NSA literature and the LEED-ND framework.

6.3. The Interplay Across the Themes of the Open-End Coding Framework

To identify potential areas of analysis in terms of how the themes of the open-end coding framework interact, I used the NVivo 'query' feature to cross-tabulate the codes of the open-end coding framework against each other. As in the earlier sections, I used a heat table to illustrate the result of the previous query. Table 6.6. shows the percentage of the overlapping coded text between each pair of themes, with higher percentages having a darker shade of colour. It is worth mentioning that the 3D matrix of the same query did not add further interpretation to the heat table. Hence I did not use it to demonstrate the open-end coding overlaps. The outlined cells in Table 6.6 are the ones mentioned by a minimum of 50% of the participants. Based on the inclusion criteria in section 6.2, I only discussed the themes with an overlap ratio higher than 5%. The following sections present the overlap between 'Physical Features' and 'Feelings', 'Physical Features' and 'Problems', and 'Identified Places' and 'Activities'.

Physical Features and Feelings

The largest percentage of coding overlaps within the open-end coding framework was between the 'Physical Features' and the 'Feelings' themes, with 22.3% overlap (table 6.6). To analyse the nature of the relationship between these two themes, I extracted their overlapping coding occurrences[22]. Using this data, I listed the physical features which the participants associated with specific feelings. In most of the cases, the feeling was explicitly mentioned by the participant. In such cases, I used the term used by the participant to describe his/her feeling. In the few cases where the feeling was implied, I attempted to identify it based on the participant's response. For those cases, I needed to adjust the code displayed by NVivo software to show the

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[22] The full account of those occurrences can be found in appendix I. table 1.

wider context of the coded text. In the cases where the participant repeated the same physical feature with its associated feeling, I listed this as another occurrence. The outcome of this process is displayed in appendix m. table 1.

Table 6.6. Coding overlap between the themes of the open-end Coding framework

	Physical Features	Identified places	Feelings	Problems	Equity	Activities	Personal traits and preferences	Opinion on social behaviour	Ways of Getting to know others	Frequency of usage	Social network	Mode of transportation	Ways to change attitudes and perceptions	Significance of the discussed theme	Awareness	Changed perceptions and attitudes
Physical Features																
Identified places	3.6															
Feelings	22.3	0.2														
Problems	11.2	1.2	4.2													
Equity	4.4	1.1	7.7	9.3												
Activities	5.3	6.4	0.0	0.0	3.4											
Personal traits and preferences	13.1	0.5	7.7	1.5	1.7	0.9										
Opinion on social behaviour	2.6	0.1	6.7	14.1	10.0	0.0	4.1									
Ways of Getting to know others	4.2	6.9	2.6	0.0	2.2	3.5	2.6	2.6								
Frequency of usage	3.0	10.5	1.9	0.0	0.0	11.5	1.3	0.0	7.4							
Social network	0.0	1.9	0.0	0.0	0.0	7.1	0.0	11.0	13.6	0.0						
Mode of transportation	0.0	2.3	0.0	6.4	0.0	10.0	3.2	0.0	2.3	5.1	0.0					
Ways to change attitudes and perceptions	2.6	0.2	4.2	12.6	2.7	0.0	4.0	2.5	1.7	0.0	1.0	0.0				
Significance of the discussed theme	0.9	8.0	9.2	0.0	0.9	0.0	3.9	5.7	0.0	0.0	0.0	0.0	8.6			
Awareness	0.0	3.9	0.0	0.0	23.3	0.0	10.1	10.1	0.0	0.0	0.0	0.0	0.0	0.0		
Changed perceptions and attitudes	14.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	17.7	17.7	0.0	0.0	
Factors influencing major life choices	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

Legend

Theme discussed by at least 50% of the sample

Based on this table, neighbourhood density was the most discussed physical feature, which the residents explicitly associated with specific feelings. Table 6.7 shows all the occurrences of physical features that relate to density, as well as the feelings associated with them by the participants. The perception of density was related to four physical features: 1) The number of cars parks in the street, 2) The width of the space outside in front of the house, 3) Visual privacy in one's own yard, and 4) Street connectivity (figure 6.14). The most discussed feature, and the one associated only with positive feelings, was what the participants described as the outside space in front of the house. This space was a simple paved sidewalk, slightly elevated from the street level (mostly used to park cars by the house). This feature can be seen in Figure 6.15, which is a photograph taken of an intersection in Alsayah Neighbourhood.

Table 6.7. The overlap between the 'Feelings' theme with the 'Density' occurrences within the 'physical features' Theme

Participant	Mentioned physical feature		Associated feeling
3	1.	Dense parking	Crowded
	2.	Wide sidewalks	Comfort – Residential satisfaction
	3.	Space in front of the house	Privacy - Comfort – Social Connection
5	4.	Slightly dense housing	Intimacy - Belonging
	5.	Dense housing with connection to inner streets and limited connection to main streets	Quietness
	6.	Densely connected inner street network (similar to traditional neighbourhood layout in Bahrain)	Familiarity
	7.	Dense housing	Social connection - Belonging
	8.	Dense housing with Wide sidewalks	Social connection
6	9.	Street connectivity	Belonging
12	10.	Dense Housing without wide sidewalks	Stress
	11.	Housing Density	Discomfort
	12.	Dense Housing without wide sidewalks	Lack of joy
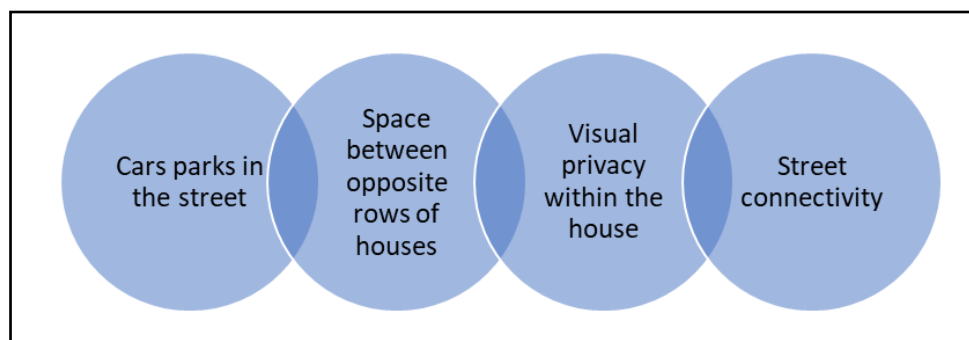
Figure 6.14. Factors that influence the perception of density based on the data analysis

Figure 6.15. A photograph taken for Alsayah Affordable housing neighbourhood

The space between the houses (which constitutes the sidewalk and the street) was also frequently brought up by the participants while discussing other areas throughout the interviews. As shown earlier in this section, this feature appeared while discussing the overlap between 'Aesthetics and Physical Features', 'Connection to Nature' and 'Physical Features', and 'Social Contact' and 'Ways of getting to Know Others'. This feature was always associated with positive evaluation in any theme it appeared at and was strongly related to how dense the neighbourhood felt. Density as an absolute measure (number of dwellings within the neighbourhood area) fluctuated between being perceived as a positive or a negative feature, with different tolerance levels across the participants, to how dense a neighbourhood is. But space in front of the house was constantly perceived as a positive feature. Since density is viewed as one of the most pressing concepts in social and environmental sustainability (Carmona et al., 2010), there is a clear indication of the significance of this space to sustainable neighbourhoods in the context of Bahrain, especially in terms of operationalising the perception of density by the locals.

In terms of how the overlap between 'Physical Features' and 'Feelings' relate to the LEED-ND framework, three indicators stood out as relevant. Those were 'Walkable Streets', 'Compact Development' and 'Connected and Open Community', all of which seem relevant to the factors that relate to the perception of density in the case study neighbourhood. LEED-ND discussed these themes in relation to both environmental and social benefits, with a focus on the former. The aim of the 'Walkable Streets' indicator was to create safe and appealing streets that could facilitate physical activity and reduce the carbon footprint of transportation (USGBC, 2018b). The 'width of sidewalk' and 'on-road parking' were street features used as measures for this indicator

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and where also referred to by the participants. Both features had a similar impact on the residents' feelings to the ones presumed by LEED-ND, which were affecting safety, visual appeal, and promoting walkability.

As for 'Compact Development', this indicator appeared to induce opposite feelings for the residents compared to the ones presumed by LEED-ND. The framework set this indicator to promote liveability and walkability, amongst other things. However, in the case study, density made walkability feel more dangerous because the presence of more people meant the presence of more cars. The positive association between 'Walkability' and 'compactness' was therefore conditional to the availability and effectiveness of a quality public transportation system. This is where the limitation of my proposed methodology of using POE to review the impact of existing NSATs could slip unnoticed.

At first glance, it appears as if dense developments are creating an opposite effect to the one presumed by LEED-ND. However, the framework has a prerequisite of selecting a 'Smart Location'. This indicator requires developing the project within walking distance of quality transit facilities or having a diverse range of facilities close to the development. In this case, the interaction between the 'Compact Development' indicator and 'Smart Locations' would together create the required effect of promoting walkability and liveability. When using my suggested methodology, it is imperative to know that it is conditional upon having independent indicators in the investigated NSAT. Otherwise, comparisons cannot be drawn between the case study that did not use the NSAT in its design and the investigated existing framework.

With this condition in mind, I explored how the overlap between 'Physical Features' and 'Feelings' relates to the 'Connected and Open Community' indicator of LEED-ND. This indicator directly relates to the street connectivity feature discussed by the participants, which was regarded as a mediator for the perception of density. Well-connected streets affected the feeling of 'familiarity' and 'sense of belonging' of the residents (table 6.7). Using the extended coding occurrences for this overlap[23], feeling familiarity seems to correlate with the responses of older residents, who believed that such a layout resembles traditional neighbourhoods they used to live in, which made them like this layout. While for the remaining participants, the connectivity of the internal streets of the neighbourhood made it easier for them to identify their neighbourhood and find their way around it. This seemed to develop a feeling of belonging to this area.

Residents discussed two types of connectivity, connection to the wider urban context (other neighbourhoods and nearby cities); and internal connection to the neighbourhood

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[23] The full account of those occurrences can be found in appendix I. table 1.

components. Based on participants' reporting, internal connectivity was more influential in affecting the strength of feeling connected to the neighbourhood as a place and the strength of feeling bonded with the community. Both types of connectivity are depicted in LEED-ND, which sets two alternative measures for fulfilling the 'Connected and Open Community' indicator, which were surrounding connectivity and internal connectivity. Interestingly, LEED-ND sets the surrounding connectivity measures for smaller developments (smaller than 5 acres) and the other one for larger developments (USGBC, 2018b). In comparison to the case study, Alsayah neighbourhood is a small development which would require more attention to surrounding connectivity as per LEED-ND guidelines. However, the residents were more concerned with internal connectivity than external one, especially when discussing its social impact.

The difference can be understood by noticing that LEED-ND constantly prioritises environmental gains over social ones. For smaller communities, having strong surrounding connectivity means having access to facilities provided by surrounding areas, which in turn means having shorter travelling distances and less car dependency. This would explain why smaller developments are associated with the measure of surrounding connectivity. But for the locals at Alsayah, their small neighbourhood had a distinctive identity because of its limited entrances and exits, which meant that people who entered were primarily residents. Also, the limited surrounding connectivity made fewer cars enter the neighbourhood and had them drive at slower speeds, which enhanced the safety and walkability within the neighbourhood.

This preference can be a contextual one, as locals in this Middle Eastern country might assign a higher value to privacy, which could justify why restricting access to the neighbourhood can aid in developing a sense of belonging. Regardless of the exact preference in the examined context, residents seemed to develop strong identifiable feelings because of physical features that related to the perception of density and mobility. This correlation highlights the significance of density in affecting the social sustainability of urban neighbourhoods, which is one of the main hypotheses within social sustainability literature. And one of the few ones supported with empirical evidence in numerous cultural contexts such as India (Dave, 2011) and the UK (Dempsey et al., 2012).

Physical Features and Problems

Using the overlap between these two themes[24], I classified the problems resulting from the physical features of Alsayah neighbourhood into two types. 1) Problems that could have been foreseen by the designers and do not necessitate user participation. The mentioned ones

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[24] Full occurrences can be found in appendix I. table 2.

included difficult roof accessibility for maintenance, natural site slope and water accumulation, sewage, thermal comfort, and air quality, all of which have relevant indicators from LEED-ND to consider in advance. And 2) problems that result from the type of space usage, which could have been anticipated or mitigated through consulting with the locals before developing the project. Those included crowded parking spaces within the neighbourhood and uncomfortably small indoor spaces within the housing unit. As with the first type of problem, the second type also had relevant indicators in the LEED-ND framework to discuss them.

The residents explicitly related the second type of problem (dense parking and small indoor house spaces) to feelings of crowdedness and discomfort. Also, both problems relate to area requirements, which are frequently found to coincide with high-density urban developments (Howley et al., 2009). Using the identified problems, residents appeared to associate the negative perception of density to measures of 'car density' and 'the areas of indoor spaces within the house'. Within the LEED-ND framework, density is promoted by the mandatory indicator of 'Compact Development'. This indicator is defined using two measures that can be analysed in relation to the case study findings. The framework sets different measures for two cases of development: ones within close distance to quality transit services and ones without.

For the first type of development, LEED-ND defines density measures in relation to distance from the transit facility. The framework sets higher residential density requirements for areas closer to quality transit and lower densities for further ones (USGBC, 2018b). In a way, this approach is consistent with the perception of density by the residents of Alsayah. Without access to quality transit (as in the case study neighbourhood), people are more likely to rely on private cars for transportation. Such neighbourhoods would probably end up with higher car densities, which would increase the perception of neighbourhood density to an uncomfortable level. While this remark does not examine the exact measure assigned by LEED-ND, it supports the theoretical underpinning of relating residential densities to their distance from close transit facilities.

For developments without access to quality transit, LEED-ND changes the density measure to predefined ratios of dwellings per acre (USGBC, 2018b). This suggests that the density in LEED-ND can be read using the number of people per neighbourhood area. While this approach makes sense for the environmental gain behind densification, it does not do the same for the social one because it assigns no weight to the number of people per indoor house area. Several studies showed that small indoor house areas can negatively affect the residential satisfaction in urban neighbourhoods (Cao & Wang, 2016), including affordable housing ones (Ibem et al., 2015). Enlarging the house area while keeping the neighbourhood dense could be used as a strategy to promote shifting for more liveable dense neighbourhoods.

The persistent occurrence of density-related measures in the occupants' narratives gives an ethical and instrumental significance to this concept. With the undisputed environmental benefits of this measure, its impact on the social qualities of urban neighbourhoods cannot be overlooked or advocated theoretically. Density, or the perception of density to be precise, strongly and explicitly affected social aspects of neighbourhood qualities, including liveability and wellbeing. Those impacts are more likely to influence community members with lower economic levels as residents of affordable housing neighbourhoods. Those members have lower choices for opting in or out of residential areas and are most likely to have to live with the imposed measures by planners and developers. As density appears to be an inevitable option for many contexts, either for environmental gains or due to the high populations, more research needs to examine the social implications of perceived density in order to find ways to make dense neighbourhoods more liveable.

Identified places and Activities

The last coding overlap of a value greater than 5% and discussed by more than 50% of the participants were between 'Identified Places' and 'Activities', with a 6.4% overlap between the two[25]. The listed places were mosques, seafront walkways, sports centres, and parks. The sample size did not allow for a strong pattern to appear in order to deduct further findings. However, the diversity of the listed places associated with specific activities reflects the broad range of interests that exists within the same community. This solidifies the claim that diversifying community facilities could create more lively neighbourhoods (Carmona et al., 2010). Nevertheless, no conclusive findings can be inferred by examining this overlap.

6.4. Summary

In this section, I presented the implications of the findings and their significance to the context of affordable housing neighbourhoods in Muharraq, Bahrain, as well as their relevance to the broader context of NSA literature. The discussion was structured around three categories: the variables that affected residents' evaluation of their neighbourhood environments; the overlap between the predefined themes of the POE framework and the open-end coding framework which emerged through the content analysis of the interviews; and the interrelationship between the themes of the open-end coding framework. The 'Physical Features' of the open-end coding framework had the greatest overlap with the themes of both analytical frameworks, and it reflected the significance of density-related features on various social qualities of residents' lives. The findings show that sociological variables such as age and gender can

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[25] The full list of occurrences can be found in appendix I. table 3.

cluster residents' feedback with regard to their neighbourhood areas. While this is beneficial, it is unknown if the same variables affect other contexts in the same way or if they remain relevant. Future research can be replicated in other contexts to explore the generalisability limitations of using age and gender to cluster residents' opinions. It could also identify the variables that define what similar contexts are, for instance, is geographical commonalities, historical ones, ideological ones, and so on.

Chapter 7: Conclusion

This chapter presents a systematic outline of the theoretical, methodological, and practical impacts and contributions of my research. It underscores the importance of localising international sustainability assessment tools like LEED-ND for specific cultural and regional contexts and emphasises the necessity of incorporating local perspectives into urban sustainability practices. The chapter begins by examining the interplay between the fixed analytical framework of the Post-Occupancy Evaluation (POE) tool, the community-led, open-ended coding framework, and the LEED-ND-Based Analytical Framework. This exploration provides crucial insights for adapting the LEED ND framework to Bahrain's affordable housing neighbourhoods and enhancing the methodological rigour of the proposed POE model.

The chapter then transitions to the specific contributions of the research in refining and localising the LEED-ND framework for Muharraq, Bahrain, and showcasing methodological advancements. The integration of community perspectives into neighbourhood sustainability assessments is also highlighted, ensuring that evaluations are not only technically robust but also socially relevant and context-sensitive. In the second section, I present context-specific contributions, directed towards supporting decision-making by adapting LEED-ND indicators to the context of new affordable housing neighbourhoods in Muharraq, Bahrain, based on local insights. The integration of community input with the LEED ND framework offers a nuanced understanding of the community's needs and preferences and ensures that sustainability assessments can be both technically sound and socially relevant.

In the third section, the discussion expands to more general methodological contributions that can be applied in contexts beyond Bahrain. Here, I revise my designed methodological approach to devise a systematic way of using community-led Post-Occupancy Evaluation (POE) to localise expert-led Neighbourhood Sustainability Assessment Tools (NSATs) to suit specific cultural contexts. This is supported by reflections on the insights and experiences gained from conducting this applied research. Importantly, the applicability of this model is confined to expert-led NSATs that employ an indicator-based framework with a scoring evaluation system. I conclude the chapter by emphasising the significance of localising international sustainability assessment tools like LEED-ND for specific cultural and regional contexts. This conclusion is followed by an exploration of the research's limitations and future research directions. Specifically, I suggest expanding studies to evaluate generalisability limitations of POE research, highlighting the potential role of sociocultural influences on the generalisability of POE findings.

7.1. Understanding the Interplay Between the fixed POE, Open-End Coding, and LEED-ND-Based Analytical Frameworks

This section discusses the coding overlap between LEED ND impacts identified in section 4.2.4., the fixed analytical framework based on the POE themes, and the open-end coding framework. This step is instrumental in linking the findings of the community-led POE interviews to the recommendations of the LEED-ND framework. In section 4.2.4., I laid the foundation on how to systematically link the LEED-ND framework to the findings of the community-led POE. The premise was to search for community-relevant impacts defined by the LEED-ND framework and see if the locals picked those up and, if so, what those meant to them. The expectation was that community-led POE would aid in defining contextually relevant indicators and measures on how to approach some of the expert-defined impacts or even suggest ways to refine them for the context in question.

The development of impact cluster themes was a meticulous process that I initiated before collecting the data. I did this in advance to have a structured framework ready for linking the themes that I derive from the community-led POE interviews with the themes based on LEED ND framework. I began with identifying potential LEED ND indicators and impacts relevant to residents' evaluations. I listed those in a comprehensive table summarizing LEED ND indicators and impacts pertinent to community evaluation which I presented earlier in chapter 4, table 4.8, pp. 139-140. The process resulted in identifying 12 indicators and isolating their intended impacts from LEED v4 Neighborhood Development Addenda (USGBC, 2018b). I used the listed impacts for each of the 12 indicators to generate a list of keywords for all community-relevant impacts and mapping them against their corresponding LEED ND indicators.

This analysis revealed a total of 48 expected impacts from the 12 indicators, with several impacts recurring across different indicators. These repetitions indicated interrelationships between various factors contributing to specific impacts, a nuance not directly addressed in the LEED-ND framework, where each indicator is scored individually. The elimination of these repetitive impacts resulted in a refined list of 23 unique impacts. These impacts were then clustered into five categories based on the relevance of their content (as detailed in Chapter 4, Figure 4.8, pp. 141). Those included: Cluster 1: Positive Emotions, with the impacts: of Safety, Comfort, Beauty, and Liveability; Cluster 2: Active Lifestyles, with impacts: Health, Activity, Distance, Transportation, Access, Cycling, Walking, and Speed; Cluster 3: Connection, with impacts: connection, community, engagement, participation, interaction, social. Cluster 4: Equity, with impacts: Age, Economic, Household, and Ability; and Cluster 5: Flexibility and Freedom, with

the impact: Responsiveness. Interestingly, except for the 'Equity' cluster, the remaining four categories aligned with the themes used in the Social Value Toolkit, which informed the development of the POE framework.

I used these keywords as search prompts in NVivo software, utilizing its multi-levelled word search capability to code the impacts. When coding the impacts, I opted for a 'generalization' level in the word search query to ensure I do not miss any possible findings. The final analysis stage involved cross-referencing the keywords within the impact cluster themes based on LEED ND, against the two other analytical frameworks based on the community-led POE. This level of analysis enabled me to align the community-led findings with the framework structure of LEED ND. By comparing the findings of the three analytical frameworks, I identified LEED ND indicators and measures that were discussed by the locals in Alsayah and opted to devise ways to refine them based on the recommendations of the locals. This approach aimed not only to develop a local neighbourhood sustainability assessment framework relevant to Muharraq, Bahrain but also to refine the methodological framework for using community-led POE in localizing expert-led NSATs.

Below, I discuss how those impacts overlapped across the three analytical frameworks I used in this study, the fixed POE framework, the open-end coding framework, and LEED-ND-Based Analytical Framework. The intention is to use the community-led data to finetune relevant LEED-ND indicators to make them more capable of achieving their impacts in ways the community feels relevant. To manage the data, I produced a large table where I mapped the themes of the fixed POE analytical framework and the open-end analytical framework against the defined community-relevant impacts of LEED ND. The full table is attached in appendix n. The following sections present a breakdown of each identified LEED ND impact and compare it to residents' comprehension of it. For each impact, I use a diagram to map the correlating themes from each analytical framework. Those diagrams offer a visual illustration of the range of physical and non-physical components that are at play when assessing each theme. The sections discuss how each impact could be understood from residents' perspective and suggest ways to adapt them (when needed) to the context of affordable housing neighbourhoods in Muharraq, Bahrain.

7.1.1. Impacts Cluster 1 - Positive Emotions:

This cluster of impacts includes safety, comfort, beauty, and liveability. Such emotions involve a large subjective component, with meanings that can differ across various contexts. They are also unlikely to be the result of a single linear cause. LEED-ND framework primarily attributes this cluster of impacts to streets and streetscapes (refer to table 4.3). However, the community

input from the case study shows that positive emotions relate to more than those physical features. Instead of focusing on streets and walkability, the locals at Alsayah largely attributed positive emotions to social features and behaviours. The following discussion shows how each of those impacts compares across the three analytical frameworks.

- Safety

Safety appeared to be a complex impact affected by numerous factors. In LEED ND, safety was primarily related to the safety of streets, with a focus on pedestrians. While street safety remained an important aspect through residents' evaluation of this impact, the issue had a stronger psychological component to it (Figure 7.1). Participants particularly linked perceived safety to being acquainted with the neighbours and sharing common values, which were mostly attributed to having neighbours with a homogenous ethnic and cultural background. This reinforces the notion that across the spectrum of diversity, homogeneity at the neighbourhood scale appears to induce more positive effects on neighbourhoods' social qualities than diversity.

The negative relationship between diversity and neighbourhood quality is not an unexplored phenomenon, as many works of literature have discussed this correlation. For instance, in policy, Stolle et al. (2008) emphasised how diversity at the neighbourhood scale could negatively affect interpersonal trust. In urban planning, diversity at the neighbourhood scale was correlated with lowering residents' place attachment levels (Oliver, 2010). Similarly, in residential satisfaction, diversity lowered levels of trust and happiness among residents (Stolle et al., 2008). Those repeated findings in the literature reinforce the need for revisiting imposed diversity at the neighbourhood scale and possibly introducing it as a planning strategy at the city scale instead.
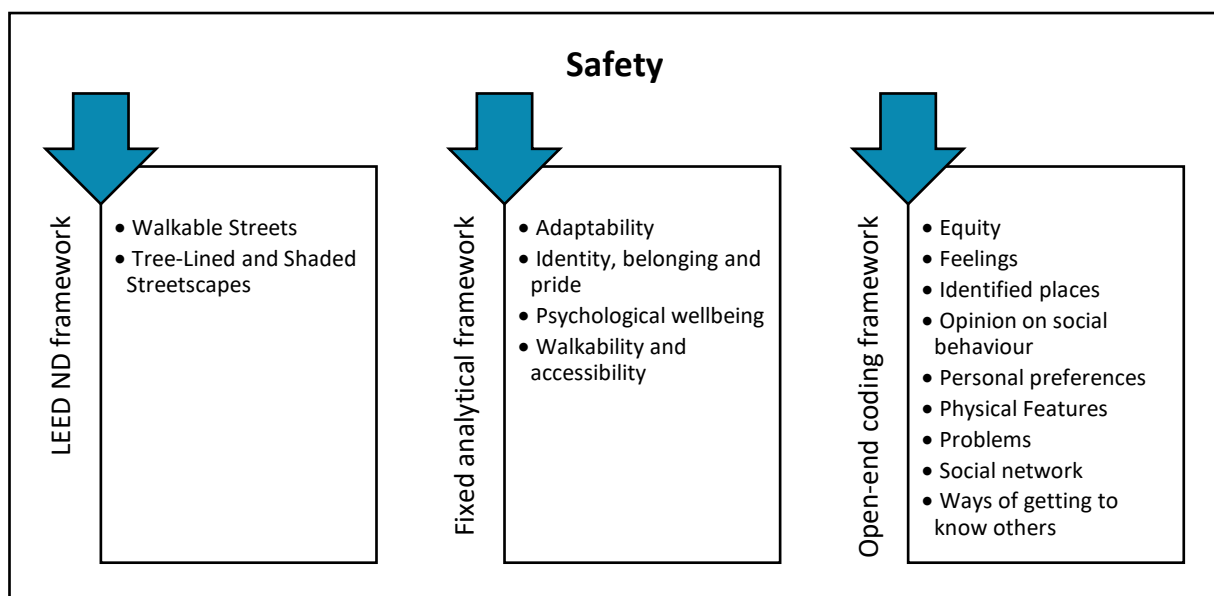

Figure 7.1. Interrelated themes relevant to 'Safety' impact, classification based in relation to: LEED ND framework, Fixed analytical framework, and open-end framework

Comfort

As in safety, LEED ND strictly related comfort at the neighbourhood scale to street walkability. However, based on residents' feedback, this impact too had a strong social and psychological component to it (as depicted in Figure 7.2). In terms of physical features, residents repeatedly related comfort to features of street width and sidewalk width. A review by Mehta (2007) identified that liveability literature put significant weight on street width as a predictor for street liveliness and promoting subsequent social behaviour. Interestingly, participants' narratives showed that wider street and sidewalk width created a private atmosphere for each house while making it easy to run into neighbours to get a satisfactory level of social contact. In summary, street features were deemed significant to residents' comfort by both the LEED-ND framework and residents' narratives. However, LEED ND attributed comfort to street walkability, while the residents attributed comfort to balancing social contact and privacy needs.

