

The Triad of Social Sustainability

Defining and Measuring Social Sustainability of Urban Neighbourhoods

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Abstract

Despite recent advances in social sustainability discourse, there is a dearth of working definitions and evaluation frameworks regarding measuring social sustainability of neighbourhoods for research, practice, and policy purposes. Building on the qualitative meta-analysis of relevant resources, this paper proposes the triad of social sustainability consisting of three pillars of neighbourhood, neighbouring, and neighbours, as a conceptual framework for understanding and measuring social sustainability of neighbourhoods. It introduces relevant indicators for each pillar, suggests advanced techniques for measuring them, and incorporates them into an integrated framework. At the end, significant research and policy implications of the proposed framework are discussed.

Keywords: social sustainability, urban neighbourhoods, evaluation framework, triad of social sustainability, neighbourhood enhancement index

1. Introduction

Social aspects of sustainability, referred to as social sustainability, remains one of the integral components of sustainable development discourse (Shirazi and Keivani 2017), but presents itself as the least developed dimension (Ročak, Hospers, and Reverda 2016; Yoo and Lee 2016; Woodcraft 2012; Boström 2012; Dillard, Dujon, and King 2009). Studies also show that most of the existing sustainability assessment tools developed to measure the success of sustainable development goals only partially cover the social dimension of sustainable development and are largely characterized by the dominance of environmental aspects of sustainability (Sharifi and Murayama 2014; Sharifi and Murayama 2013). The lack of sufficient research and scholastic investigation about social sustainability of the built environment, we would argue, is observable in two interrelated areas: conceptualisation and definitional concerns, and operationalisation and measurement concerns. On the one hand, due to lack of clear and comprehensive conceptualisation, social sustainability has been referred to as a ‘concept in chaos’ (Vallance, Perkins, and Dixon 2011, 342), ‘fragmented’ (Weingaertner and Moberg 2014), and ‘under-theorized or often oversimplified’ (Colantonio 2009). On the other hand, the conceptual opacity and ambiguity leads to crucial challenges in operationalisation as it would take its core themes and arguments from concepts. The question is, how essential qualities of social sustainability could be measured in a given context, from the local to the regional scale.

Here it is pertinent to note that social sustainability has a multiscalar character and its integration into urban policies and planning schemes starts from micro to macro scale, e.g. from a community to the region and beyond (Shirazi and Keivani 2017). This multiscale character has two significant implications. First, there is no scalar significance in the sense that the micro scale is as important for achieving a sustainable society as the macro scale. Second, attempts for conceptualisation and operationalisation, as noted above, should take into consideration the specificities of the given context and territorial scale. Since socio-spatial indications of different territories, and the nature and relevance of indicators change moving from micro to macro scales, any simple and unthoughtful upscaling and downscaling should be avoided (Woodcraft 2012). Considering these two implications, in this paper we focus on the micro scale of neighbourhood.

This focus is in line with the growing significance of urban neighbourhoods in different areas of urban planning and design (Bradley 2017; Pagano 2015; Davoudi and Madanipour 2015; Forrest 2008; Whitehead 2003), which introduces social sustainability of urban neighbourhoods as an area of concern for both researchers and policy makers (Bacon, Cochrane, and Woodcraft 2012; N. Dempsey, Brown, and Bramley 2012; Dempsey et al. 2011; Jenks and Jones 2010). A number of arguments underpins the significance of conceptualising and operationalising 'neighbourhood social sustainability'. 1) Neighbourhood is a practical scale for urban authorities to address social problems and challenges, as local authorities are directly concerned with the neighbourhood scale (Pagano 2015; Durose and Lowndes 2010). 2) There are a large number of neighbourhood-oriented initiatives and programmes which have direct societal implications and objectives, such as urban renewal programmes, slum upgrading schemes, and re-development projects. Social sustainability could provide a theoretical and empirical framework for evaluating and measuring social achievements of these programmes (Bailey and Pill 2011; Lawless et al. 2010; Atkinson and Kintrea 2000). 3) New housing developments exploit the sustainability rhetoric to market their products as sustainable communities or neighbourhoods. Social sustainability discourse can provide a safe departure point for urban planners, developers, and decision makers to address social aspects of the new developments, and monitor them over time (Lafferty 2014; Lees 2014; Brownill and Carpenter 2009). 4) Already existing urban neighbourhoods are the actual sites where social urban qualities such as social interaction, collective activities, and public engagement, are practiced by the inhabitants on a daily basis. Social sustainability could offer a framework to evaluate social aspects of the neighbourhood, identify challenges and problems, and plan for the future improvements (Walton, Murray, and Thomas 2008; Kennett and Forrest 2006). 5) Neighborhood Sustainability Assessment (NSA) tools, as the latest generation of impact assessment tools, evaluate and rate the performance and success of neighborhood redevelopment plans against a set of criteria and themes in approaching sustainability goals. Although a number of NSA tools are available, such as LEED-ND, EarthCraft Communities (ECC), BREEAM Communities, and CASBEE-UD, Sharifi and Murayama's critical analysis of seven existing tools shows that overall the social criteria are overlooked and they fail to properly address social sustainability (Sharifi and Murayama 2013). It is also argued that the practice of NSA is to a large extent market-driven and characterized by the dominance of the environmental aspects of sustainability (Sharifi and Murayama 2014). Developing a framework for socially sustainable neighborhood can help existing NSA tools to revise their criteria in such a way that the social sustainability dimension is adequately addressed in the proposed assessment framework.

The main goal of the paper is to develop an integrative framework for measuring social sustainability of urban neighbourhoods. It draws on a critical reflection on the previous literature and research conducted regarding social sustainability in the built environment,

builds on their achievements and arguments, and advances the territorial focus of social sustainability debate in the built environment towards the local scale of urban neighbourhoods, and thus contributes to the discourse in terms of conceptualisation and operationalisation. To this end, this paper makes contribution to the twofold lacuna of social sustainability discourse: it first proposes a conceptual framework to understand dimensions of social sustainability in urban neighbourhoods. Secondly, it proposes a triad structure for measuring social sustainability of urban neighbourhoods. It introduces relevant indicators for each pillar, provides suggestions for measuring them, and incorporates them into an integrated framework. It then concludes with research and policy implications of the proposed framework for social sustainability discourse.¹

2. Methodology

To gain an in-depth understanding from the social sustainability landscape, we undertook a comprehensive literature analysis using qualitative meta-analysis method. It systematically reviews and collates different types of available sources in order to understand the state of the art, identify specific themes that appear constantly across studies, and explore how these themes should be addressed in future studies (Cooper 2016; Davis et al. 2014; Timulak 2009). This method has been intensively utilised in the urban planning discipline (Hughes 2015; Thomas and Bertolini 2014; Loulanski and Loulanski 2011; Ewing and Cervero 2010).

Overall 73 studies were identified and analysed using academic databases and the bibliographies of the published works. These studies were diverse in terms of type (ranging from theoretical conceptualisations to international case studies), scope (either concentrate on the subject or aim at discovering its relation to other aspects of the built environment such as urban layout, and housing), discipline (such as urban planning, urban management, urban studies, political science, and sociology), scales (from local to the regional), and sources (peer-reviewed articles to official documents). We did not set a time-limit for selecting resources. However, selected literature was from 1993 onwards as the idea of social sustainability emerged at the time the concept of sustainable development became mainstream during the late 1980s and early 1990s. The result was discovering key themes relevant for the proposed triad and identifying gaps and challenges. This paved the way for suggesting the most appropriate indicators for each component, and developing a set of measures for each indicator. The meta-analysis also identified a wide range of advanced qualitative and quantitative research methods, techniques, tools and software that have been used for measuring indicators. We adopted appropriate measurement methods taking into account their relevance, reliability, strength and success in similar type of research and surveys from different disciplines that were identified as part of the review.

3. A conceptual framework for socially sustainable neighbourhoods

An integrated framework for measuring social sustainability at the neighbourhood scale should be built on a conceptual framework which addresses key dimensions and appropriate elements of social sustainability at the neighbourhood scale. The meta-analysis we conducted reveals that despite conceptual ambiguity and diversity, social sustainability has been conceptualised around a number of key principles such as equity, democracy and social engagement, social inclusion and social mix, social interaction, sense of place, safety and security, and quality of the built environment and dwelling. It also indicates that conceptualisations of social sustainability simultaneously address physical and non-physical qualities of the built environment. For example, while human interaction (Yiftachel and Hedgcock 1993), equity

¹ This paper is developed from a larger project that has applied this framework and methodology to four case study neighbourhoods in London and Berlin.