Comfort

LEED ND Framework	Fixed analytical framework	Open-end coding framework
• Walkable Streets	• Adaptability • Aesthetics • Community facilities • Connection to nature • Housing suitability • Identity, belonging and pride • Psychological wellbeing • Social contact • Support and influence • Walkability and accessibility	• Equity • Feelings • Identified places • Opinion on social behaviour • Personal traits and preferences • Physical features • problems

Figure 7.2. Interrelated themes relevant to 'Comfort' impact, classification based in relation to: LEED ND framework, Fixed analytical framework, and open-end framework

• Beauty

As with the other impacts contributing to positive emotions, beauty was only correlated to the 'walkable streets' indicator in the LEED-ND framework. This impact was also primarily attributed to physical features based on residents' narratives (figure 7.3.), but those features were not strictly related to the street level. Residents related beauty mostly to housing facades, the presence of green elements in the inner streets, and neighbourhood character. Based on LEED ND, Beauty primarily sought to facilitate walkability by creating appealing environments.

However, participants correlated this impact to a broader range of positive feelings, especially relating to satisfaction with the neighbourhood and feelings of identity and pride. This finding aligns with De La Barrera et al.s' (2016) research findings. Their research explored the relationship between differentiating socio-economic neighbourhoods and residents' perceptions of their green spaces. Their research showed that residents strongly correlated green spaces (which contribute to enhancing neighbourhoods' aesthetic quality) to create a strong neighbourhood image, which positively influenced their sense of attachment to the neighbourhood.

In addition to green elements, residents attributed beauty to housing facades. This feature can be seen as equivalent to building facades in Mehta & Bosson's (2018) study for street liveability. Their research identified a positive correlation between the ability of commercial streets to foster positive social qualities by facilitating liveability and social interactions at the neighbourhood scale. This further emphasises the relationship between aesthetic features and enhancing the social sustainability of neighbourhoods and highlights specific design elements to improve the aesthetic appeal at this scale, with a focus on housing facades and the provision of green elements.

Beauty

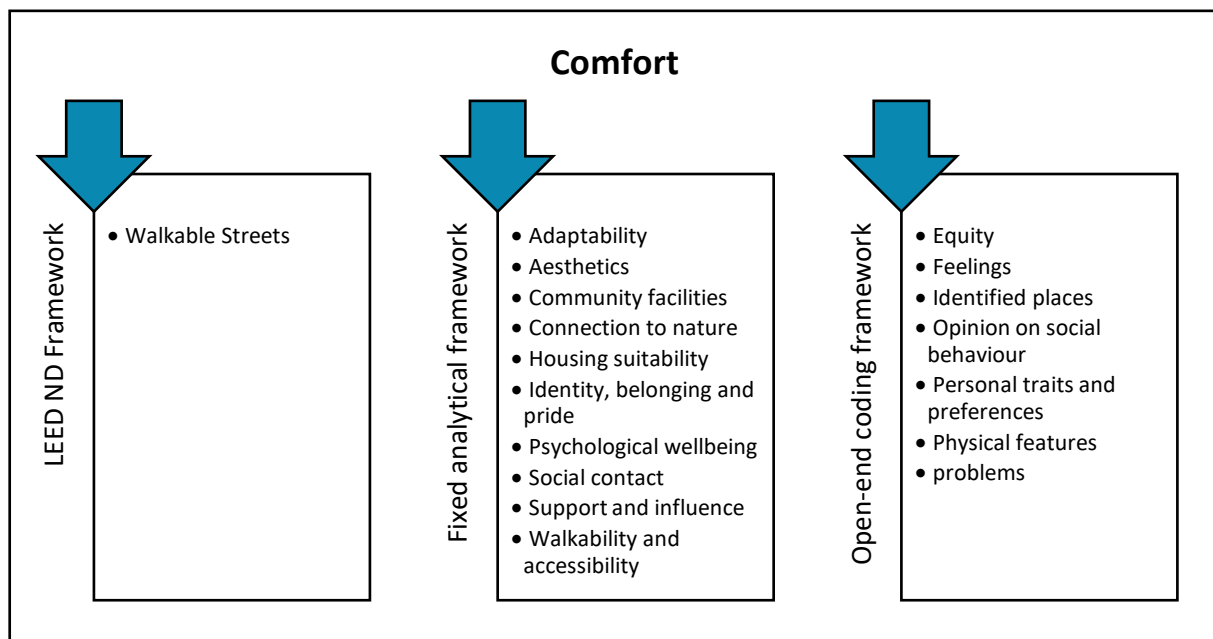| LEED ND Framework	Fixed analytical framework	Open-end coding framework
• Walkable Streets	• Aesthetics • Connection to Nature • Housing suitability • Identity, belonging and pride • Social contact • Support and influence	• Equity • Feelings • Identified places. • Opinions on social behaviour • Personal traits and preferences • Problems • Social network • Ways of getting to know others

Figure 7.3. Interrelated themes relevant to 'Beauty' impact, classification based in relation to: LEED ND framework, Fixed analytical framework, and open-end framework

• Liveability

Running a text search for the term 'liveability' in the residents' narratives did not yield any results. This included the five search levels provided by NVivo, which comprise exact match, stemmed words, synonyms, specialization, and generalization. It could be because this term is primarily academic and too complex to be explicitly referenced in residents' evaluations.

7.1.2. Impacts cluster 2: Active Lifestyles:

Based on the LEED-ND framework, the impacts clustered under Active lifestyles had numerous indicators contributing to them (appendix n. table 1). Those indicators included: ' Bicycle Facilities', 'Walkable Streets', 'Compact Development', 'Connected and Open Community ', 'Access to Civic & Public Space', 'Access to Recreation Facilities', 'Neighborhood Schools', ' Mixed-Use Neighborhoods', and 'Tree-Lined and Shaded Streetscapes'. This large number of indicators shows that the LEED-ND framework suggests an interplay of several causes that contribute to creating active lifestyles. Those impacts and their presence across the two remaining analytical frameworks are detailed below:
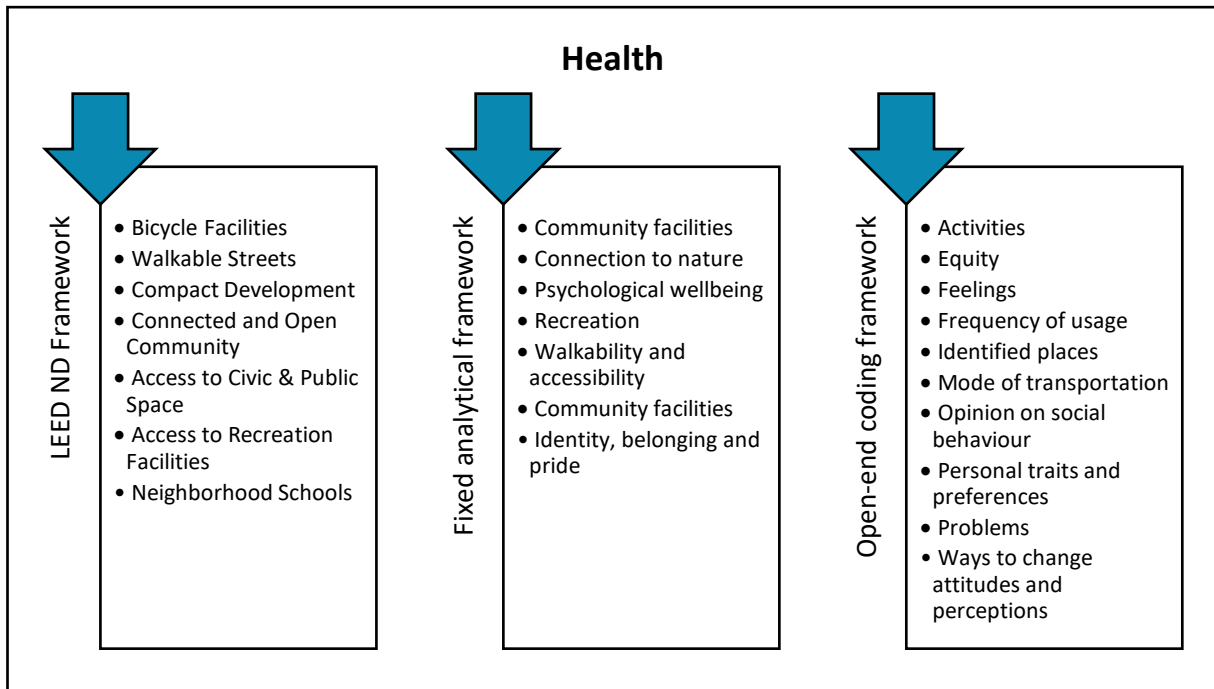
- Health

While health had seven indicators contributing to it, according to LEED-ND, the participants minimally touched upon this impact. Despite referring to several themes in the fixed and open-end analytical frameworks, as inferred from Figure 7.4, those references were very brief and only coded once per the theme. This indicated that health as a concept was not consciously significant to the participants. This relative indifference can be the result of three possibilities: the insignificance of health to participants, which is very unlikely; the satisfactory presence of this concept in the assessed neighbourhood; and/or the ignorance of the relationship between health and neighbourhood environments. Positive and negative reference to health was mainly associated with physical activities that require some sort of mobility. Many indicators of LEED-ND that relate to health were also referenced by the participants (as can be inferred from Figure 6. 15.). Participants also discussed issues related to positive feelings that come with being satisfied with the house and neighbourhood. Those can be further investigated in relation to the association between mental health and residential satisfaction. The such focus of the literature is advocated in works around social value and social return of investment, promoted by researchers like Severson & Vos (2018), and Samuel et al. (2020).

Health

LEED ND Framework	Fixed analytical framework	Open-end coding framework
• Bicycle Facilities • Walkable Streets • Compact Development • Connected and Open Community • Access to Civic & Public Space • Access to Recreation Facilities • Neighborhood Schools	• Community facilities • Connection to nature • Psychological wellbeing • Recreation • Walkability and accessibility • Community facilities • Identity, belonging and pride	• Activities • Equity • Feelings • Frequency of usage • Identified places • Mode of transportation • Opinion on social behaviour • Personal traits and preferences • Problems • Ways to change attitudes and perceptions

Figure 7.4. Interrelated themes relevant to 'Health' impact, classification based in relation to: LEED ND framework, Fixed analytical framework, and open-end framework

- Activity

The term activity used here refers particularly to physical activity. Both analytical frameworks related to the POE narratives represented similar views to what is expressed in LEED ND. Experts and the public shared the view that activities are mostly promoted by recreational facilities, close community facilities, and safe, well-connected communities where individuals can move freely outside. After analysing the themes depicted in Figure 7.5., the main contribution of the POE to LEED-ND was identifying which groups were particularly benefiting or deprived of benefiting from such recreational facilities. In the context of Alsayah neighbourhood, those groups included women, children, and people with lower socio-economic levels, particularly expatriates.
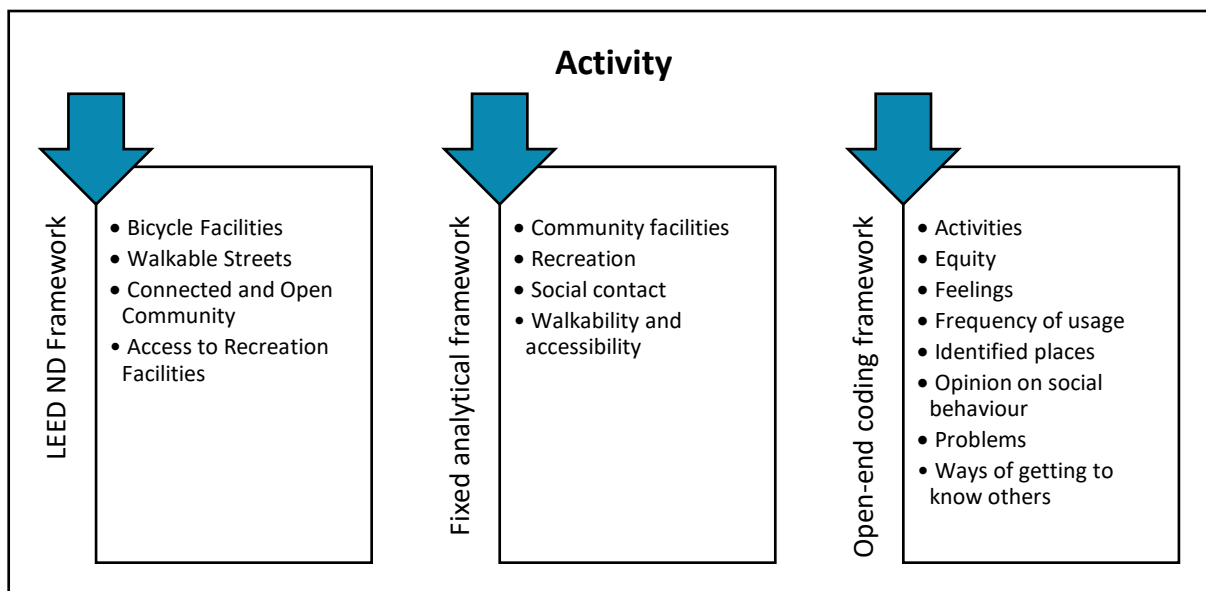
Figure 7.5. Interrelated themes relevant to 'Activity' impact, classification based in relation to: LEED ND framework, Fixed analytical framework, and open-end framework

- Distance

The proximity of various facilities to residential units was one of the aspects repeatedly promoted by the LEED-ND framework in more than one indicator (as shown in appendix n. table 1.). In addition to being facilitated by more than one indicator, proximity was promoted for more than one anticipated impact. Analysing the description of LEED-ND indicators listed in Table 4.3 shows that shortening distances between various destinations was encouraged for three purposes: 1) facilitating accessibility. 2) encouraging walking and other forms of mobility, which in turn aids in benefiting health by encouraging active lifestyles and the environment by reducing car reliance. Finally, 3) facilitating liveability through creating an interactive community because of the frequent encounters of the residents.

When compared to residents' narratives, proximity was discussed with a similar level of significance (considered important to residents) and similar anticipated impact range (facilitating accessibility, walkability, and social interaction, as shown in Figure 7.6. which correlates the themes relevant to 'distance' across the three analytical frameworks). As the experts did in LEED ND, residents of Alsayah neighbourhood identified the same places in relation to the significance of their proximity. Those primarily included community and recreational facilities. The only way in which residents' narratives differed from LEED ND's discussion around proximity was that residents differed between proximity and car accessibility. They did so when mentioning that nearby services were good if they did not cause traffic near the residential units, which they criticised for causing noise and endangering the kids walking around the inner streets.

Compactness was therefore appreciated by residents as long as it does not create perceived or physical crowdedness or negatively affect safety.
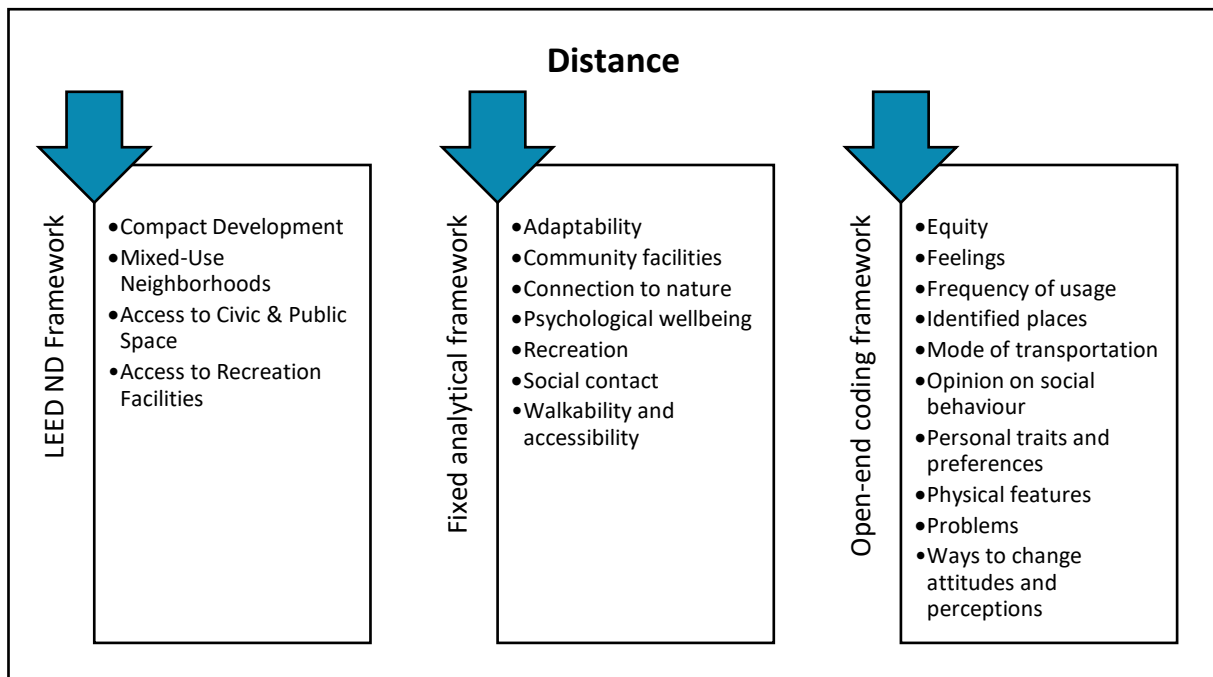

Figure 7.6. Interrelated themes relevant to 'Distance' impact, classification based in relation to: LEED ND framework, Fixed analytical framework, and open-end framework

- Access

Unlike the previous impacts within the 'active lifestyles' cluster, accessibility was approached differently across LEED ND and residents' feedback. Based on LEED ND indicators and their expected impacts (summarised in Table 4.3.), access was only encouraged through the 'mixed-use neighbourhoods' indicator. The benefits of accessibility as defined by LEED ND were also exclusive to health and environmental benefits by encouraging walking and discouraging the use of private cars. While residents shared this belief, their understanding of accessibility involved more impacts that went beyond health benefits (figure 7.7.). Residents discussed two issues related to access, those were limiting vehicular accessibility to create safe inner streets and limiting the accessibility of non-residents into the residential areas to create a stronger and more recognisable social identity.

Limiting accessibility of non-residents was not carried out by any active or formal measure (e.g., creating gated communities to restrict the access of non-locals). Instead, this naturally resulted from lacking major attractions for people from outside the neighbourhood within the inner residential areas. For instance, residents appreciated having a beach accessible at walking distance of their houses. They also reported the diversity of beach users (in terms of age, gender,

and group structures) as a positive indicator of the social qualities of their area. When witnessed in the inner areas of the residential neighbourhood, the same diversity was seen as a negative indicator of the social quality of the neighbourhood. Accessibility was therefore appreciated by residents when it radiated from the inside towards the outside of the neighbourhood, and not the opposite.
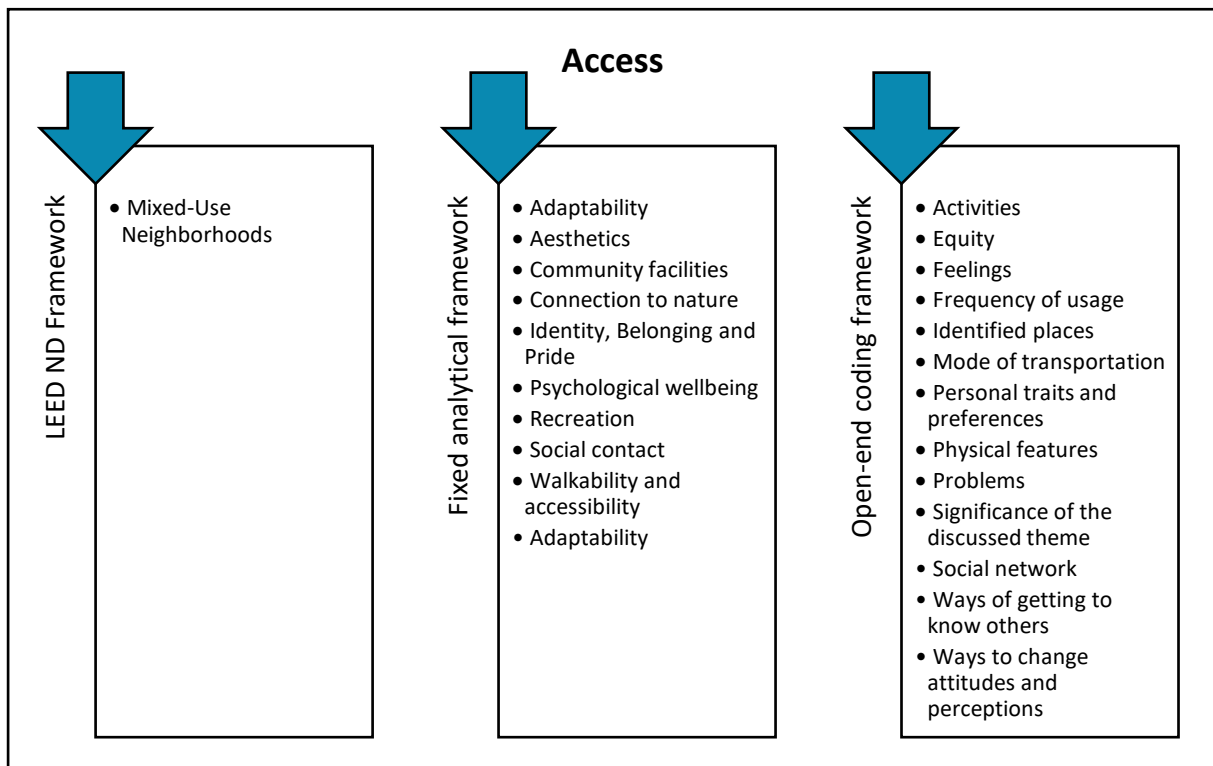

Figure 7.7. Interrelated themes relevant to 'Access' impact, classification based in relation to: LEED ND framework, Fixed analytical framework, and open-end framework

- Transportation

Transportation only involved two indicators in LEED-ND, as summarized in appendix n Table 1. Those included 'compact development' and 'mixed-use neighbourhood'. The compactness and proximity of a different range of facilities were anticipated to create more diverse transportation options, particularly walking and cycling, which benefit health and the environment. When compared to the themes of the fixed and open-end analytical frameworks (figure 7.8), transportation appears to be similarly discussed by experts (LEED-ND) and community members. This similarity includes the type of spaces and features that facilitate transportation and the benefits of using a diverse range of transportation. The only thing to emphasise is that approaching transportation at the neighbourhood scale primarily encourages recreational walking and cycling and has very limited effect on the utilitarian use of walking and

cycling. This scale, however, will not contribute to creating more reliance on public transportation systems, along with supportive walking and cycling, unless this issue is approached at a city or a national scale.

Transportation

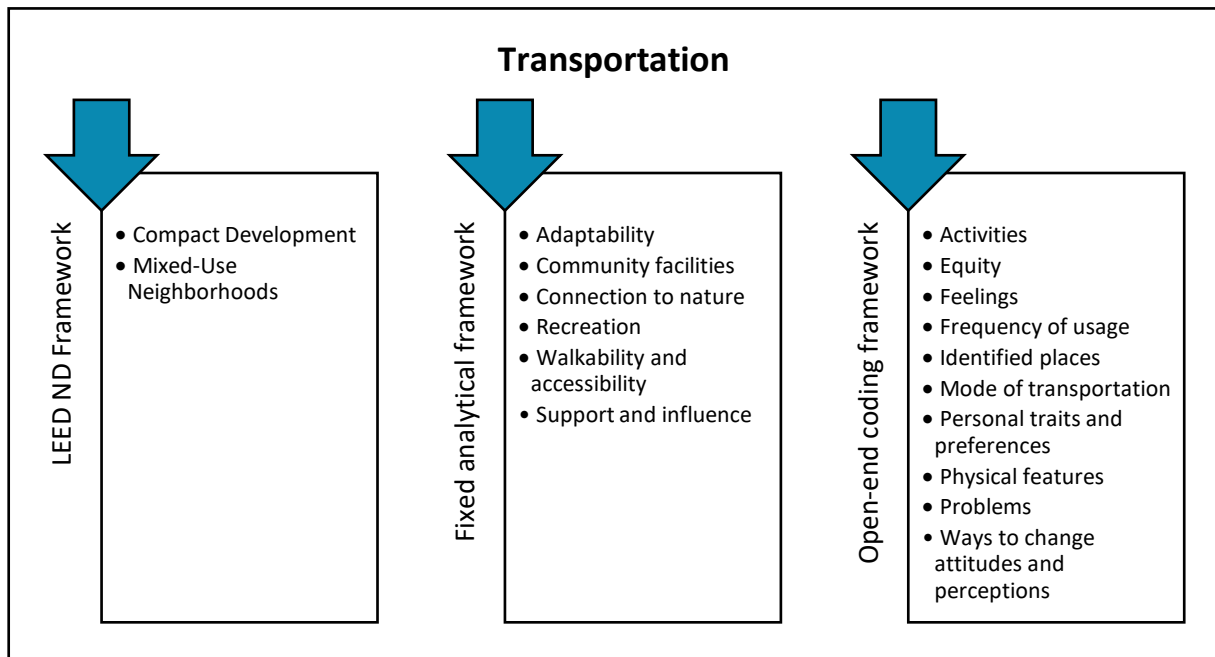| LEED ND Framework	Fixed analytical framework	Open-end coding framework
• Compact Development • Mixed-Use Neighborhoods	• Adaptability • Community facilities • Connection to nature • Recreation • Walkability and accessibility • Support and influence	• Activities • Equity • Feelings • Frequency of usage • Identified places • Mode of transportation • Personal traits and preferences • Physical features • Problems • Ways to change attitudes and perceptions

Figure 7.8. Interrelated themes relevant to 'Transportation' impact, classification based in relation to: LEED ND framework, Fixed analytical framework, and open-end framework

• Cycling

The way cycling was discussed across LEED ND and the POE findings was relatively similar in terms of what facilitates it and what benefits it creates. Facilitating cycling was promoted in LEED ND using the indicators 'Mixed-use neighbourhoods', 'tree-lined and shaded streetscapes' , and 'neighbourhood schools' (figure 7.9.). Residents overlooked the schools' impact on cycling but referred to concepts within the other two indicators. Cycling, however, was strictly seen as a recreational or exercise activity and only for children.

Cycling

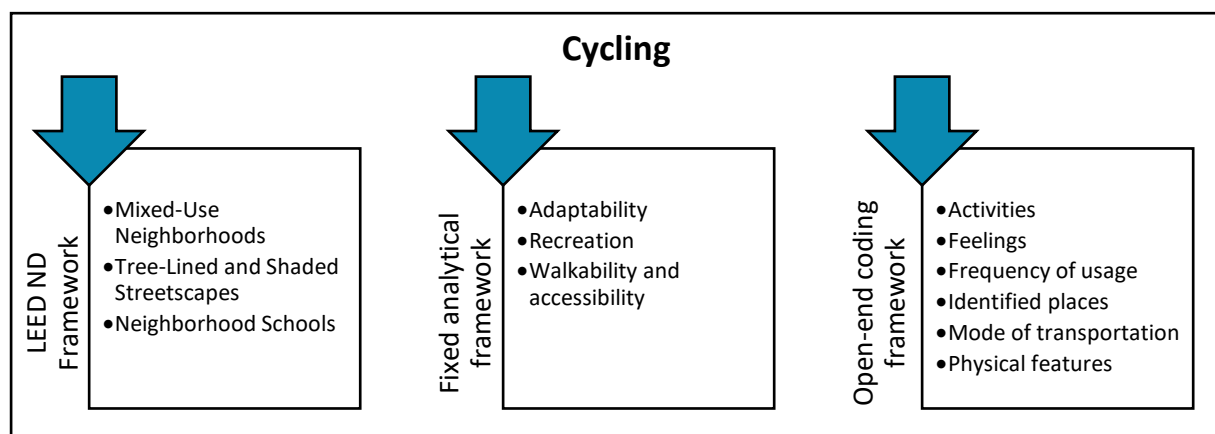| LEED ND Framework	Fixed analytical framework	Open-end coding framework
• Mixed-Use Neighborhoods • Tree-Lined and Shaded Streetscapes • Neighborhood Schools	• Adaptability • Recreation • Walkability and accessibility	• Activities • Feelings • Frequency of usage • Identified places • Mode of transportation • Physical features

Figure 7.9. Interrelated themes relevant to 'Cycling' impact, classification based in relation to: LEED ND framework, Fixed analytical framework, and open-end framework

- Walking

As depicted in Figure 7.10., walking is an impact encouraged by a large number of indicators, all related to the proximity and provision of a wide variety of recreational and utilitarian spaces. While walking and cycling was discussed by Alsayah residents using similar themes to the ones used in LEED ND, walking facilitated more impacts, especially social ones. Unlike cycling, walking was not strictly a recreational activity. This could contribute to why residents of Alsayah correlated walking with better social qualities. The ability to walk to facilitate socialisation was particularly evident for men, and many of them walked to the mosque for five daily congregational prayers. This impact was less evident for women, who were not required by Islamic teachings to go to the mosque. In terms of what community input can add to LEED-ND, the residents demonstrate that the community members are more capable of identifying specific places that contribute to facilitating walkability. For instance, those spaces were mosques for men and parks for women. The relevance of parks and walking to female residents appeared in the literature in other contexts as well, such as the significance of parks to females in Latin American contexts (De La Barrera et al., 2016; Wright Wendel et al., 2012).