(Murphy 2012; Sachs 1999), sense of community (McKenzie 2004), and social interaction (Nicola Dempsey et al. 2011; Bramley and Power 2009) are dominantly non-physical, subjective properties, concepts such as quality of life (Koning 2002), right infrastructure (Bacon, Cochrane, and Woodcraft 2012), internal and external housing conditions (Chiu 2004) and value of place (Opp 2016) have explicit material and objective dimensions. This suggests that social sustainability is a two-faceted concept: it is neither objective, nor subjective, but a combination of both. Although it has some physical implications and touches material aspects of the built environment, it is essentially an inter-subjective construct in the minds of the urbanites. In this sense, a socially sustainable environment is a place with a dialectical character. On the one hand, it is a locality where physical qualities and standards (hard infrastructure) are positively perceived, highly valued, and interactively utilised by the inhabitants through sustaining and enduring social practices (soft infrastructure). On the other hand, it is a place where substantial social qualities (soft infrastructure) are sustained, highly valued, and vividly exercised within an urban setting of high physical quality (hard infrastructure).

This dialectical character, comprising of hard and soft infrastructures, constitutes the very nature of social sustainability that enables us to frame a new conceptualisation. This implies that any framework for measuring social sustainability should be a combination of quantitative and qualitative methods to grasp an in-depth understanding from social sustainability landscape. In this sense, physical qualities of the built environment, or hard infrastructure, are the background factors upon which the foreground elements such as social ties, interaction, participation, sense of attachment, etc. (the network of soft infrastructure) are built and practiced.

For the purpose of this research, and building on the key principles and abovementioned arguments, we conceptualise social sustainability of neighbourhoods as a combination of two parallel but interconnected conceived and perceived qualities. The conceived aspect of social sustainability addresses the status quo of physical and configurational qualities of neighbourhoods in terms of availability and accessibility of urban services, building density, connectivity, building typology, and land use; what we referred to as 'hard infrastructure' or background structure. The perceived aspect, on the other hand, reflects the perception of the neighbourhood residents from the essential social qualities of neighbourhood including: equal accessibility, social interaction, participation, safety, and home and neighbourhood quality, what was referred to as 'soft infrastructure' or foreground network. In this sense, socially sustainable neighbourhoods are defined as neighbourhoods where both conceived and perceived qualities of the neighbourhood interact at a high standard level for a considerable period of time. The higher conceived and perceived qualities of the neighbourhood, the higher social sustainability of the neighbourhood. To put it another way, socially sustainable neighbourhoods are localities where conceived and perceived qualities are highly valued and interactively practiced by the inhabitants for a considerable period of time. An implication of this definition is that measuring social sustainability necessitates measuring both conceived and perceived qualities of the neighbourhood.

If social sustainability is an inter-subjective construct in the mind of urbanites, this underscores the significance of neighbourhood inhabitants in the form of individuals or families. This inter-subjectivity implies that individual and collective (family) status play a significant role in the way qualities of the built environment are perceived. Social sustainability, thus, is not an isolated entity, but rooted in, and an outcome of, the collective image of individuals and families. This underlines the third element of social sustainability besides perceived and conceived qualities: population profile.

4. The triad of social sustainability

Based on our discussion and the proposed conceptual framework, social sustainability of neighbourhoods has three integral pillars, that we refer to as ‘triad of social sustainability’: neighbourhood (conceived qualities, or hard infrastructure), neighbouring (perceived qualities, or soft infrastructure), and neighbours (neighbourhood residents, population profile) (Figure 1). This triad structure suggests that developing a framework for measuring social sustainability of neighbourhoods should encompass, and integrate, these three components. The next steps would be, first, identifying relevant and appropriate ‘indicators’ for each component (relevant for the neighbourhood scale), and then developing relevant and appropriate ‘measures’ for measuring each indicator.

Here: Figure 1: Triad of social sustainability of urban neighbourhoods, pillars and indicators

4.1. Neighbourhood: indicators and measures

The neighbourhood pillar of the social sustainability triad, in our definition, addresses physical aspects of the area in which residents reside, and thus is a matter of urban form. Drawing on the meta-analysis findings and taking into account the scale and scope of the research, we propose the six indicators of density, mixed land use, urban pattern and street network, building typology, quality of centre, and access to facilities for measuring the ‘neighbourhood’ pillar of social sustainability (see Figure 1). To quantify each indicator, we suggest a number of measures and explain how they can be measured.