Walking

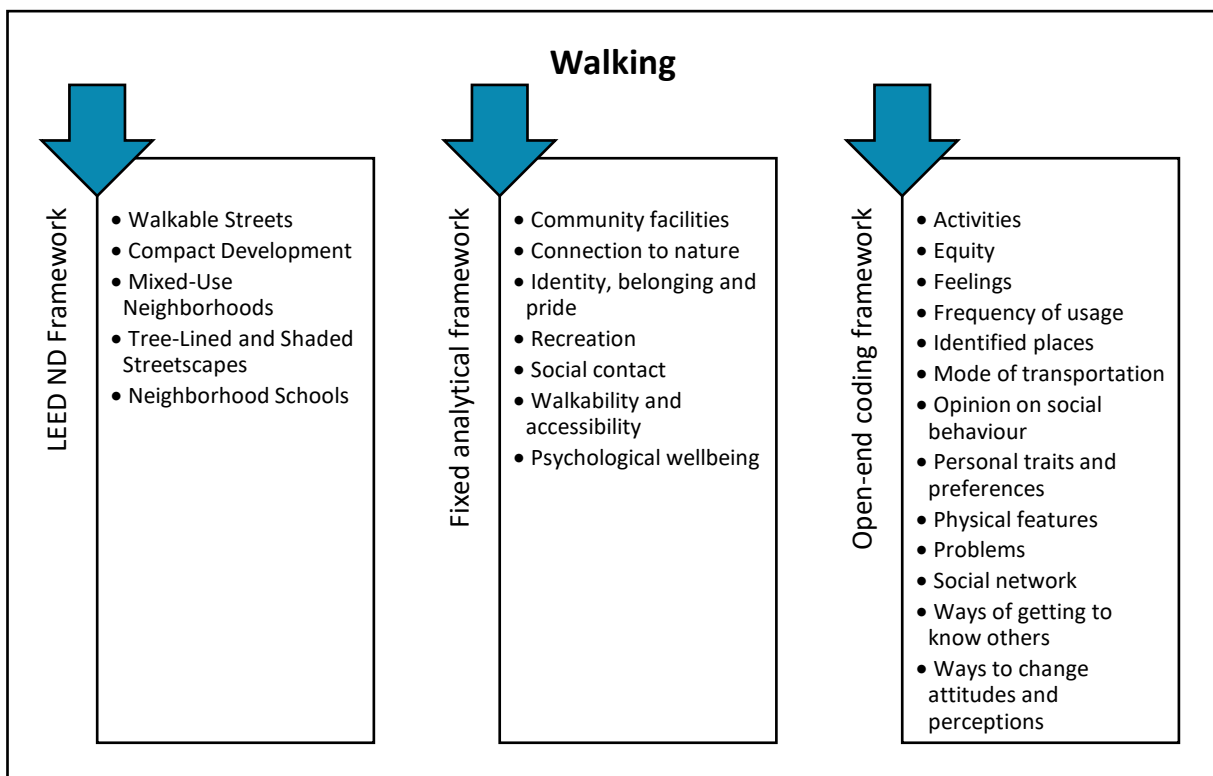| LEED ND Framework	Fixed analytical framework	Open-end coding framework
• Walkable Streets • Compact Development • Mixed-Use Neighborhoods • Tree-Lined and Shaded Streetscapes • Neighborhood Schools	• Community facilities • Connection to nature • Identity, belonging and pride • Recreation • Social contact • Walkability and accessibility • Psychological wellbeing	• Activities • Equity • Feelings • Frequency of usage • Identified places • Mode of transportation • Opinion on social behaviour • Personal traits and preferences • Physical features • Problems • Social network • Ways of getting to know others • Ways to change attitudes and perceptions

Figure 7.10. Interrelated themes relevant to 'Walking' impact, classification based in relation to: LEED ND framework, Fixed analytical framework, and open-end framework

- Speeding

No results were found when overlapping the three analytical frameworks devised for this study.

7.1.3. Impacts Cluster 3 - Connection:

This cluster of impacts involves social qualities that range from social contact and interaction to community engagement. The number of LEED-ND indicators relevant to achieving those impacts is minimal, with limited overlaps between the themes. Despite the low presence in the LEED-ND framework, the participants heavily referenced this cluster, especially within the open-end analytical framework. Those references included a balanced combination of physical and non-physical themes, such as 'activities', 'feelings', 'identified places', and 'physical features'. The breakdown of those qualities and how they compare across the three analytical frameworks is presented below. It is worth mentioning that while the figures correlating the three analytical frameworks show a large number of themes identified by the residents, those did not have many occurrences (meaning that they were mentioned only a few times) or coverage (mentioned very briefly). However, such an outcome is expected from qualitative research and should not be read as low significance for those themes, as the idea behind qualitative research is to scope out concepts that are not clearly identified by existing literature.

- Connection:

This impact relates to overlapping relations between physical and non-physical aspects of residential neighbourhoods. This correlation is evident in the depicted indicators within LEED-ND, which were found to be relevant to connectivity impact (figure 7.11.). This overlap is also present in residents' narratives, in which relevant themes included a range of physical and non-physical elements (Figure 7.11.). The was a strong overlap between physical connectivity, positive social impacts correlated, and walkability. There was no significant difference between how this impact was discussed in LEED ND and by the residents of Alsayah. The main difference would be that LEED-ND focused on the broader connection between residential units to other types of facilities, while residents focused on connectivity between the adjacent housing units in and how to balance connectivity and privacy in a manner that facilitates positive social interaction. According to the residents, such balance was primarily achieved by having wide streets and sidewalks serving relatively dense residential areas.
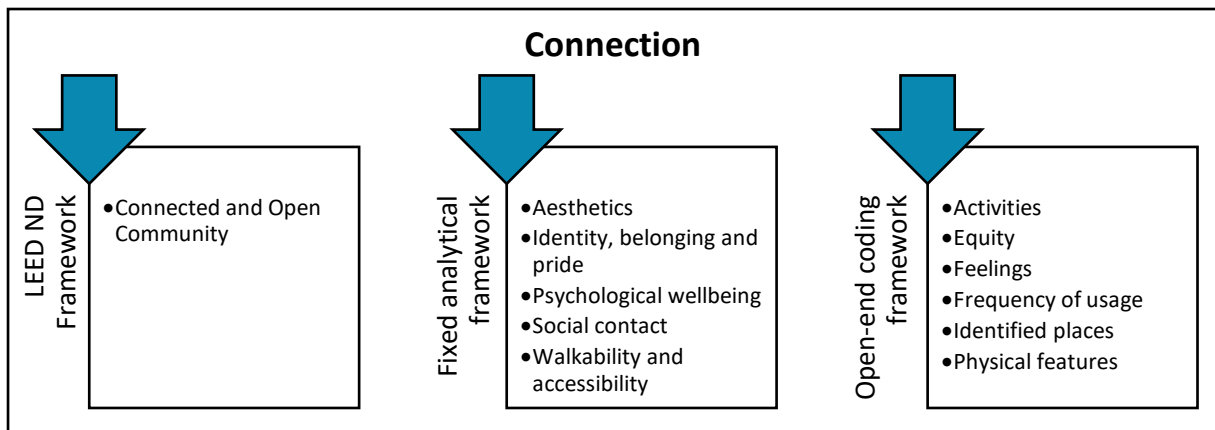
Figure 7.11. Interrelated themes relevant to 'Connection' impact, classification based in relation to: LEED ND framework, Fixed analytical framework, and open-end framework

- Community

As with connection impact, LEED-ND correlated strengthening feeling connected to the community to neighbourhoods' physical connectivity (Figure 7.12.). Once again, this theme was discussed similarly across LEED ND and the residents' narratives. However, the residents were more explicit in mentioning the social benefits of strengthening community feelings, while LEED ND broadly mentioned liveability without identifying what it means by this concept.
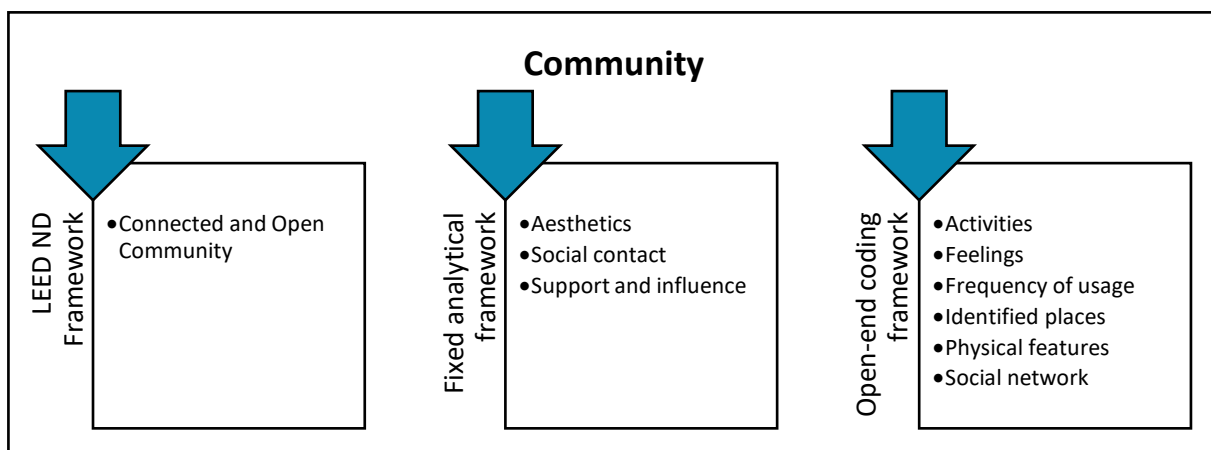

Figure 7.12. Interrelated themes relevant to 'community' impact, classification based in relation to: LEED ND framework, Fixed analytical framework, and open-end framework

- Engagement

Engagement in LEED ND was primarily related to the presence of a diverse range of residents in one inclusive environment. This was achieved using 'housing types and affordability' and 'neighbourhood schools' indicators (figure 7.13.). From residents' perspective, engagement was less related to the residents and more to have clear communication channels with formal authorities to report problems they are facing in the area. According to Reed et al.'s (2018) theory of participation, understanding and acknowledging the local culture towards participation is instrumental for designing effective participation activities (ones that end up being implemented and achieve their expected aim as conceived by the participants). In terms of adapting LEED-ND indicators to the context of Bahrain, this would suggest resolving to more structured means of communication with the locals that are ideally expert-initiated and not overly ambitious.
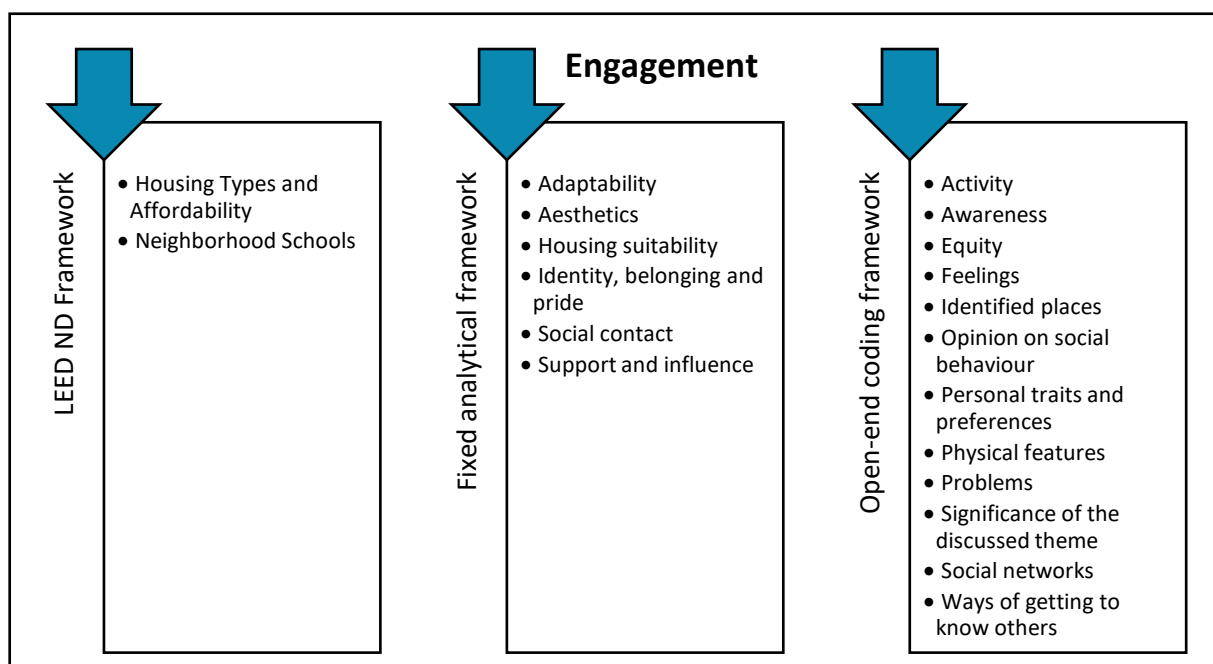

Engagement

LEED ND Framework
- Housing Types and Affordability
- Neighborhood Schools

Fixed analytical framework
- Adaptability
- Aesthetics
- Housing suitability
- Identity, belonging and pride
- Social contact
- Support and influence

Open-end coding framework
- Activity
- Awareness
- Equity
- Feelings
- Identified places
- Opinion on social behaviour
- Personal traits and preferences
- Physical features
- Problems
- Significance of the discussed theme
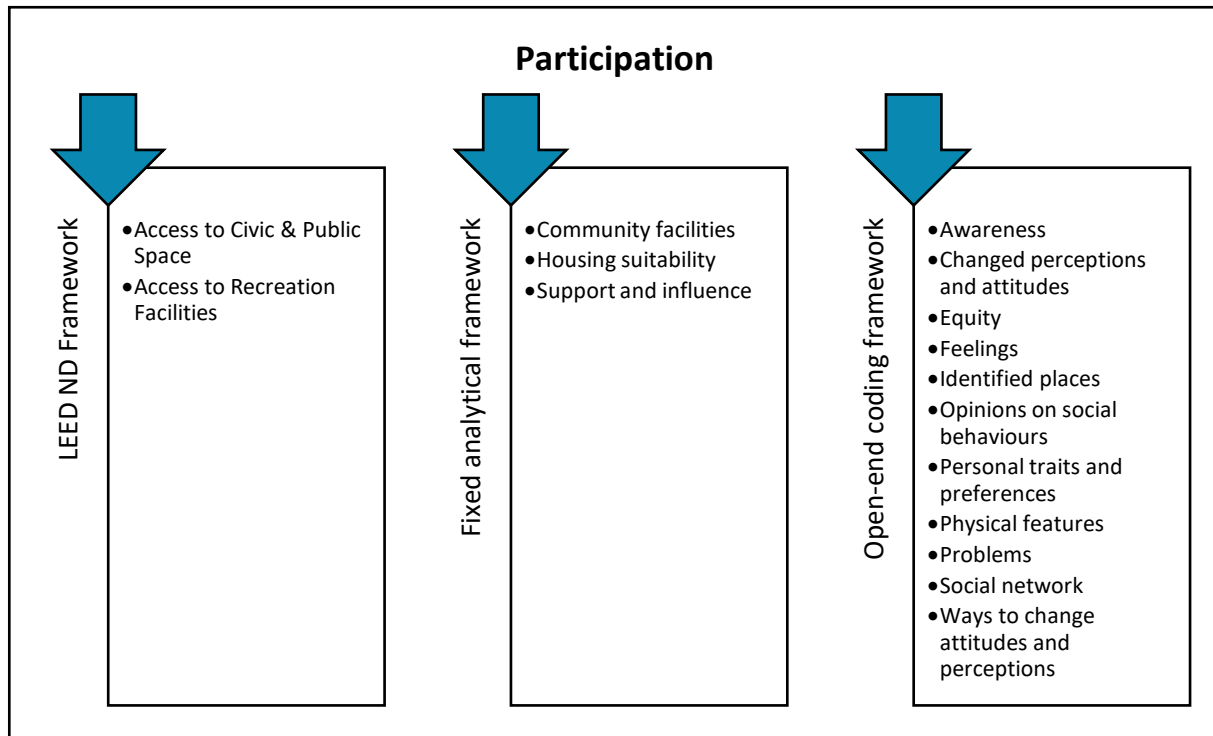- Social networks
- Ways of getting to know others

Figure 7.13. Interrelated themes relevant to 'engagement' impact, classification based in relation to: LEED ND framework, Fixed analytical framework, and open-end framework

- Participation

Within the LEED-ND framework, participation related more to facilitating casual community interaction than empowering the locals to make decisions regarding their environments (appendix n. table 1). The latter understanding of participation was more evident in residents' narratives. However, analysing the community-based themes within participation impact (depicted in Figure 7.14.) showed that residents appeared to neither hold a strong sense of agency nor desire to participate. Agency, particularly political agency, was found to be an important contributor to building bottom-up neighbourhood resiliency (Petrescu et al., 2016).

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The discussion of the 'participation' impact, along with the previous 'engagement' impact, suggest that effective participation for the context of Bahrain requires taking minimal steps towards facilitating community engagement in the local decision-making process. It also points towards the importance of building trust amongst community members and other stakeholders, which many researchers found essential for effective participation practices (Missimer et al., 2017a; Petcou & Petrescu, 2018; Reed, 2008; Sun et al., 2022).

Figure 7.14. Interrelated themes relevant to 'Participation' impact, classification based in relation to: LEED ND framework, Fixed analytical framework, and open-end framework

- Interaction

In LEED ND, explicit interaction between community members was only evident in the indicator 'Neighbourhood schools' (Figure 7.15.). Residents' narratives were particularly useful in expanding on the type of places and physical features that facilitate social interaction. Valued social interaction by residents was primarily one that occurred casually near their houses while attempting to go to a recreational or utilitarian facility.
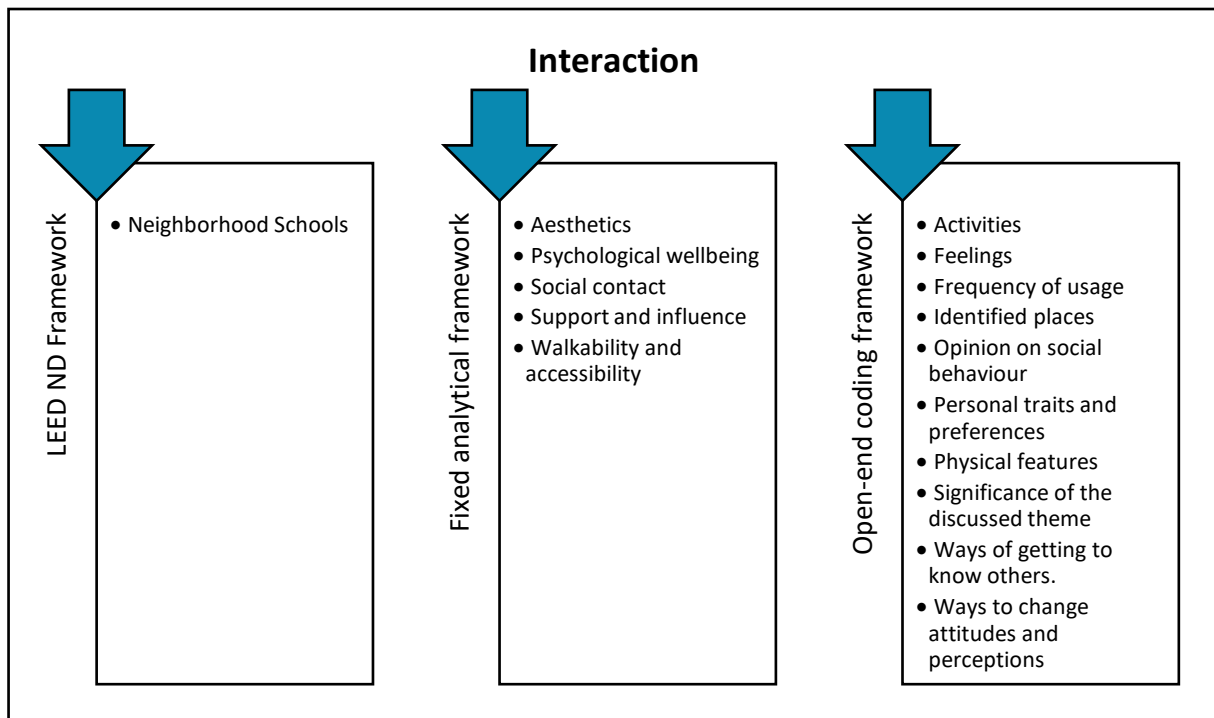
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Figure 7.15. Interrelated themes relevant to 'interaction' impact, classification based in relation to: LEED ND framework, Fixed analytical framework, and open-end framework

- Social

Social aspects intersected more with the open-end analytical framework than with the fixed POE framework (Figure 7.16.). The overlap mostly highlighted areas of concern, which revolved around the discomfort that results from having mixed ethnicity neighbourhoods. The open-end coding also showed that valued social qualities were mostly associated with casual meeting opportunities. People identified the mosque and the cold store (the local term for a grocery store) as the main places for meeting neighbours and getting to know them. They also identified the wide sidewalks next to the houses as the main contributors to having a chance to meet others while maintaining their desired level of privacy by distancing the opposing rows of houses. With regard to the fixed POE analytical framework, social qualities overlapped with social contact, which again highlights the significance of short-term, informal social spaces in enhancing the neighbours' social contact.

Although the discussion across the LEED-ND framework, the fixed POE framework, and the open-end coding framework similarly brought forward the importance of community spaces, LEED ND only mentioned the role of recreational facilities in doing so, while the residents emphasised the role of utilitarian community facilities (e.g., stores, mosque). Residents also explicitly related those spaces to numerous social benefits, such as improving psychological wellbeing, and building a sense of identity and attachment, which expands the social value of this impact. For the context of affordable housing neighbourhoods, understanding the monetary

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value of social qualities can be particularly powerful in promoting those qualities in a way that developers and policymakers would find compelling.
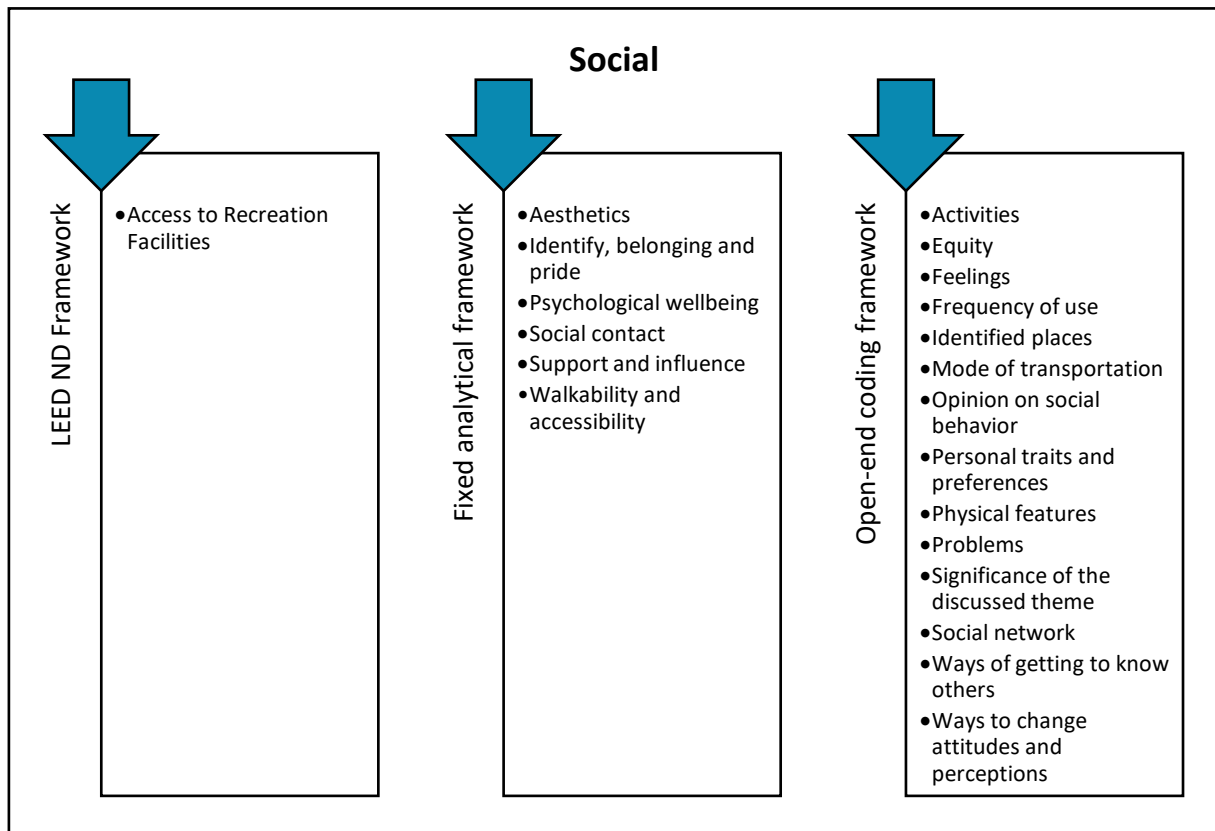

Social

LEED ND Framework
- Access to Recreation Facilities

Fixed analytical framework
- Aesthetics
- Identify, belonging and pride
- Psychological wellbeing
- Social contact
- Support and influence
- Walkability and accessibility

Open-end coding framework
- Activities
- Equity
- Feelings
- Frequency of use
- Identified places
- Mode of transportation
- Opinion on social behavior
- Personal traits and preferences
- Physical features
- Problems
- Significance of the discussed theme
- Social network
- Ways of getting to know others
- Ways to change attitudes and perceptions

Figure 7.16. Interrelated themes relevant to 'Social' impact, classification based in relation to: LEED ND framework, Fixed analytical framework, and open-end framework

7.1.4. Impacts Cluster 4 - Equity:

LEED-ND framework appeared to pertain to equity impacts strictly through the 'Housing Types and Affordability' and 'Visitability and Universal Design' indicators (appendix n. table 1.). After analysing the overlaps between the three analytical frameworks around the equity impact, it appears that LEED-ND was more successful in responding to equity issues concerning age and less successful in economic and household equity aspects.