Indicator 1: Density. Density is a quantitative indicator and refers to the concentration of individuals or physical structures within a specific territorial area. There is no standard measurement system for density, but a set of conventional and widely used measures (Grosvenor and O’Neill 2014). A main categorization for measuring density is people density and building density; while the latter is defined by the ratio of building structures to an area unit, the former addresses the number of people in a given area. Building density can be calculated by gross residential density (number of persons, households, or dwelling units per hectare of the total neighbourhood area), net residential density (number of persons, households, or dwelling units per hectare of the total area devoted to residential land use), floor area ratio (ratio of total built floor area to the total neighbourhood area), coverage (ratio of the area covered by buildings to the neighbourhood area), and household density (average number of persons per household), but to name only a few important ones. Studies have proved that density is significantly associated with different social dimensions such as urban equity (Dave 2010; Burton 2000; Williams, Burton, and Jenks 1996), social exchange (what Pahl-Weber refers to as social density, see: Pahl-Weber, 2007), sense of community (Nasar and Julian 1995), and social inclusion (Raman 2010), and hence potentially makes significant contribution to the social dimension of sustainability.

Indicator 2: Mixed land use. Mixed land use addresses the combination of different socio-economic functions in the same area, and could be defined as the ‘implementation of more functions in a determined place in a determined period of time’ (Priemus, 2001). It promotes close proximity of heterogeneous land uses to one another, makes local services needed for everyday life available within walking distance, and accommodates a wide range of income levels (Foord 2010; Rodenburg and Nijkamp 2004). Mixed land use has been proved to positively contribute to social aspects of communities, including enhancing well-being and feeling of security (Elkin, McLaren, and Hillman 1991), and halting racial segregation (Wheeler 2013). Mixed land use can be measured through a set of criteria such as: gross/net residential/non-residential area ratio, land use (size and number), mixed use buildings/plots (size and number), mixed use pattern (concentrated in the centre, concentrated in different

centres, dispersed, etc.), number and distribution of services (chemist, corner shop, supermarket, post office, bank, etc.), and density of services.

Indicator 3: Urban pattern. Urban pattern refers to the spatial arrangement and configuration of different urban elements including streets, blocks, and buildings (Dempsey et al., 2010). It shows the spatial layout of an area and the way built and non-built environment are juxtaposed and co-related. A key aspect of urban pattern is street network; it describes connectivity, integration, and permeability of space. Literature suggests that street layout has significant social implications and is associated with feeling of safety (Foster, Giles-Corti, and Knuiiman 2010b), neighbourhood crime (B. Hillier and Shu 2000), personal development, contentment and social integration (Sauter and Huettenmoser 2008). The following measures can be used for urban pattern and street networks: intersections density, street density, street length (max, min, mean, median), number of cul-de-sacs, block size (max, min, mean median), lot size (max, min, mean, median), number of public transportation stops and stations, length of pedestrian paths, and length of cycling paths. Space syntax analysis, developed by Bill Hillier and Julienne Hanson, can be employed to analyse urban space and investigate the configurational properties of urban structure by measuring the relationship between urban components (Bill Hillier 1996; Bill Hillier 2002; Bill Hillier and Hanson 1989).

Indicator 4: Building typology. Building typology can be described as ‘an abstract characterization of a set of buildings that have common formal characteristics’ (Scheer 2010, 27). Buildings can be categorised based on their type (e.g. detached, semi-detached, terraced, etc.), height (e.g. low-rise, high-rise), age (e.g. pre-war, post-war, etc.), function (e.g. residential, office, educational, etc.), architectural style (e.g. Victorian) or any other common characteristic. Studies show that building typology has significant effects on health, well-being, and social life of the inhabitants. For example, building height is shown to be correlated with personal relations and behaviour (Gifford 2007), fear of crime (Newman and Franck 1982), and mental health (Warr et al. 2007). Appold and Yuen (2007) find that there is inadequate neighbourly relations in high-rise public housing in Singapore so that only a minority have relationships with neighbors that go beyond the occasional chit chat. For measuring building typology, we can look at: floor area of houses (min, max, mean, median), built-up to plot area ratio for residential buildings (min, max, mean, median), house types percentage, and height of residential buildings percentage.

Indicator 5: Quality of centre. Quality of centre explores open and public spaces of neighbourhoods which serve as a socio-spatial ‘centre’ for the community. A small local green space, a spacious square, a religious building, or a community complex with surrounding mixed-use buildings can serve as focal points for the neighbourhood, accommodate a number of communal urban facilities, and be used as places for socialising and gathering. Studies indicate that the presence of open space in neighbourhoods is associated with better relationships among neighbours, decreased violence and increased overall satisfaction with one’s home (Karuppannan and Sivam 2011). Neighbourhoods with high quality communal centres have important effects on residents well-being (Francis et al. 2012). Quality of the centre investigates physical and non-physical qualities of the neighbourhood’s focal point, and covers a range of spatial qualities (e.g. land use, enclosure, aesthetics), environmental qualities (e.g. cleanliness, green space), social qualities (e.g. socialising pattern, collective activities), infrastructure (e.g. sufficient urban facilities, furniture, play grounds), and other basic qualities. The lack of such a centre within the neighbourhood space implies the loss of a communal focal point for inhabitants and diverting activities outside.