- Age

With regard to age, the community-led POE showed that the neighbourhood underperformed in responding to the needs of children, in particular, followed by older people of age 70 and above. This inadequacy was in terms of provision, especially that of recreational spaces and the creation of safe, walkable outdoor spaces. Those problems could have been mitigated by implementing the guidelines of LEED-ND framework, which identified general age requirements for residents in the indicators 'Housing Types and Affordability' and 'Visitability and Universal Design' (figure 7.17.). This remark reinforces the hypothesis I presented in the literature

review, that expert-led NSATs are likely to perform better in identifying and attempting to respond to the needs of minorities or vulnerable groups who are not specific to a special context, such as children, elderly, and people with disabilities. Hence, the POE did not appear to be valuable in adapting the expert-led tool to age-related equity measures.
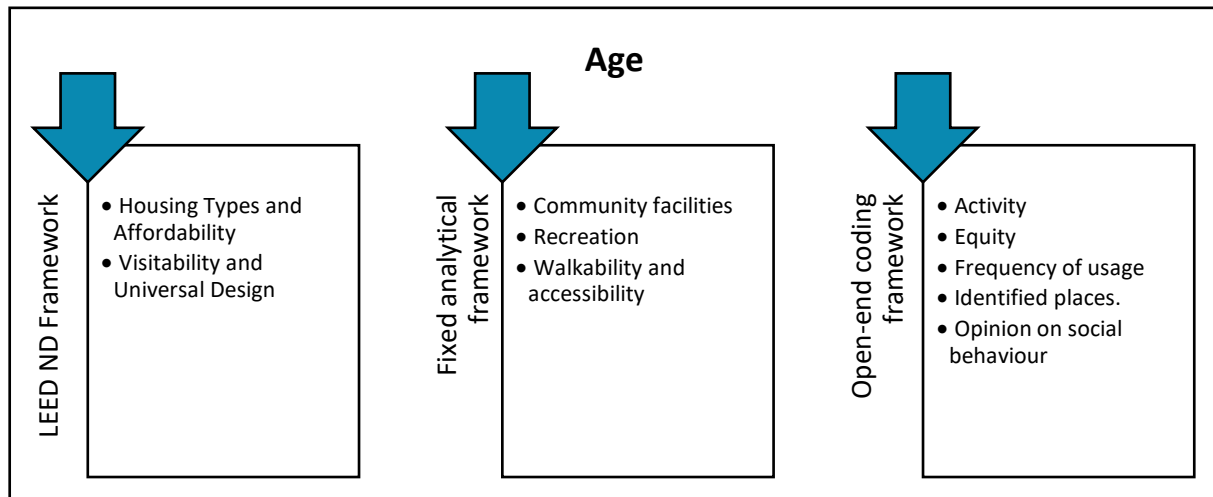
Age

LEED ND Framework	Fixed analytical framework	Open-end coding framework
• Housing Types and Affordability • Visitability and Universal Design	• Community facilities • Recreation • Walkability and accessibility	• Activity • Equity • Frequency of usage • Identified places. • Opinion on social behaviour

Figure 7.17. Interrelated themes relevant to 'Age' impact, classification based in relation to: LEED ND framework, Fixed analytical framework, and open-end framework

- Economic

Participants' references to economic difficulties were primarily linked to the cost of making changes in their houses to meet their specific family needs. Interestingly, analysing the content of themes coded within the economic impact (mapped in Figure 7.18.) showed that most families resorted to similar modifications of adding bedrooms, bathrooms, and storage spaces because of their family size. Many families also reported changing the housing units to accommodate adult children who got married and remained in the extended family house. To cater for this need, many families resorted to introducing separate entrances for their married adult children, building extra bedrooms for them, or creating whole new floors. Residents reported that those modifications were difficult to solve spatially and costly to achieve. They attributed this to the inability of the original house design to predict those common spatial needs. This finding indicates that community outreach programs in the early stages of neighbourhood development could have mitigated some of those issues by anticipating such needs.

It is worth mentioning that LEED-ND has a community outreach indicator, which suggests that economic equity could have been better approached solely by relying on the existing indicators of LEED ND. However, it is difficult to judge if the locals could have had the forward-thinking ability, which would make them anticipate their future needs, especially those that

emerged after a relatively long period of residency, such as the need to house married adult children. Therefore, while outreach programs could adapt the project to imminent residential needs, a POE for neighbourhoods with a similar scope (affordable housing in the case of this research) can better identify those needs for the longer term.
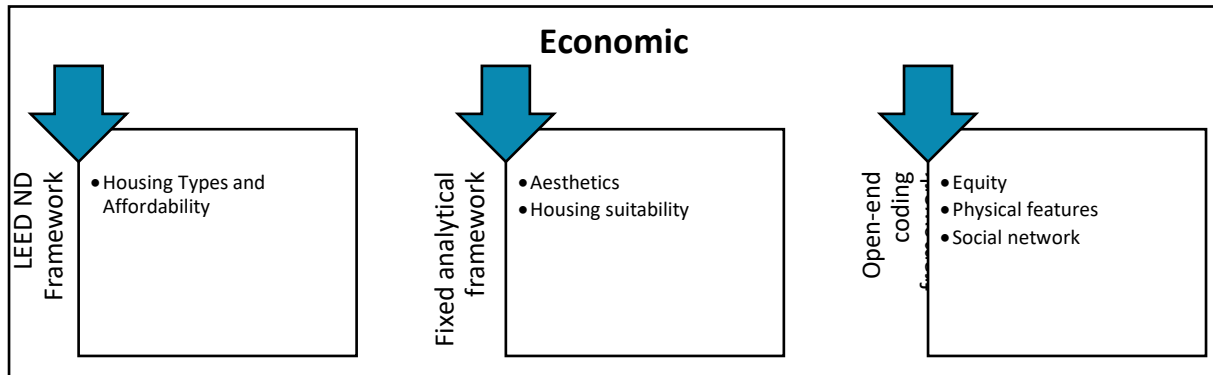

Figure 7.18. Interrelated themes relevant to 'Economic' impact, classification based in relation to: LEED ND framework, Fixed analytical framework, and open-end framework

- Household

Figure 7.19. encompasses the range of themes that overlap in discussing household types. Regarding household size, residents reported similar feedback in responding to the neighbourhood's ability to respond to household needs. Those issues primarily revolved around the difficulty of accommodating families consisting of more than five members (two parents and three children). LEED ND hypothesized that household problems could be mitigated by providing a variety of household types, which would cater for the needs of a diverse range of family structures. However, such an approach would not have helped the context of affordable housing neighbourhoods in Muharraq, Bahrain, because the household characteristics there were mostly similar and consisted of larger families. It could be comprehendible that early community outreach programs (as required by the LEED-ND framework) could have used community input to minimise household adaptability issues. However, this still does not explain why LEED ND considers diverse household types to be universally relevant to the sustainability of residential neighbourhoods, especially those of affordable housing ones.

The expert-led suggestion to include a diverse household type appears to result from the ethical commitment to creating inclusive neighbourhoods that house various family structures, which Lützkendorf & Balouktsi (2017) reports to be currently lacking in urban practices. Despite this apparently noble aim, household types that do not respond to the needs of local contexts appear to directly increase rates of residential mobility (Winstanley et al., 2002). This is likely to happen when universally consistent diversity measures end up creating overly fitted housing units

for specific household sizes. When this happens, the created housing typology, which is not necessarily responsive to the local social structure, would produce two likely results: 1) forcing residents to live in houses that do not meet their residential needs because they are financially unable to move, resulting in alerting levels of residential satisfaction. Or 2) exacerbate the rate of residential mobility to find a house that meets the new needs of a family.

Increased residential mobility means shortening the length of stay for more families in their houses. With a massive amount of literature pointing towards the positive correlation between the length of stay to issues like strengthening social bonds (Lewicka, 2011), place attachment (Lewicka, 2011; Manzo & Perkins, 2006), and Residential satisfaction (Buys & Miller, 2012); encouraging families to stay longer in their original houses and neighbourhoods should take higher significance within NSA literature, particularly to cater for the social aspects of sustainability. With this aim in mind, it is important to dissociate the positive relationship between sustainable neighbourhoods and diverse ones, especially in terms of household types. Instead, NSA frameworks should opt for a better understanding of the needs of the context in question and then create household types that meet the needs of that specific context.

Household

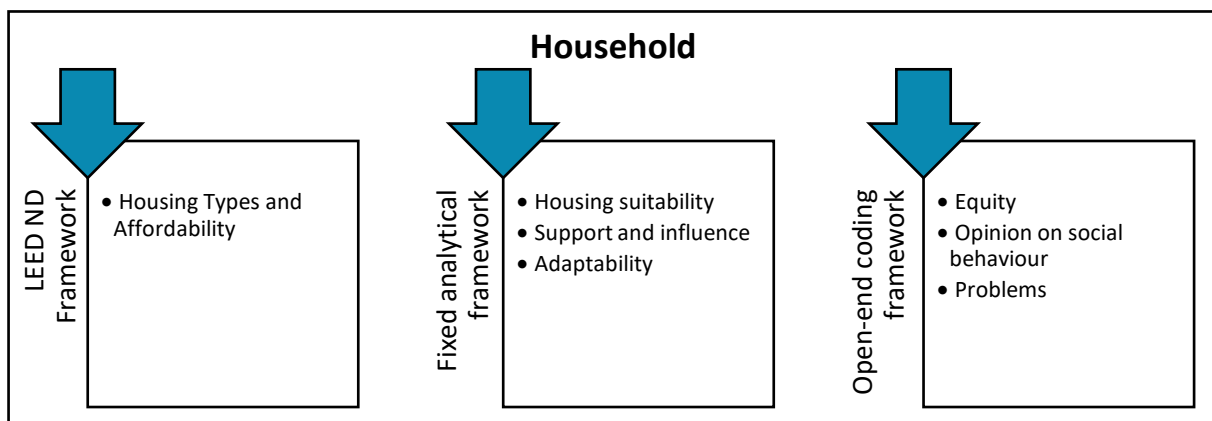| LEED ND Framework	Fixed analytical framework	Open-end coding framework
• Housing Types and Affordability	• Housing suitability • Support and influence • Adaptability	• Equity • Opinion on social behaviour • Problems

Figure 7.19. Interrelated themes relevant to 'Household' impact, classification based in relation to: LEED ND framework, Fixed analytical framework, and open-end framework

- Ability

No results were found using the POE data, which resonates with my earlier comment that expert-led frameworks perform well in responding to the needs of vulnerable groups who are not specific to a particular context, such as people with disabilities.

7.1.5. Impacts Cluster 5 - Flexibility and Freedom:

- Responsiveness to community needs

The recommendations of LEED-ND as well as residents' feedback, indicated that the needs of the local community would be better met if they were involved in the planning and

design stages of the neighbourhood and housing units. Therefore, this impact did not need to be refined for the case study context.

7.2. Using the Findings of Community-led POE to Finetune LEED ND to the Context of Affordable Housing Neighbourhoods in Muharraq, Bahrain

The findings discussed earlier show that POE could contribute to adjusting many indicators of LEED-ND to make them more adaptive to the context of affordable housing units in Muharraq governate, Bahrain. This can happen through either redefining indicators' relevant measures, expanding upon their expected impacts which can further leverage the application of a specific indicator, or better operationalising the defined indicators. The main contribution of the POE to finetuning LEED ND to the context of affordable housing neighbourhoods in Bahrain was identifying the minorities struggling within those areas, primarily women, children, elderly. Also, the POE was particularly useful in identifying the exact spaces that benefit the local community. This means that instead of simply promoting the creation of recreational and civic facilities in general, developers can use POE to identify the spaces that can significantly impact encouraging social contact, building identity, belonging and pride, and creating social networks, and encouraging walkability. Those included parks and gyms for women; mosques within walkable distance for men, particularly the elderly; small local bakery and grocery store for all community members; and expanding the notion of sidewalks from mere circulation pathways to social spaces.

The findings also expanded on the social benefits of several physical features. For instance, green elements were particularly useful in adding an aesthetic appeal to the area, which broke the monotony of the identical facades of affordable housing units. Those drastically increased people's appreciation of their area because they managed to distinguish it from other affordable housing neighbourhoods. This identification aided in improving residents' notion of identity, belonging and pride, which can be difficult to achieve in projects of a social intervention nature because of the stigma that can be associated with them (Ilesanmi, 2010; Lützkendorf & Balouktsi, 2017). The full list of recommended adjustments to LEED-ND is shown below in the table 7.1.

Table 7.1. The outcome of using community-led POE findings to finetuning relevant LEED ND to the context of affordable housing neighbourhoods in Muharraq, Bahrain. Summary of outcome classifications and conclusions

LEED-ND indicators	Nature of POE contribution to LEED-ND framework	Recommended adjustment to LEED-ND measures	Recommended adjustment to LEED-ND anticipated impacts
Bicycle Facilities	- Identify targeted minorities who are not benefiting from this feature.	- Widen sidewalks. - Create close-by destinations for women and mothers. - Create a culture towards using cycling.	
Walkable Streets	- Identify relevant destinations for segments within the community. - Define targeted minorities who are not benefiting from this feature.	- Move trees to inner streets to adjust the microclimate near houses. - (Mosques for men, parks for women) - Reduce the need to use cars by creating closer destinations. - Increase sidewalks' width and better define it with design features.	- Add Social contact. - Add creating identity, belonging and pride.
Compact Development		- Encourage culture towards using public transportation. - Connect neighbourhood to city-scale plans	
Connected and Open Community	- Define and operationalise liveability. - Define minorities. - Include considerations for mental health. - Define local thresholds for privacy and contact. -	- Create gradual connectivity that strengthens towards the outside of the neighbourhood.	- Add Identity, belonging and pride. - Add social interaction. - Add creating social networks. - Add safety.
Mixed-Use Neighborhoods	- Identify needed facilities.	- Separate residential areas from larger commercial uses. - Provide walkable small services within residential areas.	
Housing Types and Affordability	- Define relevant initial and future targeted household size and minimum spatial needs through outreach programs & community-led POE of similar projects. - Use a combination of community-centred outreach programs with future users along with POE of housing with similar residents' profiles. - Revisit planning regulations to allow houses to extend instead of forcing mobility.	- Design houses for a minimum of 5 members. - Prioritise the provision of more rooms and bathrooms over enlarging spaces. - Have a minimum of 3 bedrooms with ensuite bathrooms (one for parents and a separate room for male and female children) - Design for extended family in mind. - Involve the community in early development to accommodate needs and minimise the need for modifications. - Develop innovative solutions for providing alternative finishing options instead of receiving a fully finished unit (e.g., partner with the private sector to provide subsidized options of finishing). - Change planning regulations in affordable housing units over time to accommodate the growing family size.	- Add economic equity. - Add household equity.

Category			
Access to Civic & Public Space	- Define community-relevant civic and public facilities. - Define targeted minorities.	- Have mosques and grocery stores within walking distance. - Consider the needs of women, children, and the elderly.	- Add social interaction. - - Add creating social networks. - Add psychological wellbeing. - Add identity, belonging and pride. - Adjust the definition of participation from social contact to community engagement. - Emphasise added value to developers by exploring the monetary value of social return on investment (SROI).
Access to Recreation Facilities	- Define targeted minorities that are not benefiting from this feature.	- Do not create major attractions within inner areas to avoid losing local social identity by attracting non-residents. - Create better walkability in spaces used by women. - Identify spaces used by women (e.g., parks, gyms)	- Adjust the definition of participation from social contact to community engagement.
Visitability and Universal Design	- Better approached in LEED than in POE.		
Community Outreach and Involvement		- Focus on building trust and culture towards participation	- Add building resiliency and adaptability
Tree-Lined and Shaded Streetscapes	- Not discussed by residents, better approached in LEED. - Identify added impacts for trees and where they matter the most.	- Move concentrations from outer to inner streets. - Encourage their creation within houses (e.g., adjust setback regulations).	- Add identity, belonging and pride. - Add aesthetic.
Neighbourhood Schools	- Not discussed by residents, better identified by LEED ND	- Understand why public schools are not approaching their potential in combining neighbourhood's residents.	- Add identity, belonging and pride. - Add creating social networks.

7.3. Refining the Methodological Framework for Localising Expert-Led NSATs

The broader aim of this research was to identify the potential value of community-led POE in localising expert-led NSATs. This was explored by developing a methodological framework for using community-led POE to finetune expert-led NSATs. The methodological framework was tested by conducting an inductive, qualitative case study research in Alsayah

Affordable Housing neighbourhood in Muharraq governate, Bahrain. The case study intended to use community-led POE to localise LEED-ND for the context of Muharraq, Bahrain. As the case study was explorative in nature, it required constant reiteration of the analytical frameworks to develop a systematic way to process the data and deduct meaningful conclusions from them.

The study adopted an instrumental understanding of community participation; therefore, the intention was to use community-led data to aid expert-led NSATs in achieving their stated aims through meaningful means. This required repeated reiteration on how to process the collected community-led data. In conclusion, I developed the following steps to systematically analyse POE data and link them to the selected expert-led NSAT framework:

1. Identify community-relevant indicators within the selected expert-led NSAT.

2. Identify the intended impacts of those indicators.

3. Search for impacts within residents' narratives.

4. Understand what those impacts mean within the examined context and identify how they can be met.

The broader contribution of this research was to understand the potential role that hybrid NSA can add to this literature. Based on the case study findings, it was evident that qualitative data were particularly powerful in identifying the interrelationships between neighbourhoods' physical and non-physical components. The findings also point to the potential value of using visualisation tools to explore such correlations. In addition, the findings confirm the current discussions within NSA literature that considers social sustainability to be a dynamic, context-specific concept. While dynamic, this concept seems to be governed by sociological variables. This means that operationalising social sustainability could be better achieved by identifying sociological variables that shape the locals' perceptions and attitudes within their neighbourhood environments.

7.4. Summary

This research was conducted to understand how researchers, designers, planners, and developers can use community-led Post-Occupancy Evaluation (POE) to adapt generic Neighbourhood Sustainability Assessment frameworks (NSAFs) to the needs of specific local cultural contexts. The case study research method was conducted at Alsayah affordable housing neighbourhood in Muharraq governorate, Bahrain. I analysed the data in relation to the recommendations of NSA literature to see how POE findings can be used to adapt expert-led

Neighbourhood Sustainability Assessment tools (NSATs) to a specific cultural context, using LEED-ND as a framework of analysis. The research was developed within the premises of grounded theory, where the data constructs the final hypothesis. The expected findings were about methodological recommendations for incorporating POE effectively in the process of Neighbourhood Sustainability Assessment (NSA), the theoretical understanding of the nature and limitations of POE data, and the impact of having community-led context-specific findings on adapting expert-led NSATs to specific contexts. The case study was also expected to produce a localised NSAF for the context of affordable housing neighbourhoods in Muharraq, Bahrain.

The analysis was structured around three analytical frameworks: two related to the POE case study and one to the LEED-ND framework. Those analytical frameworks included a predefined POE framework, an emergent open-end coding framework, and one using community-relevant impacts identified by LEED-ND. The themes of the POE, in order of their highest frequency, were Identity, Belonging and Pride; Aesthetics; Social Contact; Housing Suitability; Support and Influence; Community Facilities; Walkability and Accessibility; Recreation, Connection to Nature; Adaptability, and Psychological Wellbeing. The open-end coding was developed by analysing the interview transcripts using content analysis and thematic coding. This resulted in defining 17 themes which were (in order of frequency): Physical Features; Mode of transportation; Feelings; Problems; Equity; Activities; Personal traits and preferences; Opinion on social behaviour; Ways of getting to know others; Frequency of usage; Social network; Identified places; Ways to change attitudes and perceptions; Significance of the discussed theme; Awareness; Changed perceptions and attitudes; and Factors influencing major life choices. Of those 17 themes, I focused on the first four throughout the discussion.

Both frameworks were examined individually and then against each other using content analysis. The discussion showed that gender and age were among the most significant variables that affected the direction and extent of residents' evaluation of various components of their neighbourhood. Those variables were also significant for the neighbourhood scale in other contexts, but they did not have the same strength in affecting residents' evaluation of their neighbourhood environment, which means that the significance of different sociological variables on residents' evaluation was inconsistent. The only variable with a consistent impact in various cultural contexts was the homogeneity of the residents' profile in terms of their ethnic background. Diversifying the ethnic background of the residents at the neighbourhood scale seemed to negatively affect their comfort, place attachment, the strength of the social network,

and the development of social capital. While diversifying residents' profiles is essential for inclusivity and, therefore, the equity of urban environments; diversity appears to have a more positive social impact at the city scale than at the neighbourhood scale.

Physical Features of the neighbourhood components, especially those of the housing units, were the most referenced features for evaluating the themes within both analytical frameworks. The evaluations for the impacts of the physical features improved over time under the condition that residents were satisfied with their neighbours. With more time spent in the neighbourhood, residents acknowledged feeling attached to the area and the community to a level where they started to be more forgiving in evaluating the same physical features of their neighbourhood. The only exception to this was for residents' evaluation of what they considered insufficient (or excessively small) house area, which only caused more distress over time for residents who found them lacking. Satisfaction with the social network was important for evaluating neighbourhoods in various reviewed contexts. However, the subgroups within the social networks varied in different cultural contexts, along with the significance of those subgroups. In Bahrain, having first-degree relatives within proximity was the most impactful network in affecting residents' evaluation of their environment in the long term, especially in terms of their willingness to cope with the existing physical features of their houses and neighbourhood.

The most important type of adaptability for the studied population was being able to house adult children within an extension of the house or in a nearby area. This feature led to the unintentional densification of the affordable housing neighbourhoods in Bahrain, as they ended up housing more members than the original beneficiaries of the project. Investing money and time to modify the house to meet the needs of the residents made them overcome their original dissatisfaction with the neighbourhood's location. But this was also conditional upon being satisfied with the neighbours' ethnic background, which was associated with lower levels of neighbours' diversity. In addition to satisfaction with the neighbours, the low perception of neighbourhood density also significantly increased residents' satisfaction with their neighbourhood. In Bahrain, the perception of density was strongly related to the width of the inner sidewalks and streets within the neighbourhood and the number of cars parked in the streets. This suggests that the perception of density strongly relates to the availability and efficiency of a public transportation system, as it would affect the number of private cars owned by families and therefore increase the on-street parking.

Throughout the discussion, it was evident that isolating the components of the built environment cannot provide a meaningful understanding of their impact on residents' evaluation of their neighbourhoods. This isolation is a common practice in the LEED-ND framework as well as other NSATs, as it provides an easy checklist to follow. Despite the simplicity of this approach, it appears to lower the efficiency of those frameworks in achieving their stated aims, including the ones set to achieve environmental benefits. The discussed indicators of LEED-ND were more successful in predicting the impact of their implemented measures when they had relevant prerequisites. The use of qualitative POE managed to identify broad categories of interrelationships between the components of the built environment, which can make setting such prerequisites more meaningful in specific cultural contexts. The interplay between social and physical features was strongly evident throughout the discussion. Neighbourhood homogeneity, development of social bonds, length of stay in the neighbourhood, satisfaction with the features of the housing unit, and the low perception of density were strong themes that affected residents' satisfaction with their residential environments.

In Bahrain, age and gender were the main variables that affected the generalisability of the findings of the POE of affordable housing neighbourhoods. However, those variables were different in other contexts, which limits the reliability of using them elsewhere. Still, they demonstrate that sociological variables play a significant role in clustering residents' evaluations of their neighbourhoods, which could aid in improving their satisfaction with new neighbourhoods that are developed based on the recommendations of POE carried by a comparable population profile. Further research needs to be conducted in other cultural contexts to define those variables for the contexts in question and to understand the causes of changing those variables in various contexts.

The results show that qualitative POE is particularly powerful in identifying physical and non-physical features that contribute to increasing residential satisfaction in a particular setting and defining the hierarchy of their importance. This can aid in structuring interim plans to gradually change the features of urban neighbourhoods while maintaining residents' acceptability, especially in terms of acceptable densification of affordable housing neighbourhoods. Although residential satisfaction is not inherently an indicator of environmentally sustainable neighbourhoods, urban forms cannot be sustained if their users are not satisfied with them. Residential satisfaction should therefore have some weight in evaluating the sustainability of urban neighbourhoods. Sustainability therefore should not be seen as a goal but a pathway with

incremental gains. This gradual nature of change is not only important for increasing the acceptance and liveability of the slightly changed forms but also to develop the behavioural patterns needed to facilitate more environmentally and socially sustainable practices. This also highlights the importance of studying facilitators of pro-environmental behaviour in various settings, as it could serve as a valuable link between environmental and social sustainability.

7.5. Research Limitations

I started the data collection for this research during the outbreak of COVID-19, around six months into imposing restrictions on social contact and use of indoor and outdoor spaces. The restrictions limited the range of feasible data collection methods which would have aided in triangulating the qualitative data. For instance, at the early stages of my research design (before the outbreak of COVID-19), I intended to use a combination of site observations and face-to-face focus groups to further interpret and verify the collected qualitative interview data. However, this was no longer feasible around halfway through my PhD study plan. I was also limited by the accessibility of the targeted population to available technologies. For instance, older demographics could not easily access virtual meeting technologies, rendering the use of virtual focus groups inefficient because of the lack of diversity of the involved participants. However, I tried to overcome those limitations by designing the interview questions to be loosely structured around the assessed themes so that the answers could overlap throughout the interview. This increased the likelihood of adding more layers of interpretation to the analysed data, as well as verifying them by comparing the responses to participant's own narrative.

In addition to limitations of feasible research methods, I was also restricted by the range of potential case studies to use for conducting this research. This limitation was because the Middle East had no affordable housing neighbourhood planned according to the guidelines of an expert-led NSAT. Ideally, POE can be more effective in modifying a specific NSAT's framework if the used case study was built according to the guidelines of the same framework. In this case, the analytical framework would have been structured around the original tool's indicators, which can simplify and speed the analysis, and therefore enable me to conduct more interviews because the data would be more manageable. However, this advantage comes with the risk of being too governed by the structure of the expert-led tool, which could diminish the potential exploration of the locals' input.

Another limitation was the intensive time needed to process the community-led data to cluster them around identifiable themes. This is because sustainability literature is relatively scarce in terms of exploring the connection between expert-led and community-led input around neighbourhood sustainability themes. This made relying on available literature to create an initial analytical framework to process the data rather difficult. As a result of the time intensity of the process, and not to compromise the depth of analysis, I minimised the number of conducted interviews in order to manage the data effectively within the timeframe of a PhD research. While increasing the number of conducted interviews could have enhanced the reliability of the findings, it would have come at the expense of the explorative potential of the research, which is eventually a key component within qualitative research.

7.6. Immediate uses of this Research and Recommendations for future works

The findings of this research can provide useful guidelines for developers and urban planners in Bahrain to create new affordable housing neighbourhoods that are sensitive to the locals' needs. However, further research needs to be conducted in other neighbourhoods in Bahrain to verify the findings and identify their generalisability limitations. In addition, similar research needs to be conducted in other contexts within and outside the Middle Eastern culture to explore the role played by sociological variables in affecting locals' preferences and behavioural patterns. This research also indicates that visualising spatial data appears to be a significant aspect of NSA literature, and one in need of further exploration and systemisation to simplify its usage and enhance its efficiency.

Appendices

Appendix a: Comparison Between the Themes and Questions Used to Assess Three Place Assessment Tools, Along with the Suggested Questions for the POE Stage

Table a.1. A comparison between the themes and questions used to assess three place assessment tools, along with the suggested questions for the POE stage

	themes	Social Value Toolkit	Place Standard Tool	Berkeley Group Tool	Suggested question
1	Aesthetics	Taking Notice • Is there somewhere in the area that you think is beautiful?	Streets and spaces: Do buildings, streets and public spaces create an attractive place that is easy to get around?		What is beautiful in your neighbourhood?
2	Connection with nature	Taking Notice • Is there somewhere you can connect with nature?	Natural space: Can I regularly experience good-quality natural space?		Do you connect positively with nature in your neighbourhood?
3	Social contact	Connection • Is there anywhere that you find you tend to stop and speak to people regularly?	Social contact: Is there a range of spaces and opportunities to meet people?	Integration with wider neighbourhood Relationships with neighbours	Is there anywhere in the neighbourhood where you tend to stop and speak to people regularly?
4	Identity, belonging and pride	Connection • Can you mark onto the map any areas that you feel responsible for? Positive Emotions • Is there anywhere locally that you are proud of?	Identity and belonging: Does this place have a positive identity and do I feel I belong?	Place with distinctive character Positive local identity	Does your neighbourhood have a local identity? Do you feel you belong here? Why? is there anything you are proud of?

5	community facilities	Active lifestyles • Where are your local amenities, such as shops and community centres?	Facilities and amenities: Do facilities and amenities meet my needs?	Community facilities • Does the development provide (or is it close to) community facilities, such as a school, parks, play areas, shops, pubs or cafés? • Have the community facilities been appropriately provided?	Do the local facilities and amenities meet your needs?
6	Recreation	Active lifestyles • Do you have any places you go for recreational activities and hobbies?	Play and recreation: Can I access a range of space with opportunities for play and recreation?		Do you have any places you go for recreational activities and hobbies?

| 7 | Support and influence | Flexibility and freedom
• What support structures are there locally? Charities, Council, Church?
• Who would you speak to if you wanted to make changes to your environment? | Influence and sense of control: Do I feel able to take part in decisions and help change things for the better? | Perception of ability to influence the local area:
• In the last 12 months, has any organisation asked you what you think about...
• Do you agree or disagree that you can influence decisions affecting you local area?
• How important is it for you personally to feel that you can influence decisions affecting your local area?
Willingness to act to improve the area:
• I would be willing to work together with others on something to improve my neighbourhood.
• In the last 12 months, have you taken any of the following actions to try to get something done about the quality of your local environment?
• To what extent do you agree or disagree that people in this neighbourhood pull together to improve this neighbourhood? | Do you feel able to take part in decisions to make things better in your local area? |

8	Psychological wellbeing	Positive Emotions • Can you show where you feel happiest locally?		Wellbeing: • Have you recently felt that you were playing a useful part in things? • Have you been feeling reasonably happy? • How dissatisfied or satisfied are you with life overall? • Overall, how satisfied or dissatisfied are you with your local area as a place to live?	Does living here make you happy? Why?
9	Walkability and accessibility		Moving around: Can I easily walk and cycle around using good-quality routes?	Accessible street layout	Can you move around your area safely, quickly and using different transportation modes?
10	Public transportatio		Public transport: Does public transport meet my needs?	Transport links	Covered in walkability and accessibility
11	Traffic and parking		Traffic and parking: Do traffic and parking arrangements allow people to move around safely and meet the community's needs?		Covered in walkability and accessibility
12	Job proximity		Work and local economy: Is there an active local economy and the opportunity to access good-quality work?		Economic aspects are excluded from the study
13	Housing suitability		Housing and community: Do the homes in my area support the needs of the community?		Do the homes in my area support the needs of the community?

14	Safety		Feeling safe: Do I feel safe here?	Feelings of safety: • How safe do you feel walking alone in this area after dark? • How safe do you feel walking alone in this area during the day? • Compared to the country as a whole do you think the level of crime in your local area is..	Covered in walkability and accessibility and partially through other questions
15	Maintenance		Care and maintenance: Are buildings and spaces well cared for?	Community facilities: Is public space well designed and does it have suitable management arrangements in place?	Covered in community facilities
16	Adaptability			Physical space on development that is adaptable in the future: • Do external spaces and layout allow for adaption, conversion or extension? • Do internal spaces and layout allow for adaption, conversion or extension?	Do you want to live here for a long time? Why?

Recruitment instructions

I will circulate emails and phone messages through a network of neighbourhood residents that I am already acquainted with.

Recruitments emails and messages for participating in the research

Dear Sir/Madam,

My name is Omaima Alabbasi, and I am a PhD student from the Department of Architecture at the University of Reading. I am writing to invite you to participate in my research study about community participation in the design of Neighbourhood sustainability assessment tools. You are eligible to be in this study because you live in Alsaya neighbourhood in Muharraq governate.

The research will be carried out in the form of an individual interview. You can participate in either of them. If you decide to participate in this study, you will contact you to carry a virtual or in-person interview according to your preference. *The interview will follow social distancing guidelines to prevent any health risks. You can volunteer to participate in my research for free if you wish, but I am offering to compensate you for your time with 10£/hour.* I would like to video record your interview, and then I will use the answers to devise a neighbourhood sustainability assessment tool for affordable housing projects with the aid of community participation. None of the video or audio recordings will be released or published, so your voice and identity will be kept confidential. Any taken photograph will be anonymized in the PhD thesis, your photograph will not be taken if you don't consent to this. All your answers will be anonymous and will not be shared with any individual, organisation, or authority. The recordings will be destroyed two years after the completion of my PhD.

Remember, this is completely voluntary. You can choose to be in the study or not. If you would like to participate or have any questions about the study, please email or contact me at

o.a.m.alabbasi@pgr.reading.ac.uk - Mobile no.

Thank you very much.
Sincerely,
Omaima Alabbasi

Interview instructions

Good (morning/Afternoon) and thank you for your time. My name is Omaima Alabbasi. I am a PhD candidate at the University of Reading, UK. I will ask you 11 questions about the neighbourhood you are living in. The interview will take around an hour and a half. I am offering you 10£/hour as compensation for your time if you choose to. The purpose of the research is to get your honest opinion in order to modify the way professionals plan and design affordable housing neighbourhoods to make them more inclusive and sustainable. This is why there are no right and wrong answers. Your participation is completely voluntary, and you can withdraw from the study at any point. None of your answers will be linked to you personally, and your identity will remain anonymous in all the publications. No personal information will be shared with anyone, but me, and I will destroy the collected data 2 years after the completion of my PhD.

Tape-recording instructions

If you don't mind, I will tape-record the interview. I will do this to be able to go back to your answers for further analysis. I also don't want to consume your time writing your answers while you talk, and I want to give you my full attention.

Consent form instructions

For face-to-face interviews

Please read the following consent form. Let me know if you need any further explanation. Kindly fill out the form, and I will collect it before starting the interview.

For virtual interviews

Kindly read the following consent form, fill out the required fields and send it back to my email address before starting the interview.

Email to: o.a.m.alabbasi@pgr.reading.ac.uk

Anonymity instructions

Each participant will be given an ID number of 10 digits based on the following protocol.

Date of interview in format: DDMMYY

☐☐☐☐☐☐ ☐☐☐☐

Time in 24-hour format:HHMM

I set the numbering format to meet the following criteria:

- Have the basic interview information to simplify retrieving the interview data by the researcher
- Hold no reference to the identity of the participant

Anonymity example:

If the interview was conducted on November/2nd/2020, at 2:30 p.m., the participant ID#. Will be 0211201430

Tape-recording file name

The file will be named A(for audio)-Participant ID#.

Carrying with the previous example, the tape-recording audio file will be named:

A-0211201430

Script file name

The file will be named S(for script)-Participant ID#.

Carrying with the previous example, the script file will be named:

S-0211201430

Interviewer reflection:

I will fill the following table immediately after conducting the interview to record any issues relevant to the analysis and validity of the collected data.

Participant ID #.	
Describe the respondent's attitude towards the interview.	
Describe your (the interviewer's) attitude towards the interview.	
Describe any circumstances that might have a bearing on the interview outcome.	

Consent form

1. The researcher explained to me the purpose of the interview .... Yes ☐   No ☐

2. I consent to participate in the interview .... Yes ☐   No ☐

3. I understand that I can withdraw from the interview at anytime .... Yes ☐   No ☐

4. I consent to have my interview tape-recorded .... Yes ☐   No ☐

5. The researcher explained that I could be compensated for my time with 10£/hour .... Yes ☐   No ☐

6. I wish to be compensated for my time in the interview .... Yes ☐   No ☐

7. If yes, I would like to receive the amount in:

   a. ☐ Cash

   b. ☐ Transfer to the bank account through IBAN number

   Please provide IBAN number

   ....

   c. ☐ Transfer through the Benefit pay mobile app using my phone number

   Please provide phone number

   ....

Participant signature: ....

Date: ....

Time: ....

Appendix c: Interview Questions and Prompts

Table c. 1. The designed interview questions, along with the prompts used to facilitate responses

themes	Designed interview questions	Prompts for the interview
1. Aesthetics	What is beautiful in your neighbourhood?	• Do the houses look good in the area? • Do the streets have nice landscaping elements such as trees, pavement, etc.? • Are there any parks around? • Do the building exteriors look good? • Do you have a good view from the windows in your house?
2. Connection to Nature	Are there any nice natural elements in your neighbourhood?	• Do you see plants around your neighbourhood (lined streets, showing from houses yards, outside houses)? • Are the parks visually accessible? • Are there natural elements that you see (water features, etc.)? • Do you have a good view from the windows in your house?
3. Community Facilities	Do the local facilities and amenities meet your needs?	• Can you fulfil your daily and weekly needs without having to go outside your local area? • Have the community facilities been appropriately provided (schools, parks, play areas, shops, cafés, mosques)? • Are they well maintained? • Are they versatile and inclusive (do you see different people using them, do they fulfil the needs of all your family members)?
4. Recreation	Do you have any places you go for recreational activities and hobbies?	• Are they versatile and inclusive (do you see different people using them, do they fulfil the needs of all your family members)?
5. Social Contact	Is there anywhere in the neighbourhood where you tend to stop and speak to people regularly?	• Do you know your neighbours? • How frequently do you speak to them?

6.	Identity, Belonging and Pride	• Does your neighbourhood have a local identity? • Do you feel you belong here? Why? Is there anything you are proud of?	• Do you feel proud when you tell others where you live? • Is it easy to find your way (or for visitors) around your local area? • Do your neighbours and the local people around add to the value of your home?
7.	Support and Influence	Do you feel able to take part in decisions to make things better in your local area?	• Do you know whom to contact if you want to improve something in your area? • Have you ever tried to change or complain about something in your area? • Do you get support from people or institutions around you (neighbours, mosques, community centres)?
8.	Walkability and Accessibility	Can you move around your area safely, quickly and using different transportation modes?	• Do you have a parking problem? • Do you have traffic problems? • Is it safe for children to play outside? • Is it safe to walk around the neighbourhood (pavement, car speed, traffic)? • Are the streets well connected? Can you reach different destinations quickly?
9.	Housing Suitability	Does your house meet your (and your family's) needs?	• Do the housing units fulfil your family's needs? • Are there different tenure options? • Are the units affordable (renting or buying)?
10.	Adaptability	Do you want to live here for a long time? Why?	• Can your house respond to your growing needs in the future? • Can you modify internal and external spaces for future use? • Can the facilities in your neighbourhood accommodate future needs?
11.	Psychological wellbeing	Does living here make you happy? Why?	• Do you feel safe here? • Do you experience any stress because of your house or neighbourhood? • Do you prefer to live somewhere else?

Appendix d: Justification for the POE Questions' Order and General Guidelines for Conducting the Interviews

Theme 1- Aesthetics: What is beautiful in your neighbourhood?

- This question is simple and relevant to many people, which makes it good for conversation opening.
- The answers can relate to different elements in the built environment (dwelling unit scale, urban scale).
- I can use the prompts questions to carry the conversation further or to help the respondent if (s)he does not understand the question well.
- When doing so, I should not interfere with the respondent's feedback. The elements that matter to the respondent should remain the highlight of the discussion.

Theme 2 - Connection to nature: Are there any nice natural elements in your neighbourhood?

- This question links easily to the previous one because beauty and nature are often related. This it can make the discussion flow easily and avoid repeating the answers.

Theme 3 - Community facilities: Do the local facilities and amenities meet your needs?

- This question provides a clear cut between previous themes to the physical facilities theme.
- It is also one of the simple questions that relate to all individuals and can reflect their diverse needs from the start of the discussion.
- It can clarify what matters to the respondent from the beginning of the discussion. This helps steer the discussion towards the issues that matter to him/her, as opposed to relying on generic questions that minimize the value of interviews.

Theme 4 - Recreation: Do you have any places you go for recreational activities and hobbies?

- Recreational elements are a special type of community facilities, which provides a logical flow from the previous question and minimises repetition.
- Try to manage between the individual needs of the respondent and collective needs (e.g. mums might tend to focus on their kids' needs and overlook discussing their own).

Theme 5 - Social contact: Is there anywhere that you find you tend to stop and speak to people regularly?

- In this question, try to identify the social network that matters to the respondent (if there are any emergent patterns, gender-related issues, if social contact matters at all or not, length and frequency, quality, etc.)

Theme 6 - Identity, belonging and pride:

3) Does your neighbourhood have a local identity?

4) Do you feel you belong here? Why? Is there anything you are proud of?

- Belonging can relate to physical as well as social elements of place. Therefore, I placed it after discussing those themes.

- It is also one of the complex questions; placing it in the middle of the discussion means I will give it appropriate attention with minimal intervention.

- Pay attention to gender-related issues and the effect of demographic differences on what constitutes belonging and identity among respondents.

Theme 7 - Support and influence: Do you feel able to take part in decisions to make things better in your local area?

Theme 8 - Walkability and accessibility: Can you move around your area safely, quickly and using different transportation modes?

- It is good to put simple questions towards the end of the discussion as people tend to get tired and lose focus.

Theme 9 - Housing suitability: Does your house meet your (and your family's) needs?

- Try to understand what matters to people (are they more related to tangible or intangible elements of space, do they differ among different demographic groups, are people more interested in the housing units or the neighbourhood fabric).

Theme 10 - Adaptability: Do you want to live here for a long time? Why?

- This question identifies the future needs of the residents and defines the elements that are significant to them in the long term.

Theme 11 - Psychological wellbeing: Does living here makes you happy? Why?

- This question can bring any missed point in the discussion without pointing them out by the researcher. It also provides a smooth end to the discussion.

- The question relates to the value of space instead of identifying specific features.

Appendix e: Ethics Application

<p align="center">Response to the REC feedback for Omaima Alabbasi, ID 26807075</p>

Issue 1:

Re Section 2 - Research Methods: unless there is a clear research need (and, based on the information provided in the form's current iteration, there does not appear to be in this case), no personal data should be collected, i.e. age, income, etc. If there is a need, this needs to be articulated and justified more explicitly in the ethics form.

Response:

Justifying the need to collect personal data:

My research intends to revise sustainability visions in affordable housing neighbourhoods through community participation. This qualitative research needs to be representative of the population living in the selected affordable housing neighbourhood. I have collected ethnographic data about the neighbourhood using public census information. To have a representative sample, I need to meet a quota of diverse genders, ages, educational levels, family sizes and ethnic backgrounds. I also need to correlate resident evaluation to their ethnographic difference to analyse the factors that could affect community participation. Those reasons make collecting personal data essential for the validity of my research.

I will only collect the following personal data:

- Gender
- Age
- Educational level
- Family size
- Ethnic background

All the data will remain confidential and anonymous.

Issue 2:

Re Section 3 – Ethical Issues:

1. (Point 1) Coercion – it should be made clearer as to how it will be ensured that the respondents will not be coerced.

   Response:

To avoid coercion or pressuring the residents to participate in my study, I will not approach them through any mediating formal institution or communal/charitable organization. Instead, I will use a combination of network and snowball sampling. I chose this sampling method because Bahrainis are unlikely to respond to random mail or phone study recruitments. While this method has the advantage of finding willing participants, it can also make the sample very homogenous because they all belong to a connected network. To ensure that I avoid coercion but achieve an acceptable level of randomness in my research, I need to collect personal data about age, gender, family size, educational level and ethnic background. I will not collect any names or addresses from the interview participants, which makes their participation private and cannot pose any harm to them. As the respondents have nothing to gain or lose in participating in this research, they are not coerced in any way to take part in this study. In addition, I will explain to the participants that they are not compelled to take part in the study, and they can withdraw their consent and stop the interview at any time.

2. (Point 3) Minor incentive – the form of 'minor incentive' needs to be specified.
   Response:
   I will not use monetary incentives for participants who are willing to volunteer for the interviews. As for the individuals who are hesitant to participate, a monetary incentive could compensate them for the time taken to respond to my questions (around 1 hour). The monetary incentive should be properly assigned to attract respondents to take part in the study, but not too large to a level that would compel them to participate in my research for financial gain. To do so, I will offer 10 £ per hour, which is double the minimum wage in Bahrain, to compensate for the participants' time but avoid coercion at the same time. Throughout this whole process, the participants will be reminded that they are not required to participate and that they can opt-out at any stage of the study.

3. Data storage - password protection is required on all files. All files need to be anonymised, and a separate code sheet (password protected) be kept.

   Response:
   All soft copies will be password protected on my personal laptop. Hard copies and audio recorders will be kept in a locked locker in my home office while I'm still in Bahrain and in a locked locker in my office in the UoR office when I am in the UK.
   Anonymity protocol is provided in the anonymity instructions in the interview protocol (response to point 5- appendix D)

4. Duration of data storage – it would be better to include a maximum period after the completion of the PhD (including amendments), e.g. three years after completion.

   Response:
   All data will be destroyed two years after the completion of my PhD.

5. Any other information: more detail of the interview protocol, i.e. indicative questions *and* justifications for research needs.

   Response:
   The interview protocol is attached separately[26].

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[26] Refer to appendix b.

Appendix f: LEED-ND Project Checklist

Table f.1. LEED-ND project checklist, Highlighting the indicators relevant to public examination. Modified from the USGBC website (2018a)

		LEED v4 for Neighborhood Development Built Project	Allocated points
#	Nature of grading	Project Checklist	
		Theme 1 - Smart Location & Linkage	**28**
1	Prereq	Smart Location	Mandatory
2	Prereq	Imperiled Species and Ecological Communities	Mandatory
3	Prereq	WetlandS and Water Body Conservation	Mandatory
4	Prereq	Agricultural Land Conservation	Mandatory
5	Prereq	Floodplain Avoidance	Mandatory
6	Credit	Preferred Locations	10
7	Credit	Brownfield Remediation	2
8	Credit	Access to Quality Transit	7
9	Credit	Bicycle Facilities	2
10	Credit	Housing and Jobs Proximity	3
11	Credit	Steep Slope Protection	1
12	Credit	Site Design for Habitat or Wetland and Water Body Conservation	1
13	Credit	Restoration of Habitat or Wetlands and Water Bodies	1
14	Credit	Long-Term Conservation Management of Habitat or Wetlands and Water Bodies	1
		Theme 2 - Neighborhood Pattern & Design	**41**
1	Prereq	Walkable Streets	Mandatory
2	Prereq	Compact Development	Mandatory
3	Prereq	Connected and Open Community	Mandatory
4	Credit	Walkable Streets	9
5	Credit	Compact Development	6
6	Credit	Mixed-Use Neighborhoods	4
7	Credit	Housing Types and Affordability	7
8	Credit	Reduced Parking Footprint	1
9	Credit	Connected and Open Community	2
10	Credit	Transit Facilities	1
11	Credit	Transportation Demand Management	2
12	Credit	Access to Civic & Public Space	1
13	Credit	Access to Recreation Facilities	1
14	Credit	Visitability and Universal Design	1
15	Credit	Community Outreach and Involvement	2
16	Credit	Local Food Production	1
17	Credit	Tree-Lined and Shaded Streetscapes	2

18	Credit	Neighborhood Schools	1
		Theme 3 - Green Infrastructure & Buildings	**31**
1	Prereq	Certified Green Building	Mandatory
2	Prereq	Minimum Building Energy Performance	Mandatory
3	Prereq	Indoor Water Use Reduction	Mandatory
4	Prereq	Construction Activity Pollution Prevention	Mandatory
5	Credit	Certified Green Buildings	5
6	Credit	Optimize Building Energy Performance	2
7	Credit	Indoor Water Use Reduction	1
8	Credit	Outdoor Water Use Reduction	2
9	Credit	Building Reuse	1
10	Credit	Historic Resource Preservation and Adaptive Reuse	2
11	Credit	Minimized Site Disturbance	1
12	Credit	Rainwater Management	4
13	Credit	Heat Island Reduction	1
14	Credit	Solar Orientation	1
15	Credit	Renewable Energy Production	3
16	Credit	District Heating and Cooling	2
17	Credit	Infrastructure Energy Efficiency	1
18	Credit	Wastewater Management	2
19	Credit	Recycled and Reused Infrastructure	1
20	Credit	Solid Waste Management	1
21	Credit	Light Pollution Reduction	1
		Theme 4 - Innovation & Design Process	**6**
1	Credit	Innovation	5
2	Credit	LEED® Accredited Professional	1
		Theme 5 - Regional Priority Credits	**4**
1	Credit	Regional Priority Credit: Region Defined	1
2	Credit	Regional Priority Credit: Region Defined	1
3	Credit	Regional Priority Credit: Region Defined	1
4	Credit	Regional Priority Credit: Region Defined	1
		Project Totals (Certification estimates)	

Appendix g: Result of the Fixed Analytical Framework of the POE Interviews

Findings of coding frequency number 6: Community Facilities

Evaluation

The evaluation for this theme differed significantly between the residents of the old and the new neighbourhood. All participants from the New Alsayah believed they had a good range of facilities within walking distance. While all the residents from the Old Alsayah thought those were lacking and very far.

> Participant from the New Alsayah Neighbourhood: 'I find everything I need on a daily basis within the neighbourhood. I don't need to go far.'.

> Participant from the Old Alsayah Neighbourhood: 'We don't [have nearby facilities]. They're just building them now.'

Cause of Evaluation

Participants of the New Alsayah appreciated that the neighbourhood facilities were ready before they moved in. They also linked their evaluation to the proximity of the facilities (within walking distance), provision (having most of the services needed daily), and diversity of facilities. Mentioned facilities included local bakeries (locally called 'khabbaz' or baker, which are manned clay ovens used for baking subsidized bread daily - to differentiate from automated bakeries), grocery stores (or cold stores as commonly called in Bahrain), greengrocers, Laundry, Barber (for males), and hairdresser (for females). Participants also were pleased that the services within the neighbourhood were only the daily needed ones, which minimised the noise in the area. The community services and the paths residents use to reach them are mapped in Figure g. 1 for both sides of the neighbourhood. The neighbourhood facilities in the Old Alsayah are still under construction, and they are planned to have a medium-sized mall, which the residents are not pleased with as they believe it will create traffic and noise in the area, and it's not needed within this proximity.

Participant from the Old Alsayah: 'Oh no, even if I need something small, like match sticks, I need to go to the old Busaiteen for that. There was an empty plot for services since we moved here around 11 or 12 years ago, but those should have been ready at the same time of the houses' completion. We had nothing! No baker, no cold store!'
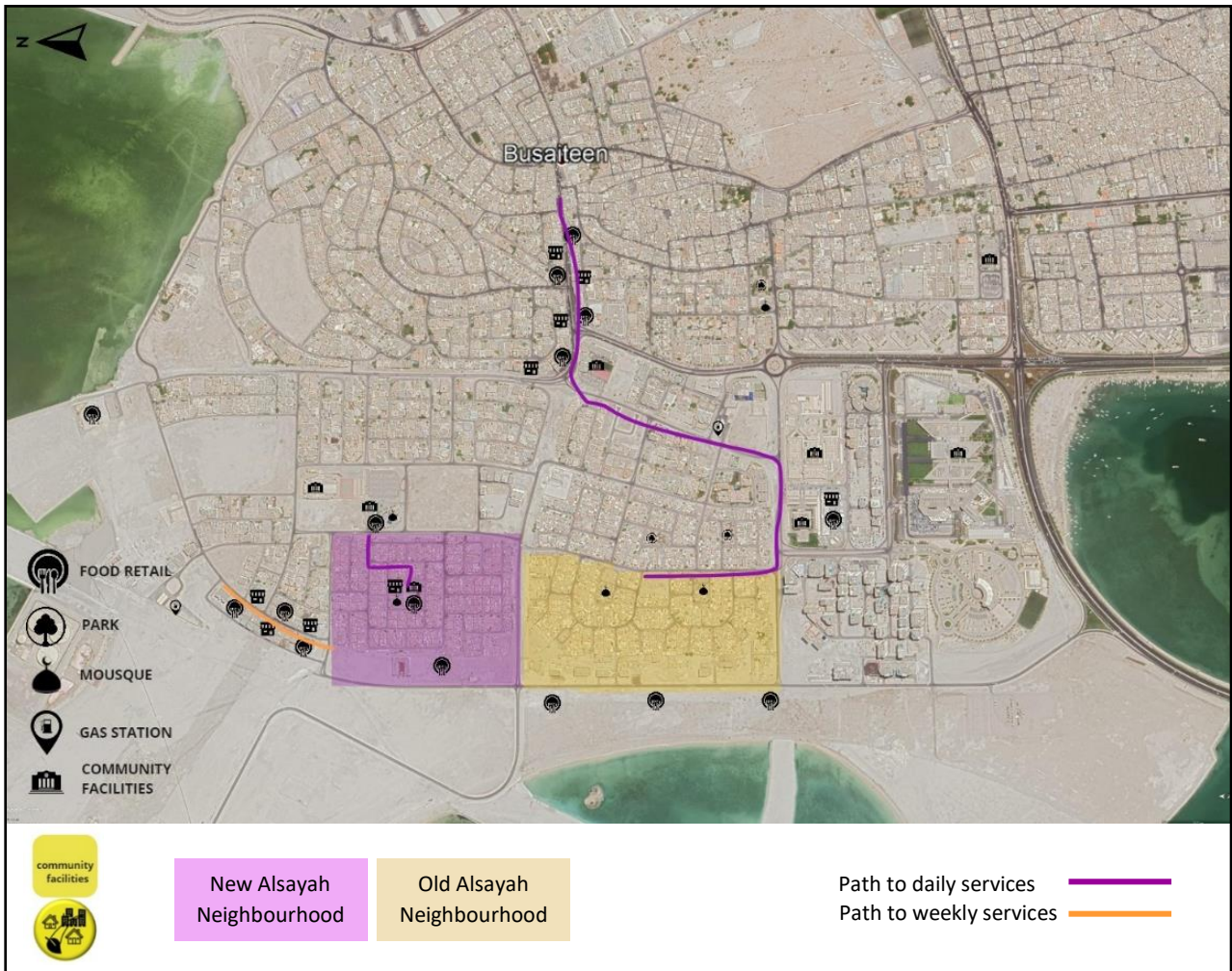

Figure g. 1. Mapping of mentioned community facilities and the used routes to reach them

Another participant from the Old Alsayah: 'In general, the mix of people here do not desire these kinds of centres [malls]. Yes, it may have air-conditioning, and people can walk inside or sit at a coffee shop, but we are used to going out ourselves [to such places] even if they are far away using a car, but here, I do not agree with it. I wished we had a local baker, a cold store, a barbershop, a laundry and so on.'

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Findings of coding frequency number 7: Walkability and Accessibility

Evaluation

Participants were mostly positive when evaluating this theme. They believed walking around their neighbourhood was safe and comfortable for them. They reported seeing many people of different ages, genders, and groups (e.g., parents with their children, friends, couples, etc.) walking at different seasons and at different times of the day.

> Participant: 'Yes, that's excellent here [walkability]. The streets are excellent for walking easily. No one would disturb you. It's actually quite nice to walk around.'

> Participant: 'You can't imagine the number of people using the walkway in our area.'

Despite this good evaluation, they reported that unless it's for recreational or exercise purposes, they would almost only use their car to run their errands or move around. The dependency on the car is evident through the word cloud in Figure g. 2, which shows that the word 'cars' was more frequently used than 'walking' or 'bike' in the discussion of this theme. Parents reported that they would only allow teenagers to walk unattended without worrying about them, while they would not allow children around the age of 11 or under to do so. They also reported that although the streets are safe for walking, they are not safe for cycling, especially when they are accompanied by their kids.

Participants were extremely happy with the street connectivity and believed they could quickly reach the facilities they needed, but only by car. The only participants who discussed public transportation when responding to this question were males above the age of 60 and with an educational level below high school.

Participant: Public transportation stops by the industrial school. It is far for the older women and men. Public transportation does not enter the neighbourhood. It should. If it comes all the way in, there would be no need for a car to go to the market.'

Figure g. 2. Word cloud - Top 50 words used by participants to discuss the 'Walkability and accessibility' theme

Cause of Evaluation

Participants attributed good walkability and accessibility to the wide sidewalks around the houses, well-connected inner streets network, limited access points to the main street, which lowered the traffic in the neighbourhood, and high safety (absence of crime or harassment). They also reported different levels of walkability depending on the weather conditions, which they believed was good overall. The remaining justifications were mostly implied in the residents' narratives. I used the responses given for this theme to map residents' circulation patterns, intensity, and

preferred modes of transportation (Figure g. 3). The causes that affected the evaluation of this theme, as understood from the responses and the mapping, are displayed in Figure g. 4.
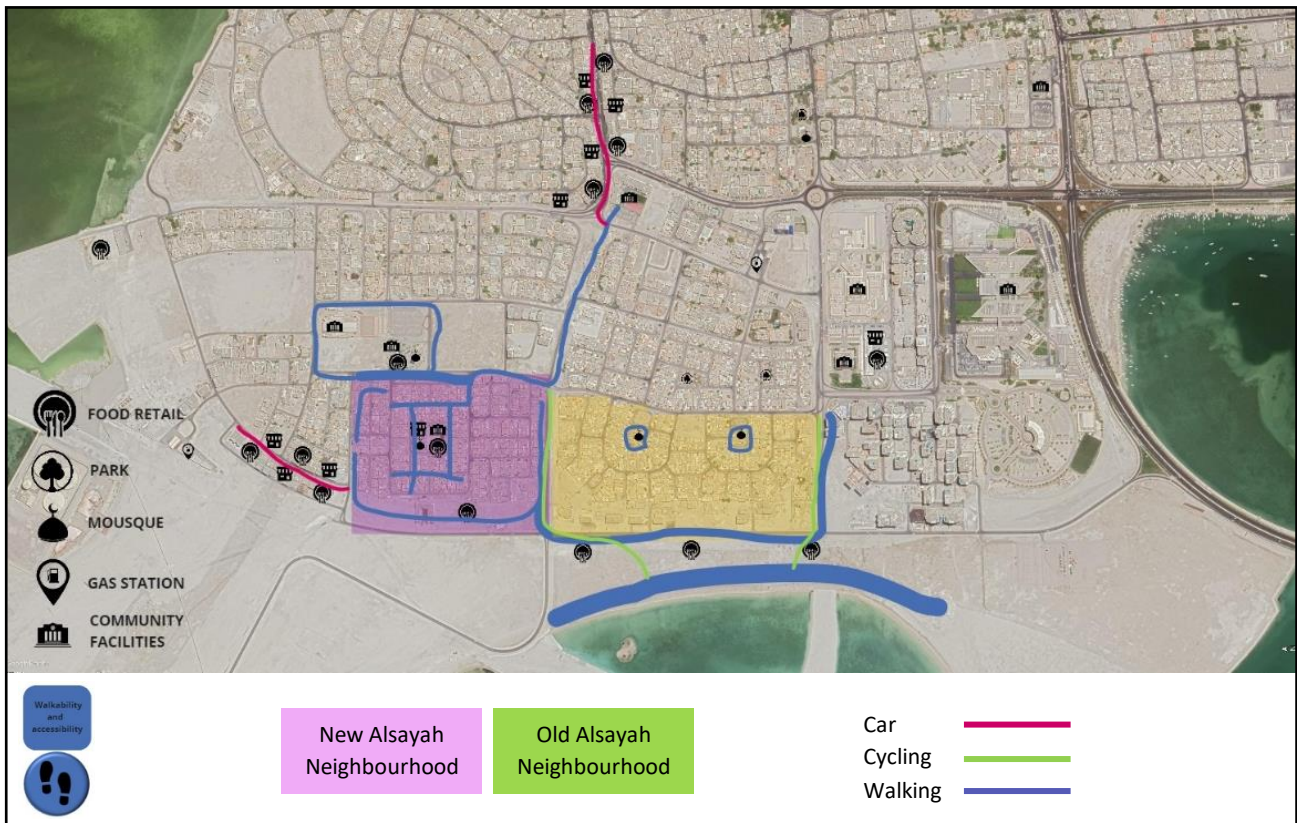
Figure g. 3. 'Walkability and Accessibility' Mapped responses
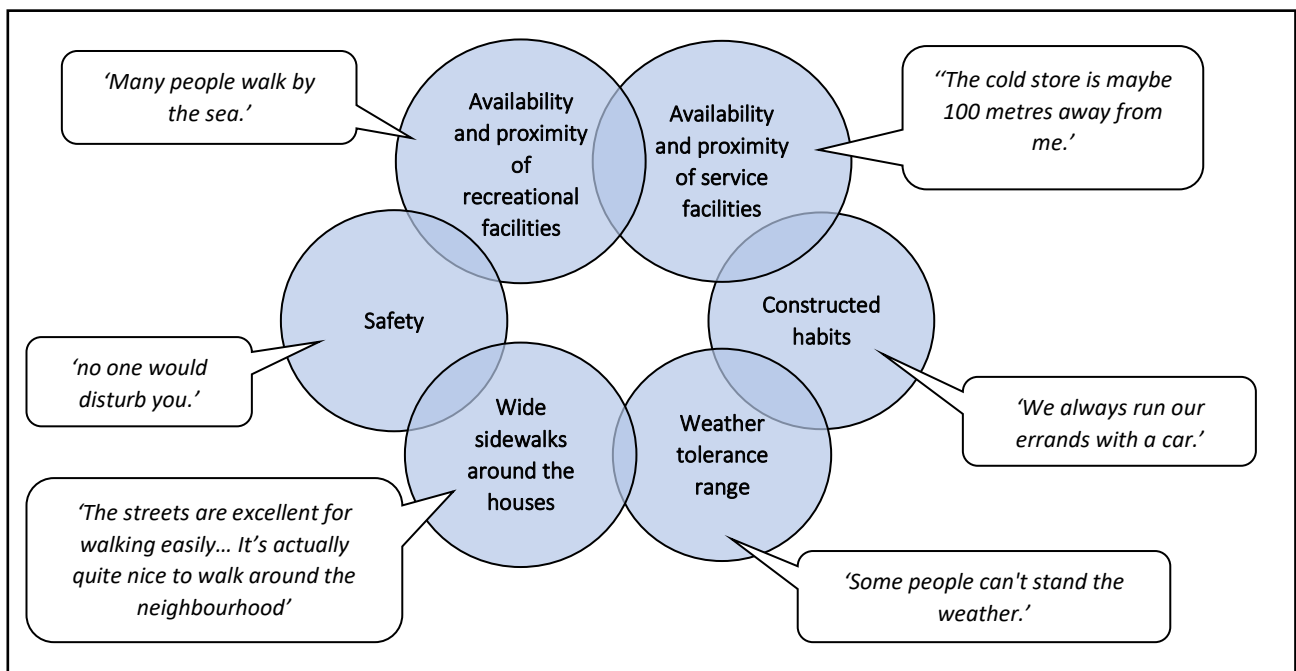
Figure g. 4. Implied factors affecting 'walkability and accessibility' - Results summary

Participants differed in what they considered recreational facilities and in their evaluation of this theme. Those differences were associated with the change in participants' educational levels. Mentioned recreational facilities can be classified as indoor spaces with registration fees, reported by participants of younger age and higher educational level, and outdoor public spaces, without registration fees, reported by participants of older age and lower educational level. Those are presented in Figure g. 5.
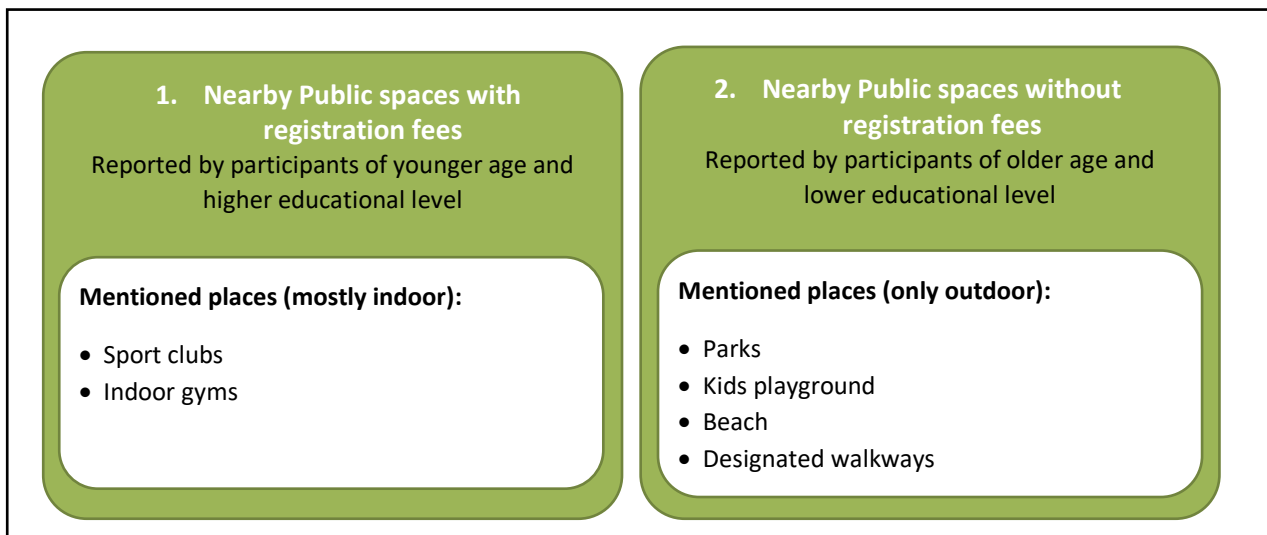
Figure g. 5. Reported recreational facilities – classification and characteristics

Evaluation

Evaluation of this theme was divided into two distinct views. The first one reports good availability and quality of recreational facilities (category 1 in Figure g. 5). And another reporting almost no recreational facilities or ones that are not efficient (category 2 in Figure g. 5).

> Positive evaluation: 'Yes, I use the health club, and my kids use the football fields, and they attended taekwondo classes there. They also use the pool.'

> Positive evaluation: 'I used the gym for a while. It's quite good.'

> Negative evaluation: 'We were told since we moved in that it [an outdoor park and playground] would be in the area behind Abdulrahman Almahmeed Mosque. We were happy because my daughter was young. She was in grade 1. But no. Nobody cared for it … They turned one part of it into parking spaces, and there's another small, fenced part. So, I don't know.!'

Negative evaluation were mostly given to parks, while the evaluation of the beach and beachside walkways fluctuated between good but difficult to reach for older respondents to good and easy to reach for younger ones. The reported recreational places are mapped in Figure g. 6.
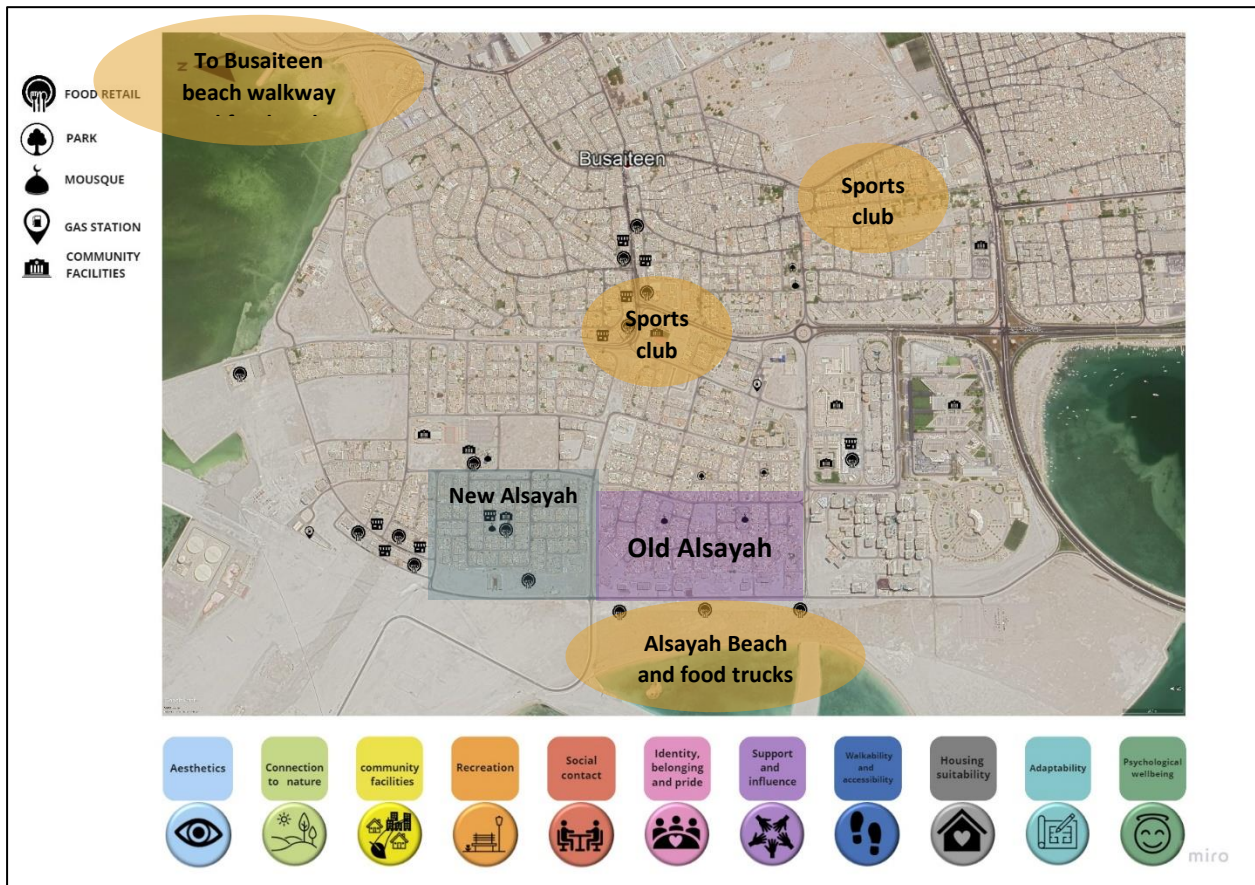
Figure g. 6. Mapped recreational facilities as reported in residents' response

Cause of Evaluation

Participants based their evaluation on factors that were consistently reported by most of them. Those were: 1) availability, 2) proximity, 3) quality, 4) maintenance, and 5) users' ethnic profile. Older participants were more concerned with the proximity factor and rarely considered walking to the recreational facilities. They were also less likely to use indoor facilities or ones with registration or entry fees. On the contrary, younger participants preferred walking to nearby facilities. Some thought entry fees could improve the facility maintenance as they restrict some user profiles from entering, which was a shared, even though antagonising, opinion. All

participants had similar negative associations with places with a lower number of female or local users. The findings of the cause' for the 'Recreation' theme are summarised in Figure g. 7.
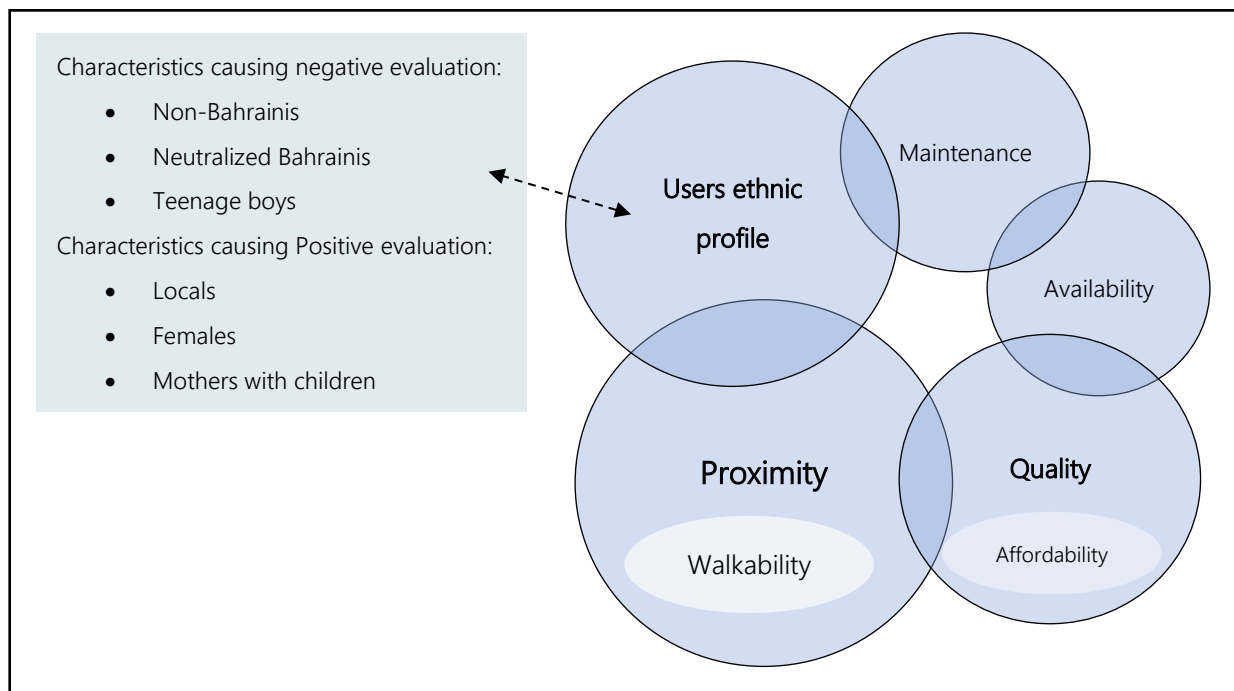
Figure g. 7. Causes for 'Recreation' evaluation

Findings of coding frequency number 9: Connection to Nature

This theme had 44 coding occurrences across all the interviews (table 5. 1). Although the interview design had a question to assess the neighbourhood's connection to nature, most of the participants dismissed this question quickly. Respondents' mention of natural elements was more evident while discussing other themes of the POE interview.

Evaluation

The participants unanimously reported having no connection to natural elements in their neighbourhood. While they believed natural elements do add a nice touch to neighbourhoods, the majority were not distressed by the lack of connection to nature.

> Participant: 'I don't see any agricultural or natural areas. Honestly, there aren't any. I don't know if there will be any in the future.'

Even though there is a beach within walking distance of the neighbourhood, participants only remembered it after thinking for a while. Their reference to it was merely as an available feature but not as one to which they connect.

Participant: 'The sea is close to us. That is one thing.'

Cause of Evaluation

Participants viewed this feature mainly as a personal responsibility; hence, they mostly justified the weak connection to nature to the absence of a sufficient front yard to use for planting.

Participant: 'The outdoor space [front yard] of the house are not enough to use for planting, so those can't add to the beauty of the area ... People sometimes put pots for planting outside their houses. Those are the only sources of beautiful natural elements that can be seen in the neighbourhood.'

Several participants even viewed this feature as a negative addition that can cause insect infestation, noise, loafing, and crime.

Participant: 'Our neighbours have plants. They dirty us. Flowers or something like that.'

Many respondents understood why some residents had this negative view to natural elements, even though they disagreed with it.

Participant: '...they were worried [the neighbours] that parks used as kids' playgrounds can cause excessive noise in the area. So, they didn't want it, but this was the only chance for green space.'

Findings of coding frequency number 10: Adaptability

This theme had 43 frequency occurrences (Table 5. 1) and a coverage pattern which was significantly different across the participants, as shown in Figure g. 8.
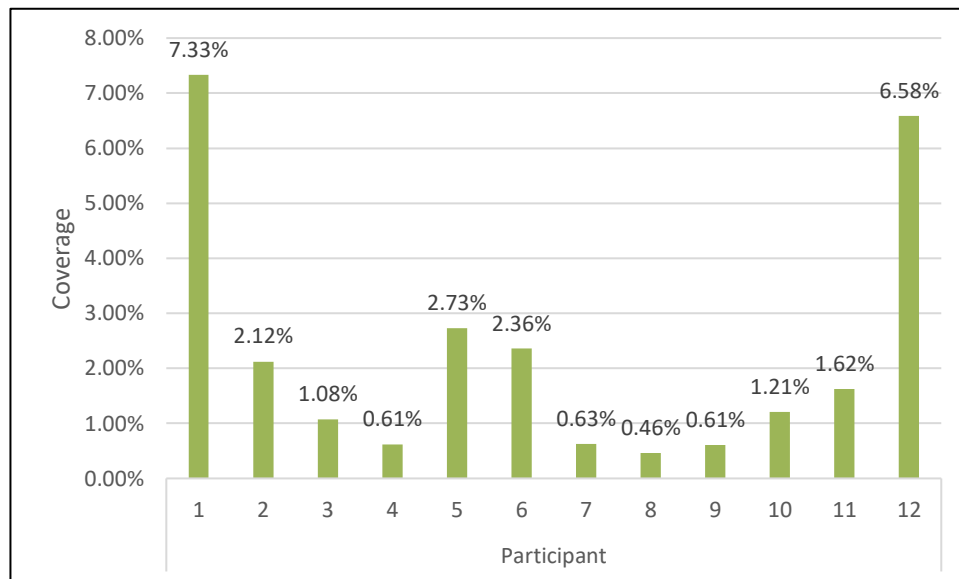
Figure g. 8. 'Adaptability' theme - Coverage per participant

Evaluation

Most of the participants believed that their needs could be met in this area for a few more years. Around half the participants believed they would never move houses, while the other half believed that the house and the neighbourhood could only meet their needs temporarily. The older demographic sample and residents who spent a longer time in Muharraq area were more positive in evaluating this theme.

> Participant: 'This house is only temporary until the kids grow. New area,
> new design.'

In addition, as participants spent a long time in the neighbourhood, they became less critical in discussing this theme.

> Participant: 'It has become our house. Where else would we go!'

Cause of Evaluation

Participants reported that having good neighbours and good facilities prolongs the likeliness of staying in the neighbourhood. However, the main factors for evaluating 'adaptability' were the

physical features of the house and its ability to meet the functional needs of the family as it grows (figure g. 9). While participants found that they had the ability to change things in the house to make it adapt to their needs, many of those modifications were in violation of the municipality regulations.

> Participant: 'When we got the house, we didn't move in immediately. We demolished some things and changed others. We changed everything (chuckles). It's like we built it from the ground, inside and out. If it had met our needs, we wouldn't have changed things ... We still have space to build above.'

> Participant: 'We committed many violations.'
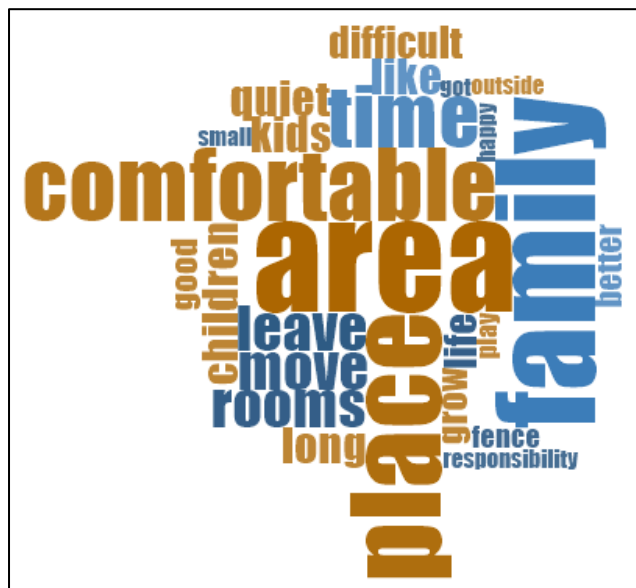
Figure g. 9. Word cloud - Top 25 words used by participants to discuss the 'Adaptability' theme

Participants who didn't have relatives living nearby were stricter in defining the requirements they needed in the house to stay longer in the neighbourhood. They were also harsher in evaluating the neighbourhood's adaptability. In comparison, those who had a social network of relatives living within Muharraq were more willing to give up their requirements, as they prioritised maintaining proximity to their social network.

> Participant: 'To me, the facilities and the strategic location. The easy accessibility to the main roads and the proximity to the capital made me prepare myself to live here for a long time and see it as an ideal place to live in, in addition to the other services I mentioned before. But before all, the

proximity to my father's house … its different for my wife, because her family
lives in Riffa.'

Findings of coding frequency number 11: Psychological Wellbeing

This theme was the least discussed by the participants, with a frequency count of 37 (Table 5. 1) and a coverage average of 2.07% (Figure g. 10). As this theme discussed participants' feelings, it was difficult to isolate the 'evaluation' and the 'cause of evaluation' for several cases.
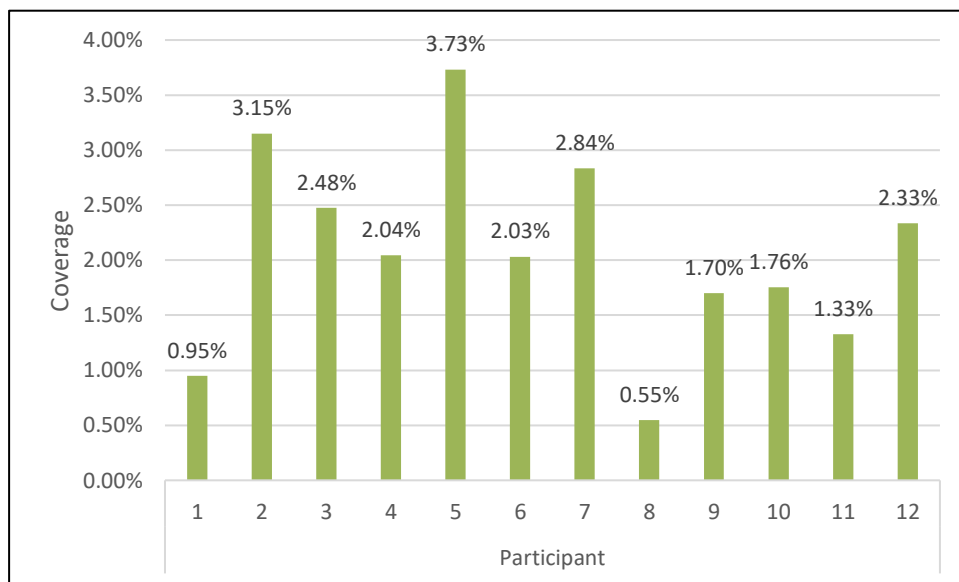

Figure g. 10. 'Psychological wellbeing' theme - Coverage per participant

Evaluation

Most of the participants evaluated this theme very positively and reported feelings of happiness, comfort, and safety. This evaluation can be read through the word cloud of the top 25 words used by the participants to discuss this theme (Figure g. 11).

Participant: 'We don't even lock our doors. We keep everything open. It's
very safe here.'

None of the participants evaluated their 'psychological wellbeing' negatively, and only two reported being neutral about it.

Participant: 'I am neither happy nor upset.'

Figure g. 11. Word cloud - Top 25 words used by participants to discuss the 'Psychological wellbeing' theme

Cause of Evaluation

As shown in Figure g. 10, most of the participants related assessing 'psychological wellbeing' to their satisfaction with the neighbourhood and their neighbours. Having what the participant called 'good' neighbours was the main reason for feeling good about living in this area. Common causes also included the quietness of the area and having many services at a near distance.

> Participant: 'People around us are good. We know them … if I urgently needed something, I'd find it [in the neighbourhood] very simply. This makes the area feel comfortable.'

> Participant justifying why he feels good: 'The quietness and serenity. There is no noise and no problems. That's the most important thing. The neighbours cause no problems. What else would one want?'

Privacy was also frequently reported as a cause of wellbeing. This was especially attributed to the wide streets and sidewalks.

> Participant: 'It [street and sidewalks width] actually gives you privacy and spaciousness. It's not like if you open the door of your house, you immediately see your neighbour.'

As for the scale of the housing unit, participants reported feeling good because of owning their houses. The physical features of the housing unit were minimally associated with this theme.

> Participant: 'Owning a house of mine makes me happy.'

Appendix h: The Relationship Between the Collected Background Information and the Five Top-Ranked POE Themes

The Relationship Between 'Educational Level' and the Five Top-Ranked POE Themes

Apart from the 'support and influence' theme, the content of the remaining four themes was not affected by the participants' educational level. As for 'support and influence', residents discussed this theme less as their educational level increased (Figure h. 1). Participants with higher educational levels were also less convinced of the value or efficiency of their own contribution or the impact of the formal support organisations (which were primarily local authorities as reported in the interviews).
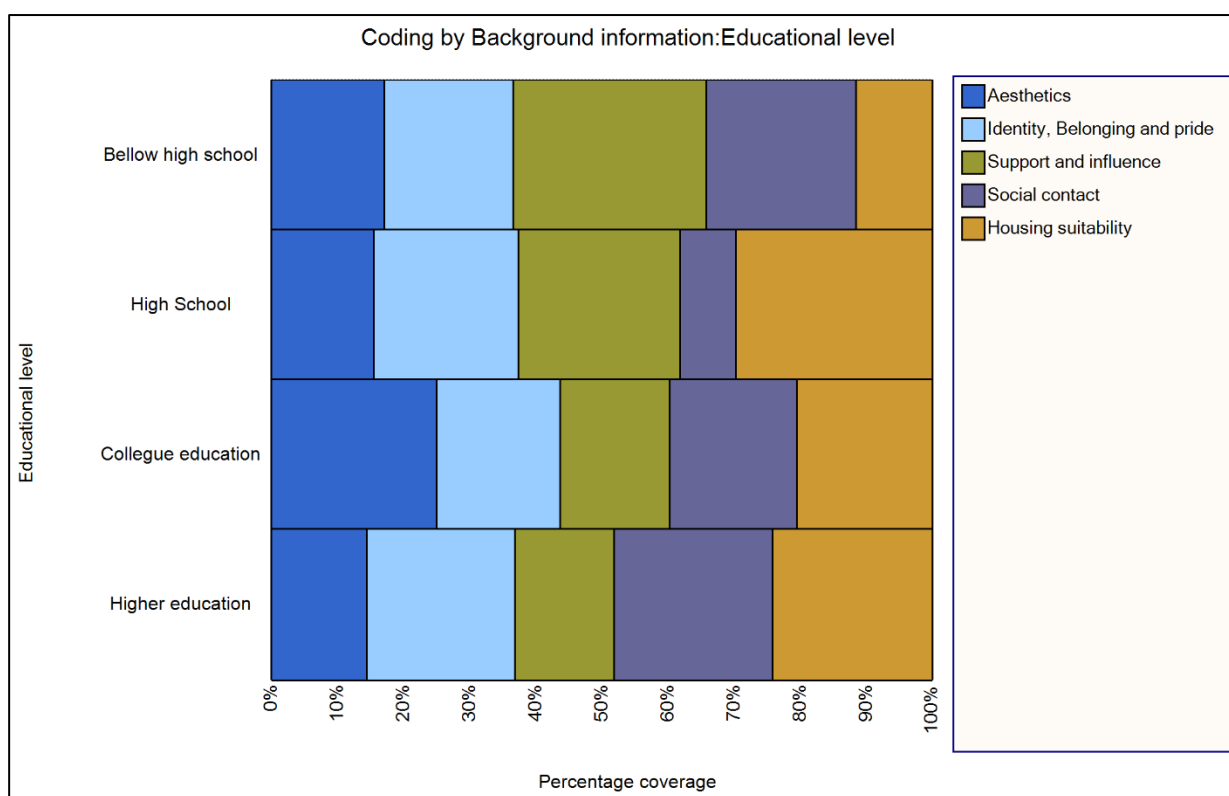
Figure h. 1. Coverage Hierarchy Chart by Educational level for the top 5 ranked POE themes

The Relationship Between 'Family Size' and the Five Top-Ranked POE Themes

Despite the difference in coverage (Figure h. 2), family size had no effect on the expressed evaluations of the participants in any of the examined five themes.
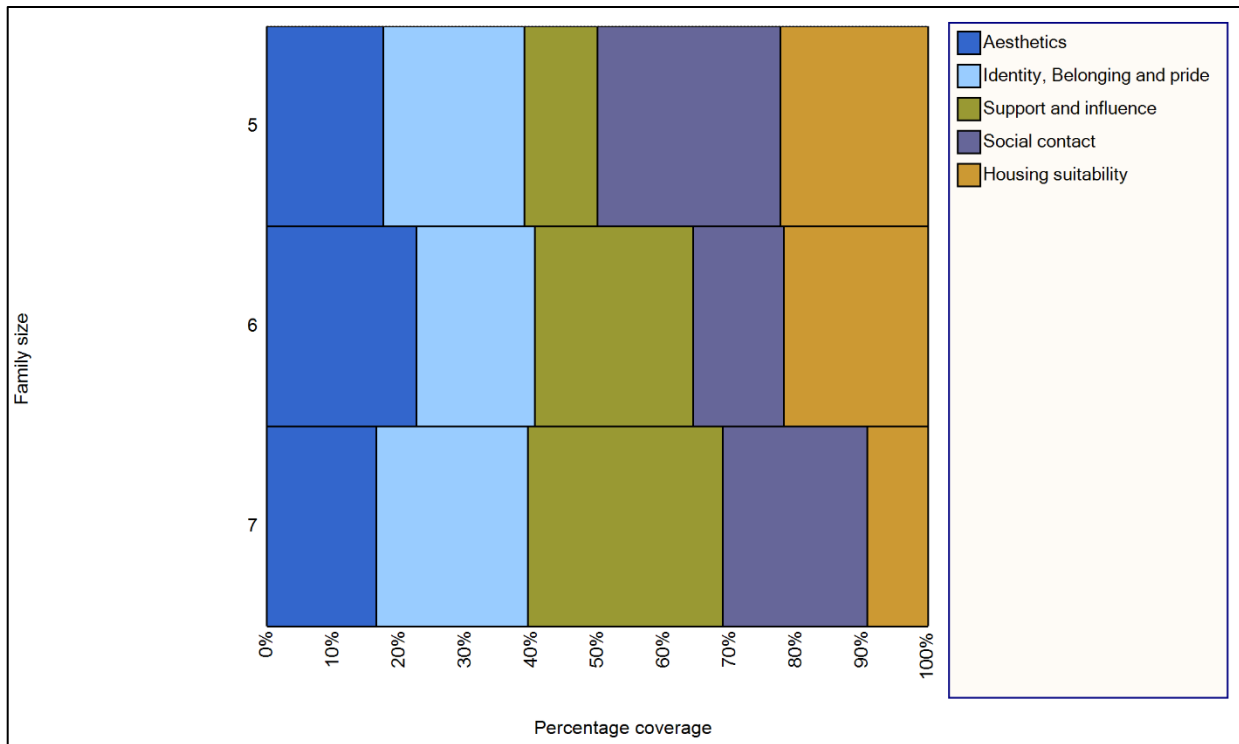
Figure h. 2. Coverage Hierarchy Chart by Family size for the top 5 ranked POE themes

The Relationship Between 'Location' and the Five Top-Ranked POE Themes.

The only theme where the 'location' attribute affected both its 'coverage' and 'content' was the 'Support and Influence' theme. The coverage of this theme was higher at the old Alsayah, with 34.27%, compared to 22.13% at the new one (Figure h. 3). Residents of Old Alsayah were slightly more positive in their evaluation of 'Support and Influence' as many respondents recalled several incidents where they needed to report problems in the neighbourhood. Their preferred approach was to contact the elected municipal representative directly via WhatsApp. While residents from the new side reported the same experience, this was less referenced by them as they were more vocal in expressing dissatisfaction towards this theme.

> Participant from the Old Alsayah neighbourhood: 'Oh yes, we have him [the elected municipal representative] on WhatsApp. It's very easy to contact him. If we have any problem, we just take a picture of it and send it to him. You don't need to worry about anything else.'

'Aesthetics' and 'Housing suitability' themes were slightly more discussed on the New Alsayah side (Figure h. 2). This, however did not affect the content of the residents' narratives, which

remained similar at both sides. 'Location' did not affect either the 'content' nor the 'coverage of the 'Social contact' and 'Identity, Belonging and Pride' themes (Figure h. 3).
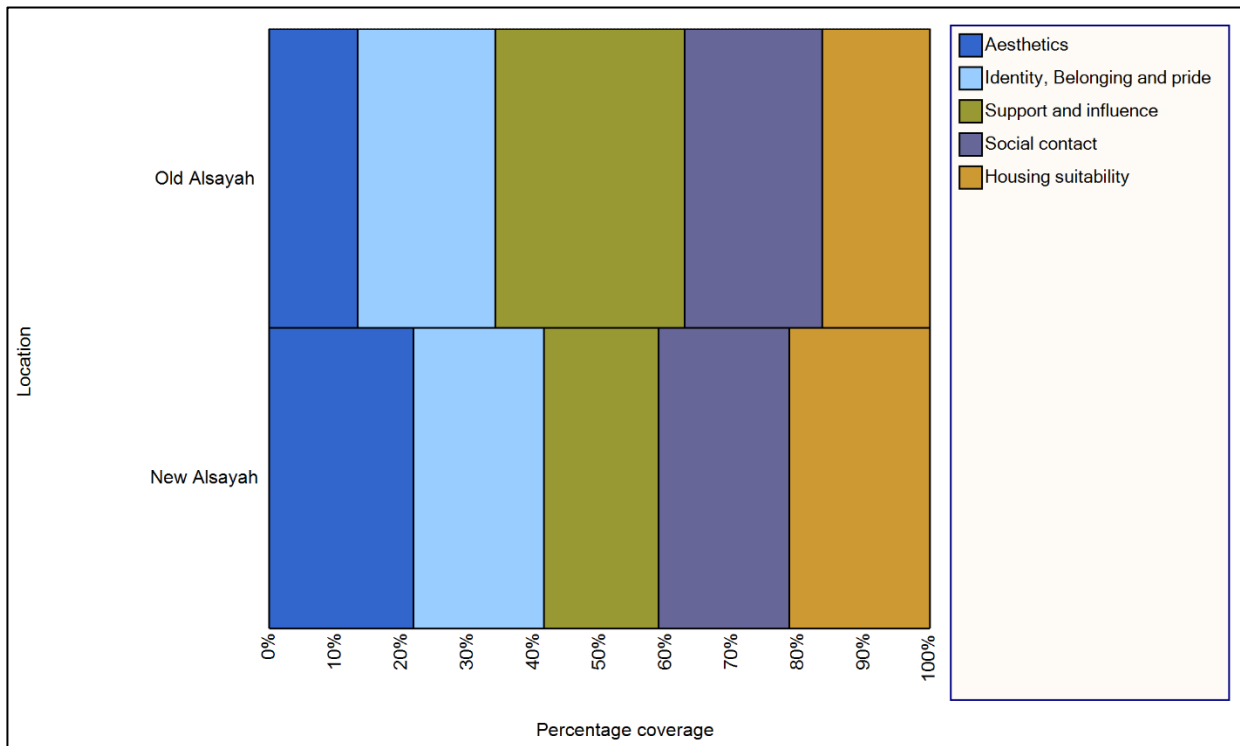

Figure h. 3. Coverage Hierarchy Chart by Location for the top 5 ranked POE themes

Appendix i: The Relationship Between Background Information and the Top-Ranked Themes of the Open-End Coding

Educational level

Educational Level and Physical Features

The extent and content of this theme were consistent across the different age groups, with around 21% coverage (Figure i. 1). This percentage was significantly higher in participants with 'higher education qualifications. However, the participants that caused this increase were a married couple, and one of them was an architect. Therefore, the change in the coverage of this theme cannot be attributed to the 'higher education' qualification and, therefore, was not considered a valid finding.

Educational Level and Mode of Transportation

The discussion of this theme decreased as the participants educational qualifications increased. Participants with higher educational qualifications were also more likely to mention walking or cycling within the neighbourhood (Figure i. 1).
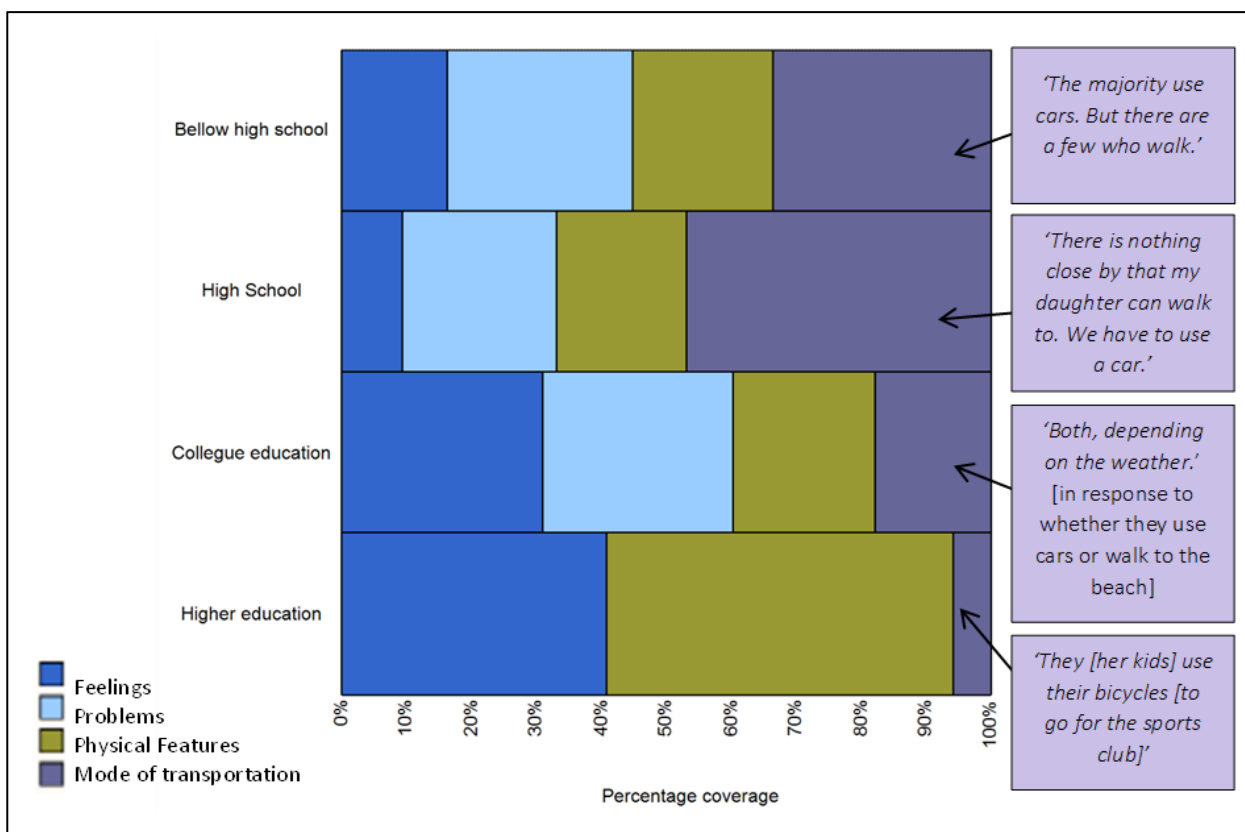
Figure i. 1. Hierarchy Chart: Open-end Coding by educational level, with a sample of responses for selected segments

Educational Level and Feelings

Participants discussed their feelings more as their educational level increased (Figure i. 1). This increase did not change the content of their discussion, which remained the same across the different groups.

Educational Level and Problems

Problems had the same coverage percentage and content throughout the different educational levels. The only different segment was with participants with 'higher education' qualifications, who did not discuss the 'problems' theme (Figure i. 1).

Family size

The 'Problems' theme was the only open-end theme that was affected by the family size attribute. 'Problems' coverage increased from 12% for families with five members (parents and three kids) to a significant 30% for families with six members and 32% for families with seven members (figure i. 2). While room sizes and parking provisions were the main problems reported by all the family size groups, families with five members started reporting problems relating to recreational use, such as the absence of a place in the house to plant trees.
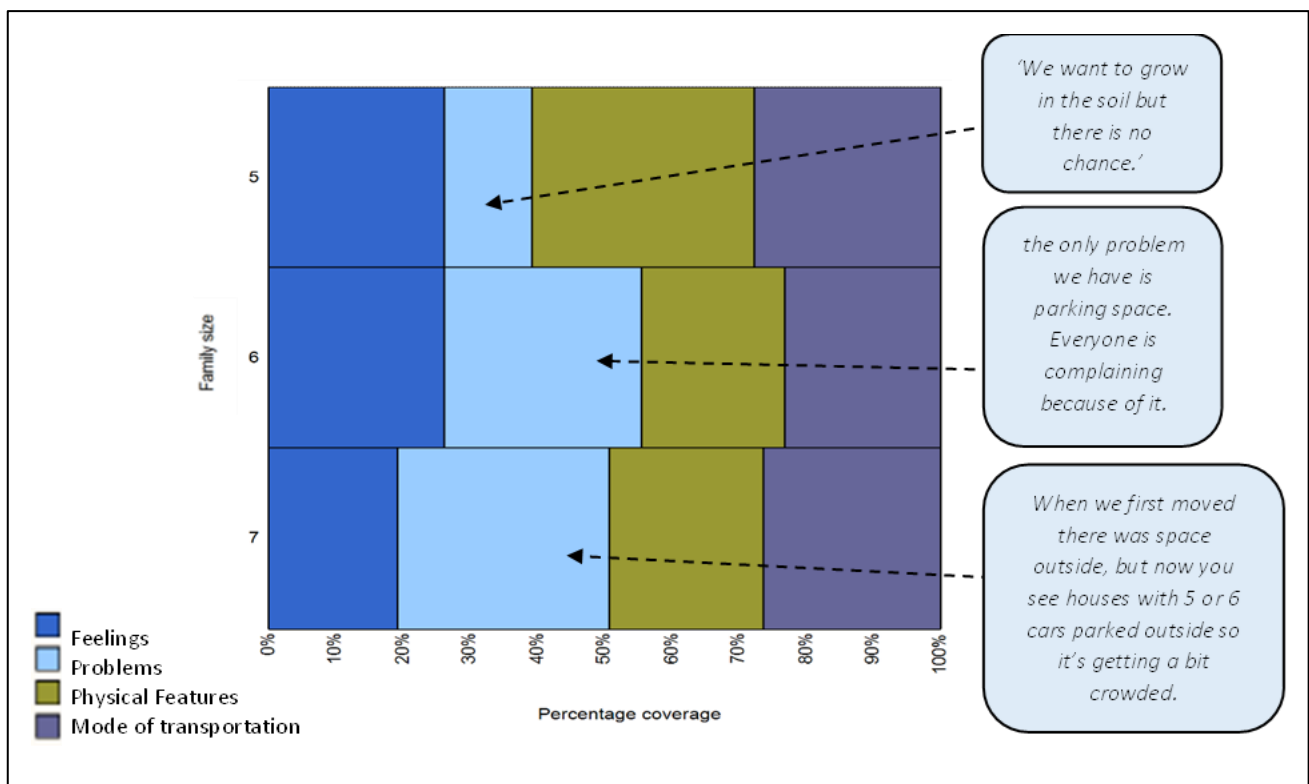

Figure i. 2. Hierarchy Chart: Open-end Coding by Family size, with a sample of responses for selected segments

A participant with five family members: 'There is no space [to grow plants] …
We already have those [planting pots]. We want to grow in the soil, but there
is no chance.'

Location

Location and Physical features

As shown in Figure i. 3, 'Physical Features' were slightly more discussed in the New Alsayah
(27% in the New Alsayah compared to 19% in the Old Alsayah). However, it did not have an
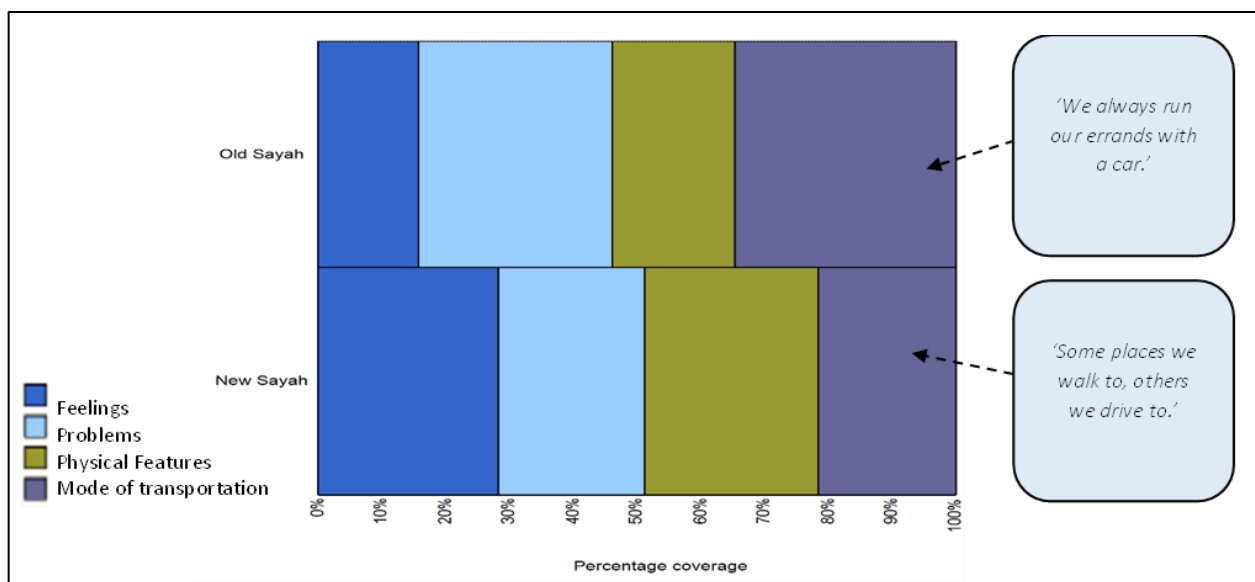impact on how people felt across the two parts.

Figure i. 3. Hierarchy Chart: Open-end Coding by Location, with a sample of responses for selected segments

Location and Mode of Transportation

The coverage of this theme was higher in the old neighbourhood (35.5% coverage) compared to
21% coverage in the new one (Figure i. 3). The content was also slightly different between the
two parts. The residents of the new neighbourhood were more inclined to mention walking as a
choice for moving around, while this was less evident by participants from the old Alsayah.

Participant from the old Alsayah: ''We always run our errands with a car.'.

Participant from the new Alsayah: ''Some places we walk to, others we drive
to.'

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<u>Location and Feelings</u>

'Feelings' were more discussed in the New Alsayah (29% in the New Alsayah compared to 15% in the Old Alsayah), as shown in Figure i. 3. However, it did not have an impact on how people felt across the two parts.

<u>Location and Problems</u>

This theme was discussed more in the Old Alsayah (30% coverage), compared to only 23% coverage in the new one (Figure i. 3). The content of the theme was discussed similarly on both sides.

Appendix j: Code Definition

Table j. 1. Open-end Coding Framework - Code Definition

CODE		DEFINITION	NUMBER OF PARTICIPANTS REPORTING THE CODE	NUMBER OF CODES
Open-end Coding		Themes that do not fit into the fixed analytical framework (2 fixed analytical frameworks, one based on the devised POE tool and another based on the LEED-ND framework). OR themes that are brought up in places other than their intended place in the interview (e.g., bringing up issues related to 'walkability and accessibility' in the theme of 'community facilities' or discussing 'connection to nature' while answering questions related to 'aesthetics').		
1.	Activities	The activities seen in the neighbourhood and brought up by the participants, whether carried out by them, their families, or others in the neighbourhood.	11	48
2.	Awareness	Recognising what is offered to the neighbourhood. whether by authorities or community members, formally and informally	6	7
3.	Changed perceptions and attitudes	Beliefs and attitudes that the participants had but were changed after living in the neighbourhood	3	3
4.	Equity	The reference to space usage by a group of people with distinctive attributes	12	53
5.	Factors influencing major life choices	Anything affecting life choices, such as school selection, job, moving out, etc.	2	2
6.	Feelings	discussed or implied personal emotions	11	91
7.	Frequency of usage	Any reference to a time of usage (e.g., frequency, length, etc.)	9	30
8.	Identified places	Specific places brought up by the participants	12	130
9.	Mode of transportation	Choices and reasons behind the selected way of transportation	11	26
10.	Opinion on social behaviour	Personal opinion on exhibited social behaviour	8	34
11.	Personal traits and preferences	Any reference to personal traits brought up by the participants, particularly ones affecting behaviours and attitudes	10	46
12.	Physical Features	Reference to specific physical features in the built environment that cause a specific impact on the participant	12	192

13.	Problems	identified issues by the respondents that cause physical or emotional discomfort	10	86
14.	Significance of discussed theme	Direct expression or clues about the importance of the discussed theme to the participants	7	16
15.	Social network	Any reference to social acquaintances from within or nearby the neighbourhood	10	29
16.	Ways of Getting to know others	Ways to know the neighbours (either exercised or believed to have an impact)	9	34
17.	Ways to change attitudes and Perceptions	believes on how behaviour or attitude could change, or examples exhibiting or causing such change	7	22

Appendix k: Extracted Coding Occurrences - Coding Overlaps Between the Fixed POE Framework and the Open-End Coding Framework

Table k.1. Coding overlaps between the 'Housing Suitability' theme and the 'Physical features' Theme

Participant - 9 references coded [5.70% Coverage]
Each child needed his own room
My husband and I took the small room, we didn't take the master bedroom. So we had to add an extra space to use as a dressing room
We added a laundry room, a maid room, a store, a dressing room, a majlis.
we just removed a wall of the adjacent rooms and added it to ours. We added a bathroom and a wash area, we added an extra room, and we added a whole second floor similar to the first floor. We added a room in each floor, a total of 3 floors, a store and a laundry in the second floor, and we built an extra room on the garage, a large one, we are using it as a home theatre.
When you design your own house, you don't want it to look like everyone else's
I would change the kitchen, it's very small
I enlarged the bathrooms, they were very small, no on w could go inside.
the finishing was of a very low quality. I changed the entire kitchen
I changed all the units and cupboards.
Participant - 8 references coded [3.97% Coverage]
We had a large backyard, and we added that to the layout of the house.
Spaces. It was small on the inside.
a small living room on the ground floor. It's very small. And there is another small living room. That's it. It was too small. The rooms were small.
we expanded many things, not a little. We changed it entirely.
We added rooms.
The master bedroom is small. I gave it to my daughter because it has a bathroom
We made a large room for us [parents]. The kids' room was also so small, so we expanded that. My son's room too
It [house] was small.
Participant - 4 references coded [1.66% Coverage]
1 for domestic help, I added a room which wasn't there
another I used as a store
third one because the rooms small, they don't fit for a bed, side tables and closets, so I used 1 room as a dressing room.
those expansions I needed them because of the size of the rooms,
Participant - 1 reference coded [1.25% Coverage]
I built [flats] for the boys. I had to turn the yard into a garage; I had to build flats. I built my other son a flat on top
Participant - 2 references coded [1.05% Coverage]
I did, I built a part, and opened some spaces on each other, I added a room, a store and a maid's room.
But I always tell my wife, I'm happy that we have a house, and that its easy to clean it.
Participant - 2 references coded [0.48% Coverage]
it was so tiny (cynically).

We expanded a lot.
Participant - 1 reference coded [0.43% Coverage]
I can't keep them both in one room with a shared bathroom. I had to save up and expand for them and make a bathroom and a room for each of them.
Participant - 1 reference coded [0.43% Coverage]
The layout and spaces. The spaces in some areas were unreasonably small.
Participant - 1 reference coded [0.30% Coverage]
we built an extra room for my brother.
Participant - 1 reference coded [0.24% Coverage]
Not that, but you can't enjoy the backyard.

Participant - 7 references coded [2.96% Coverage]
mosque right across the street
There are other things as well that we need on a daily basis, the baker, grocery store, barber shop
we have the beach that is now Busaiteen beach
we have 2 schools, primary and intermediate
we have one near the healthcenter. For medical care, Muharraq healthcenter is also not far
King Hamad hospital which is very near.
pharmacies, bakers, grocery stores, even car services are available. There is the new gas station right behind the project
Participant - 8 references coded [1.76% Coverage]
shops open,
many mosques.
a baker
the coldstors, you could walk to
There is a greengrocer. More than one actually. There is a laundry and a pharmacy. Do you know the road with all the food trucks? In that road with all the shops, everything is available.
You know Alhasan mosque?
coldstores
commercial shops
Participant - 5 references coded [0.97% Coverage]
big coldstore nearby,
near by the food trucks by the beach.
I need to go to the old Busaiteen for that.
no baker, no coldstore
the one Near king Hamad hospital, near the municipality.
Participant - 1 reference coded [0.82% Coverage]
the mall is close by in Muharraq, not in Alsayah. And there is a hospital closeby. King [Hamad] hospital.
Participant - 3 references coded [0.66% Coverage]
I tell her that my house is next to the cold store and baker.
many shops and many things.
By the Hasan Almahmeed Mosque.
Participant - 4 references coded [0.58% Coverage]
Alhelli and Megamart
Megamart in Muharraq
Lulu Hypermarket in Hidd
Muharraq's Lulu
Participant - 1 reference coded [0.56% Coverage]
We need them to make a commercial road behind our house.
Participant - 3 references coded [0.40% Coverage]
Behind us is the market.
the baker, but
coldstores.

Participant - 1 reference coded [0.35% Coverage]
no coldstores, bakers, or laundry.
Participant - 2 references coded [0.31% Coverage]
Old Busaiteen
local baker, a coldstore, a barbershop, a laundry and so on. But a commercial mall this big,
Participant - 1 reference coded [0.18% Coverage]
the supermarket, the laundry.
Participant - 1 reference coded [0.15% Coverage]
Alhassan mosque.

Participant - 5 references coded [2.99% Coverage]
the projects unity
unified theme, practical roads, and parking, organized and sufficient. And the width of the street adds to the beauty of the neighbourhood.
The overall organization is one of the most important aesthetic elements in
The width of the streets gives you enough space Infront of your house so its not very close to the street.
The traditional architectural elements that give a Bahraini identity is one of the elements that add to the beauty of the neighbourhood.
Participant - 5 references coded [2.77% Coverage]
In terms of order, the place is organised
Behind us are normal villas, so to us, it's not like we're in the middle of the area.
It's not at the centre. In terms of aesthetic elements, such as spaces used: there are no agricultural areas yet, or beautiful elements. It's all houses and blocks. As for facades, no. I don't like it at all
We changed our house entirely by the way. We literally changed it. If you see it, you would never think it's a housing unit.
It's simple but elegant.
Participant - 8 references coded [2.36% Coverage]
Because our housing system in Al-Sayah is adjoined, you get a sense of old areal intimacy.
We feel this intimacy. Modern architecture conforms to the required specification in this time.
The type of bricks, architecture, cement, and so on. Paint too, because the government provided the houses, so they were all similar, so people made changes according to their taste after moving in
The area is comfortable residentially. It is quiet.
the road system is comfortable.
The density of adjoined houses makes for little noise unlike houses outside on main roads.
on the inside, it is different. There are no traffic lights or roundabouts. It feels like the old neighbourhoods of Muharraq, of Al-Fadhil neighbourhood.
I gave them all their privacy. Every one of them has their own room and bathroom.
Participant - 1 reference coded [2.05% Coverage]
The neighbourhood is narrow. The cars park perpendicularly. The cars' fronts face the door. This hinders movement in the street. It's already narrow to begin with. There's a difference between our neighbourhood in Alsayah and East Hidd. They gave them large spaces there.
Participant - 2 references coded [0.79% Coverage]
sand and dust.
our house is on the corner, and there is an empty land behind us.
Participant 12 - 3 references coded [0.65% Coverage]
shapes of the houses or the plants they're growing
some organized [houses], even their plants.
They changed the outside.
Participant - 2 references coded [0.64% Coverage]
they look ok, they are far from each other.
like some add a garage or a shade of a bad quality, the corrugated sheets.
Participant 10 - 1 reference coded [0.62% Coverage]

The plants are indeed beautiful. When we pass by, it makes the houses look nice.
Participant - 1 reference coded [0.37% Coverage]
the problem is everything looks a like.
Participant 9 - 1 reference coded [0.28% Coverage]
You mean like parks and such
Participant 11 - 1 reference coded [0.11% Coverage]
it's spacious.

Participant - 1 reference coded [2.17% Coverage]
If it's to your right, turn left, and look at how people are parked there. Just take a walk around and take a look. Maybe they have parking areas by the mosque, but I'm talking about here, my area, close to the [parliamentary] representative's house, there are no decent parking spaces.
Participant - 7 references coded [2.16% Coverage]
the width of the street allows enough sunlight
buildings don't block sunlight.
park stayed as an empty sandy plot. After a while it was paved and transformed to car parking
(front yard) of the house are not enough to use for plantation
People sometimes put pots for plantation outside their houses,
the wide streets,
The food trucks near the beach,
Participant - 5 references coded [1.99% Coverage]
I myself planted trees, palm trees, Indian Almond, and such things.
I changed the colour of the house. And for the front of the house, I used what is called "semigraphic lighting", the science of semigraphic lighting changes décor through lighting. It gives movement. The colour changes from sunset until night-time.
there are things you can do to the décor that would give you a different feeling
I used stones, lighting from different angles, spotlights on the plants and trees. It spreads the greenery and stuff like that.
You see the area, the angle and the things they made outside their house. The shape of their house is delightful. You feel like there are touches.
Participant - 4 references coded [1.76% Coverage]
they would just buy plants for their own houses, irrigate them, a small garden outside the house,
palm trees
you see houses with 5 or 6 cars parked outside so its getting a bit crowded.
there are enough spaces between the houses, the street is wide and nice, the houses are so close to the ones across the street, that's good.
Participant - 3 references coded [1.17% Coverage]
Everybody is growing plants by their houses, even if it's just a pot. Even by the windows. They'd put pots up
I have my garden inside.
Even palm trees. My neighbour grows palm trees inside and outside the house.
Participant - 2 references coded [0.70% Coverage]
Our neighbours have plants. They dirty us.
We grow plants in our yard.
Participant - 1 reference coded [0.57% Coverage]
Not as a large area, everyone has some plants in his house.
Participant - 2 references coded [0.33% Coverage]
the plants by their houses.
agricultural or natural areas.
Participant - 1 reference coded [0.11% Coverage]
palm trees

Participant - 3 references coded [3.42% Coverage]
You open the door, and the house is right there, there is no space like us. For us we have 7 to 8 m infront of the house, and 4 to 5 m behind it. we have added a kitchen there, added a room,
But I always tell my wife, I'm happy that we have a house, and that its easy to clean it.
It actually gives you privacy and spaciousness. Its not like if you open the door of your house and immediately see your neighbour. Not that there is a problem with that, but its nice to have this space infront of the house. Men have a chance to get in touch with their neighbours, and women have a change to visit their neighbours too, so its nice.
Participant - 5 references coded [0.91% Coverage]
facilities and the strategic location
easy accessibility to the main roads
proximity to the capital
other services
proximity to my father's house.
Participant - 4 references coded [1.91% Coverage]
Well, If I found a bigger house, then why not?
Right. I desire many things. For instance, we moved in during winter. You desire a winter setup: a winter sitting area.
tell my husband to close the space and put a door so we can use it during summer and winter, so we can enjoy it
I did build a bathroom on the roof, just in case we got a housekeeper.
Participant - 2 references coded [1.74% Coverage]
Houses by the sea, and they are spacious. They're luxurious. Take a look at Alnaseem project.
that's different. There, you open the balcony to the sea. It's very different.
Participant - 4 references coded [0.98% Coverage]
Such local areas have a high population density and houses are close to each other
they would get a bigger house and leave the area
give me a yard and a garden, where I can water the plants a little and drink a cup of tea in the yard and place a small table and a chair.
My wife likes gardening. She likes flowers and pots and so on.
Participant - 1 reference coded [0.41% Coverage]
the yard isn't affecting my decision, I want larger indoor spaces.

Table k.6. Coding overlaps between the 'Social Contact' the and the 'Ways of Getting to Know Others' theme

Participant - 4 references coded [3.30% Coverage]
It was because we all received our units around the same time. For example, when we first moved in, one of the neighbours took the initiative and sent us food. She was getting to know us. Then they made a Whatsapp group, and because Bahrain is quite small, it turned out they all somewhat knew each other.
They didn't get to know each other at a certain place. Those were personal initiatives.
They'd be like "Hey, did you know that this person was given a housing unit in Alsayah", "Oh, really", and then they'd communicate and form a group.
Both. visits and calls all the time.
Participant - 2 references coded [1.56% Coverage]
we don't even have a cold store here (participant laughing), so we can't just run into someone nearby.
But we all know each other, we are all from around, I'm from Alhid and another is from Muharraq or Alhalla, we are all Bahrainis. Especially in our neighbourhoos, we are all Bahrainis.
Participant - 3 references coded [1.36% Coverage]
We used to be neighbours in the old neighbourhoods of Alhalah
We also communicate using Whatsapp
they'd meet personally. For instance, they had classes at the mosque where women would meet
Participant - 2 references coded [1.25% Coverage]
I only know the next-door neighbour from when we were renovating our house. We just asked her if she was fine with the construction work out of courtesy,
Last year, I met another mom in my son's school
Participant - 2 references coded [1.11% Coverage]
From the neighbourhood.
There is a sitting area made by my neighbour in front of me. He made a sort of garden.
Participant - 2 references coded [1.10% Coverage]
No. Someone who was with me in Alhalah. She lived here before me. So, she told them about me, and when I moved in, they kindly visited me.
We'd sometimes meet in our cars and we'd honk at each other.
Participant - 4 references coded [0.88% Coverage]
People stay outside until 3 or 2 am, some buying things from the cold store.
I would find 4 or 5 people and we would walk together to the mosque.
We have the mosque group and normal [in-person] communication.
if something happens, we contact each other. We remain in touch about the latest updates.
Participant - 1 reference coded [0.31% Coverage]
they're just our neighbours.
Participant - 1 reference coded [0.29% Coverage]
We visited them and got to know them.

Participant - 3 references coded [3.19% Coverage]
Just the sewage, their drainage is not convenient, you shouldn't bring trucks to empty the septic tanks, it's a new neighbourhood it should have had a sewage system and not tanks that get emptied by trucks. I don't know why the engineers did this, how long would you keep such an old system! You know and we have an issue that the area is slightly sloped, so if some one cleans his car all the water comes down and accumulates here.
it would have been good to have access to the roof.
There is no staircase that takes you up. There is just an opening that you pull down to access the roof.
Participant - 3 references coded [2.71% Coverage]
When we were building our house, if our neighbours were cleaning with water, it'd reach my house and get mixed with the mud and dirt. It got messy.
The problem with the new Alsayah is that there is no sewage system, so water gathers.
No, it's more than one house. It depends on the ground. The water would reach us, and it [ground] was sloped so it would reach all the way to the mosque. It doesn't reach my neighbour or his neighbour. It's based on the ground's slope. It reaches my house.
Participant - 2 references coded [2.23% Coverage]
the market, we have been requesting one for 10 years but they're just building it
The houses that are directly adjacent to it might be [bothered], but the area needs it. The plot has been empty for years and we needed it.
Participant - 2 references coded [2.07% Coverage]
Harmony is non-existent here.
For example, if they hold a wedding ceremony, and there's a neighbour who wants to look tough. That happened a few times where my neighbours played music in a party loudly, and my neighbour across the road complained and called the police.
Participant - 1 reference coded [1.60% Coverage]
the street here is a little sloped, so water accumulates down. But no one did anything about it. Some residents petitioned for something but I don't see any impact.
Participant - 2 references coded [1.41% Coverage]
with the Corona situation, people are not that close. They don't chat as often. It feels secluded. The area seems a little quiet.
People didn't have time to get to know each other.
Participant - 1 reference coded [1.37% Coverage]
I said to my husband at first that I didn't want to [stay]. The first couple of months, I didn't want the house because of the park. Our house is opposite the park and we're very bothered.
Participant - 1 reference coded [0.03% Coverage]
parking,

Participant - 3 references coded [3.50% Coverage]
Well, the place is sort of commercial: you need to rent everything. I'd rather take my kids to other places for football or such. I take them to other places.
And about their fees: they made it [centre] for the area, they should have made the fee small, but they're exploiting people. Even if I can take my children to other places, others can't. They should be able to bring them here [centre] if it was made for the area. It should have a small fee.
Participant - 2 references coded [1.60% Coverage]
this one is different because they put monthly registration fees. The fees made not everyone use the place, and those who use it
I can't say that, they are quite high, its like the fees of private gyms so no it's a bit high. But this helped to maintain
Participant - 2 references coded [1.26% Coverage]
They really like it. It's for boys and girls and the youth. It's nice.
Yes. Between 6 am to 6 pm, it's for girls, and 6 pm to 5 am it's for boys. It's got a gym, a
Participant - 1 reference coded [1.23% Coverage]
No. The older ones might go to the gym, but as for the younger ones, if the older ones want to take them, it's okay.
Participant - 2 references coded [1.20% Coverage]
It's small. No, she's not comfortable there. We even tell her to go for a change of scenery, but she says it's small with limited equipment. I mean for women.
Yes, yes, poor them, they're wronged (chuckles).
Participant - 1 reference coded [0.64% Coverage]
We can say those aged between 20.. Older than kids. There is nothing for kids. Starting from when they begin
Participant - 1 reference coded [0.52% Coverage]
Its just the park for kids, but for us there isn't really anything. And now with Corona there

Appendix l: Extracted Coding Occurrences - Coding Overlaps Across the Themes of the Open-End Coding Framework

Table l. 1. Coding overlaps between the 'Physical Features' theme and the 'Feelings' theme

Participant - 14 references coded [4.85% Coverage]
Because our housing system in Al-Sayah is adjoined, you get a sense of old areal intimacy.
We feel this intimacy. Modern architecture conforms to the required specification in this time
The area is comfortable residentially. It is quiet.
the road system is comfortable.
The density of adjoined houses makes for little noise unlike houses outside on main roads.
on the inside, it is different. There are no traffic lights or roundabouts. It feels like the old neighbourhoods of Muharraq, of Al-Fadhil neighbourhood.
I gave them all their privacy. Every one of them has their own room and bathroom.
I changed the colour of the house. And for the front of the house, I used what is called "semigraphic lighting", the science of semigraphic lighting changes décor through lighting. It gives movement.
there are things you can do to the décor that would give you a different feeling
You see the area, the angle and the things they made outside their house. The shape of their house is delightful. You feel like there are touches.
modern civil life is invading ours. I look at Bin Hindi neighbourhood and such old neighbourhoods that I was raised in. Yes, I did come to a pretty and clean area but I long for those moments. I don't like us being invaded by modernity in such a way. It is huge, extremely huge.
Such local areas have a high population density and houses are close to each other
It makes an area nice. Sitting in a corner in the fireej. Chatting, and so on.
You feel like they are not cosy. They don't experience the tenderness and love of neighbourhoods because they have always lived in buildings, high urban storeys and whatnot.
Participant - 4 references coded [3.17% Coverage]
you see houses with 5 or 6 cars parked outside so its getting a bit crowded.
For us we have 7 to 8 m infront of the house, and 4 to 5 m behind it.
But I always tell my wife, I'm happy that we have a house, and that its easy to clean it.
It actually gives you privacy and spaciousness. Its not like if you open the door of your house and immediately see your neighbour. Not that there is a problem with that, but its nice to have this space infront of the house. Men have a chance to get in touch with their neighbours, and women have a change to visit their neighbours too, so its nice
Participant - 4 references coded [2.88% Coverage]
We changed our house entirely by the way. We literally changed it. If you see it, you would never think it's a housing unit.
But you get the feeling that our area is stable. You know your way. It's easy to reach, enter and exit. It's even easy to distinguish neighbourhoods. Each one has its impression in terms of entering each area: the one by the mosque; the one by the cold store.
The facilities there are also not ready. Maybe that's why.
(Laughs) I don't know. I didn't like it. I'm not used to it.
Participant - 3 references coded [1.71% Coverage]

You can't live in the houses of Galali if there is someone behind you because you feel surrounded from all areas. It feels suffocating.
Not that, but you can't enjoy the backyard.
You're surrounded by houses. You can't enjoy it. So I found a house with nothing behind it. Just a road. The size of the plot was big.
Participant - 2 references coded [1.65% Coverage]
I used the same elements for the facades in the house extension and this made me feel like I belong to this neighbourhood and to this house
Ones want a bigger house, better location, more rooms, more facilities, a bigger yard with plantation space, possibly a pool,
Participant - 3 references coded [1.36% Coverage]
When it's dusty, the yard feels like you're in the desert.
You give me this miniscule house [sarcastic term used] and expect me to live in it? You don't want me to expand it?
Yes.
Participant - 3 references coded [0.81% Coverage]
smaller house is more cozy, more homey.
A big house can be chaotic
in a small house you always feel like your family is close to you
Participant - 1 reference coded [0.46% Coverage]
Because if someone is new, they'd get confused
Participant - 1 reference coded [0.36% Coverage]
Every neighbourhood with a park is uncomfortable.

Participant - 7 references coded [6.10% Coverage]
The cars' fronts face the door. This hinders movement in the street.
If it's to your right, turn left, and look at how people are parked there. Just take a walk around and take a look. Maybe they have parking areas by the mosque, but I'm talking about here, my area, close to the [parliamentary] representative's house, there are no decent parking spaces.
When it's dusty, the yard feels like you're in the desert.
Yes, and it's full of dust. We have to wait 10 or 15 years until they build the [surrounding area]. This is what's bothering the neighbourhood the most.
You can't close that. What if I want to turn it into a sitting area for visitors?
And you can't build on top of the garage
You give me this miniscule house [sarcastic term used] and expect me to live in it? You don't want me to expand it?
Participant - 4 references coded [1.83% Coverage]
you see houses with 5 or 6 cars parked outside so its getting a bit crowded.
the area is slightly sloped, so if some one cleans his car all the water comes down and accumulates here.
it would have been good to have access to the roof.
There is no staircase that takes you up. There is just an opening that you pull down to access the roof.
Participant - 1 reference coded [1.32% Coverage]
in summer it gets really hot. When there is sun without trees to provide shade, no, it gets very hot. If you touch the ground at 8 or 9 pm, the ground feels hot. If there was an agricultural extension or grass in the empty open areas, if they put grass, it would make it a little cooler. Not cooler per se, but, I mean, it is not all rocks that store heat since sunrise until noon or the afternoon. The sun blats the ground, and the ground is hot.
Participant - 2 references coded [1.03% Coverage]
Every neighbourhood with a park is uncomfortable.
We're very bothered by them. If they turn them into parking spaces, it would be much better.
Participant - 1 reference coded [0.89% Coverage]
The houses that are directly adjacent to it might be [bothered], but the area needs it.
Participant - 1 reference coded [0.65% Coverage]
our house is on the corner, and there is an empty land behind us.
Participant - 1 reference coded [0.44% Coverage]
But we want to grow in the soil but there is no chance.
Participant - 2 references coded [0.32% Coverage]
It depends on the ground.
It's based on the ground's slope.
Participant - 1 reference coded [0.28% Coverage]
The spaces in some areas were unreasonably small.

Table I.3. Coding overlaps between the 'Identified Places' theme and the 'Activities' theme

Participant - 3 references coded [1.10% Coverage]
Abdulrahman Almahmeed mosque
be it around the area, or near Alhasan. They even walk by the school.
even near food trucks' road, not even the walkway inside. They walk there by the food trucks. Many do.
Participant - 2 references coded [0.41% Coverage]
use the health club, and my kids use the football fields,
the pool
Participant - 1 reference coded [0.14% Coverage]
a new walkway
Participant - 1 reference coded [0.12% Coverage]
they go to the club
Participant - 1 reference coded [0.10% Coverage]
just the mousque.
Participant - 1 reference coded [0.07% Coverage]
Alsayah sea
Participant - 1 reference coded [0.06% Coverage]
I really love the sea
Participant - 1 reference coded [0.06% Coverage]
parks

Appendix m: Full List of Physical Features and Feelings Identified by Respondents

Table m.1. The Identified physical features defined by each participant, along with the feelings they associated with them

Participant	Mentioned physical feature	Associated feeling
1	1. Consistency of façade treatment	Belonging
	2. Larger indoor and outdoor spaces (specifically: Larger indoor spaces, a larger yard, having plants in the yard)	Accomplishment
2	3. Small size house	Cosy - Homey
	4. Big size house	Chaotic
	5. Small size house	Connection with Family members
3	6. Dense parking	Crowded
	7. Wide sidewalks	Comfort – Residential satisfaction
	8. Manageable house size	Happiness - Residential satisfaction
	9. Space in front of the house	Privacy - Comfort – Social Connection
5	10. Slightly dense housing	Intimacy - Belonging
	11. Traditional architectural style	Intimacy
	12. Quietness	Comfort
	13. Connection to inner street network and distance from main streets	Comfort
	14. Dense housing with connection to inner streets and limited connection to main streets	Quietness
	15. Dense connected inner street network (similarity with traditional neighbourhood layout in Bahrain)	Familiarity
	16. A room with private bathroom for each family member	Privacy - Residential Satisfaction
	17. Outdoor house lighting	Joy
	18. Changing facades treatment by house owner	Individuality
	19. Distinctive physical features	Happiness
	20. Huge facilities within the neighbourhood (Large scale developments)	Stress - Discomfort
	21. Dense housing	Social connection - Belonging
	22. Dense housing with Wide sidewalks	Social connection
	23. Highrise building	Lack of cosines - Lack of connection with neighbours
6	24. Distinctive features in the house (unlike surrounding ones)	Pride
	25. Street connectivity	Belonging
	26. Provision of facilities (worship, services)	Recognition
	27. Provision of facilities	Familiarity - belonging
	28. Unfamiliar elements (little time spent in place)	Dislike
7	29. Dust (because of building near empty plots).	Discomfort

	30. Small house size	Resentment - Dissatisfaction
	31. Luxurious housing unit	Happiness
8	32. Unfamiliarity	Confusion
11	33. Parks	Discomfort
	34. Dense Housing without wide sidewalks	Stress
12	35. Housing Density	Discomfort
	36. Dense Housing without wide sidewalks	Lack of joy

Appendix n: Overlapping Themes Between the Three Analytical Frameworks

Table n.1. Mapping themes that contribute to creating a specific impact: overlapping the findings based on LEED-ND framework, fixed POE analytical framework, and open-end coding framework

	Searched Keywords for impacts (to be achieved or avoided)	Impact in the case study (significance and nature) Case study LEED ND	Relevant indicators based on the case study		Relevant indicators based on LEED-ND
			Based on fixed analytical framework	Based on open end coding framework	
Positive emotions	Safety	Important, considered positive	• Adaptability • Identity, belonging and pride • Psychological wellbeing • Walkability and accessibility	• Equity • Feelings • Identified places. • Opinion on social behaviour. • Personal preferences. • Physical Features. • Problems. • Social network. • Ways of getting to know others.	• Walkable Streets • Tree-Lined and Shaded Streetscapes
	comfort	Important, considered positive	• Adaptability • Aesthetics • Community facilities • Connection to nature • Housing suitability • Identity, belonging and pride • Psychological wellbeing • Social contact • Support and influence • Walkability and accessibility	• Equity • Feelings • Identified places • Opinion on social behaviour • Personal traits and preferences • Physical features • problems	• Walkable Streets
	Beauty		• Aesthetics • Connection to Nature • Housing suitability • Identity, belonging and pride • Social contact • Support and influence	• Equity • Feelings • Identified places. • Opinions on social behaviour • Personal traits and preferences • Problems • Social network • Ways of getting to know others	• Walkable Streets
	Liveability		NO RESULTS FOUND	NO RESULTS FOUND	• Compact Development

		• Community facilities • Connection to nature • Psychological wellbeing • Recreation • Walkability and accessibility • Community facilities • Identity, belonging and pride	• Activities • Equity • Feelings • Frequency of usage • Identified places • Mode of transportation • Opinion on social behaviour • Personal traits and preferences • Problems • Ways to change attitudes and perceptions	• Bicycle Facilities • Walkable Streets • Compact Development • Connected and Open Community • Access to Civic & Public Space • Access to Recreation Facilities • Neighborhood Schools
	Activity	• Community facilities • Recreation • Social contact • Walkability and accessibility	• Activities • Equity • Feelings • Frequency of usage • Identified places • Opinion on social behaviour • Problems • Ways of getting to know others	• Bicycle Facilities • Walkable Streets • Connected and Open Community • Access to Recreation Facilities
Active lifestyles	Distance	• Adaptability • Community facilities • Connection to nature • Psychological wellbeing • Recreation • Social contact • Walkability and accessibility	• Equity • Feelings • Frequency of usage • Identified places • Mode of transportation • Opinion on social behaviour • Personal traits and preferences • Physical features • Problems • Ways to change attitudes and perceptions	• Compact Development • Mixed-Use Neighborhoods • Access to Civic & Public Space • Access to Recreation Facilities
	Transportation	• Adaptability • Community facilities • Connection to nature • Recreation • Walkability and accessibility • Support and influence	• Activities • Equity • Feelings • Frequency of usage • Identified places • Mode of transportation • Personal traits and preferences • Physical features • Problems • Ways to change attitudes and perceptions	• Compact Development • Mixed-Use Neighborhoods
	Access	• Adaptability • Aesthetics • Community facilities • Connection to nature	• Activities • Equity • Feelings • Frequency of ysage • Identified places	• Mixed-Use Neighborhoods

		• Identity, belonging and pride • Psychological wellbeing • Recreation • Social contact • Walkability and accessibility	• Mode of transportation • Opinion on social behaviour • Personal traits and preferences • Physical features • Problems • Significance of the discussed theme • Social network • Ways of getting to know others • Ways to change attitudes and perceptions	
	Cycling	• Adaptability • Recreation • Walkability and accessibility	• Activities • Feelings • Frequency of usage • Identified places • Mode of transportation • Physical features	• Mixed-Use Neighborhoods • Mixed-Use Neighborhoods • Tree-Lined and Shaded Streetscapes • Neighborhood Schools
	Walking	• Community facilities • Connection to nature • Identity, belonging and pride • Recreation • Social contact • Walkability and accessibility • Psychological wellbeing	• Activities • Equity • Feelings • Frequency of usage • Identified places • Mode of transportation • Opinion on social behaviour • Personal traits and preferences • Physical features • Problems • Social network • Ways of getting to know others • Ways to change attitudes and perceptions	• Walkable Streets • Compact Development • Mixed-Use Neighborhoods • Tree-Lined and Shaded Streetscapes • Neighborhood Schools
	Speeding	NO RESULTS FOUND	NO RESULTS FOUND	• Tree-Lined and Shaded Streetscapes
Connection	Connectivity	• Aesthetics • Identity, belonging and pride • Psychological wellbeing • Social contact • Walkability and accessibility	• Activities • Equity • Feelings • Frequency of usage • Identified places • Physical features	• Connected and Open Community
	Community	• Aesthetics • Social contact • Support and influence	• Activities • Feelings • Frequency of usage • Identified places • Physical features	• Connected and Open Community

		• Social network	
Engagement	• Adaptability • Aesthetics • Housing suitability • Identity, belonging and pride • Social contact • Support and influence	• Activity • Awareness • Equity • Feelings • Identified places • Opinion on social behaviour • Personal traits and preferences • Physical features • Problems • Significance of the discussed theme • Social networks • Ways of getting to know others	• Housing Types and Affordability • Neighborhood Schools
Participation	• Community facilities • Housing suitability • Support and influence	• Awareness • Changed perceptions and attitudes • Equity • Feelings • Identified places • Opinions on social behaviours • Personal traits and preferences • Physical features • Problems • Social network • Ways to change attitudes and perceptions •	• Access to Civic & Public Space • Access to Recreation Facilities
Interaction	• Aesthetics • Psychological wellbeing • Social contact • Support and influence • Walkability and accessibility	• Activities • Feelings • Frequency of usage • Identified places • Opinion on social behaviour • Personal traits and preferences • Physical features • Significance of the discussed theme • Ways of getting to know others. • Ways to change attitudes and perceptions	• Neighborhood Schools
Social	• Aesthetics • Identify, belonging and pride • Psychological wellbeing • Social contact • Support and influence • Walkability and accessibility	• Activities • Equity • Feelings • Frequency of use • Identified places. • Mode of transportation • Opinion on social behavior • Personal traits and preferences	• Access to Recreation Facilities

			• Physical features • Problems • Significance of the discussed theme • Social network • Ways of getting to know others • Ways to change attitudes and perceptions	
Equity	Age	• Community facilities • Recreation • Walkability and accessibility	• Activity • Equity • Frequency of usage • Identified places. • Opinion on social behaviour	• Housing Types and Affordability • Visitability and Universal Design
	Economic	• Aesthetics • Housing suitability	• Equity • Physical features • Social network	• Housing Types and Affordability
	Household	• Housing suitability • Support and influence • Adaptability	• Equity • Opinion on social behaviour • problems	• Housing Types and Affordability
	Ability	NO RESULTS FOUND	NO RESULTS FOUND	• Visitability and Universal Design
Flexibility and freedom	Responsive	• Participants believed that the neighbourhood would have been more responsive to their needs if they were consulted in the planning and design stage	• Participants believed that the neighbourhood would have been more responsive to their needs if they were consulted in the planning and design stage	• Community Outreach and Involvement

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