Indicator 6: Access to facilities. Access to facilities has two implications: availability of key amenities needed at the neighbourhood level, and physical accessibility of them for all the

members of the community. Accessibility also should cover disabled, elderly, and children. At the neighbourhood scale, accessibility should be evaluated on the basis of walkability of destination (Talen 2003). Spatial distribution of urban facilities and their accessibility is a determinant factor for social equity and urban justice (Tsou, Hung, and Chang 2005). Accessibility of amenities and their distance from the place of residence is a challenging topic. Some scholars have suggested minimum accessibility standards for local facilities with different density patterns (Barton, Grant, and Guise 2010), or developed neighbourhood spatial accessibility (NSA) indicators to inform urban policy issues, such as amenity provision and spatial equity (Hewko, Smoyer-Tomic, and Hodgson 2002). For assessing accessibility, we propose the following measures: spatial distribution of urban facilities such as small shops, supermarket, chemist, post office, etc.; walkability of urban facilities; median distance to urban facilities.

4.2. Neighbouring: indicators and measures

Generally speaking, neighbouring pillar comprises two sets of qualities: the relationship between neighbours, and the perception of neighbours from their social environment. The meta-analysis we conducted suggests that ‘neighbouring’ pillar of social sustainability has been developed around some key principles such as equity; democracy, participation, and civic society; social inclusion and mix; social networking and interaction; livelihood and sense of place; safety and security; human well-being and quality of life. It also reveals that related indicators have been proposed according to the goals and objectives of the study on the one hand, and the scale of inquiry on the other. Based on these findings, and taking into account research objectives and scale of the inquiry, we propose the following six indicators for measuring ‘neighbouring’ pillar of social sustainability: social networking and intersection, safety and security, sense of attachment, participation, quality of neighbourhood, and quality of home (see Figure 1). To quantify these indicators, we introduce a set of ‘measures’ for each indicator.

Indicator 1: Social interaction and networking. Social interaction refers to the social activities that neighbours engage in, and social networks which residents develop in their neighbourhood (Unger and Wandersman 1985). It addresses interaction between two or more individuals, and covers a range of non-verbal or verbal interrelationships such as eye contact, face-to-face chat, smiling, talking, winking, debating, and discussing (Argyle 2007). Social interaction may lead to strong social networks and better quality of life (Kavanaugh et al. 2005). Studies show that higher social networking and interaction encourages citizen participation and engagement (Mcclurg 2003) and is an integral part of social capital (Putnam 2000). New digital social networking tools have changed the urban interaction and networking landscape; scholars have extensively underlined both social advantages and disadvantages of modern socialising technology (Kraut, Brynin, and Kiesler 2006; Brignall and Van Valey 2005; Bargh and McKenna 2004; Katz and Rice 2002). The following measures, informed by the literature, are suggested for assessment: number of the neighbours known by name, frequency of meeting neighbours, number of friends in the neighbourhood, number of neighbours frequently visited, asking help from neighbours, and exchange of help and support with neighbours.

Indicator 2: Safety and security. Broadly speaking, feeling of safety can have external or internal sources, such as threats originated from an in-migration of ‘problem’ citizens, or threats rooted in the individuals and their anti-social behaviour (Raco 2007). Safety and security make places attractive for the people, invite others to move in, and encourage inhabitants to live for longer periods (Brounen, Cox, and Neuteboom 2012). Sense of safety is also related to the safe environment in terms of traffic and motor vehicles (Bennett et al.

2007), and in terms of the level of crime or fear of crime (Foster, Giles-Corti, and Knuiiman 2010a). For safety and security indicator, the following measures are proposed: feeling of safety in daytime, feeling of safety at night time (after dark), safety of open spaces such as parks, children's safety on the streets (secure traffic), safety of pavements and sidewalks, being victim of crime, and the presence of police at the neighbourhood.

Indicator 3: Sense of attachment and belonging. Sense of attachment can be studied from two perspectives: attachment to the physical aspects of the built environment, and attachment to the people and community members. While the latter indicates how we feel associated and connected to the community and community members because of the shared interests and inter-human linkages and bonds, the former points to the quality of space and our personal associations with elements of the built environment including memories and sensations. (Rogers and Sukolratanametee 2009; Mannarini et al. 2006). Scholars have shown that sense of attachment has significant social advantages: people who identify themselves with their 'place' are more likely to conserve it (Comstock et al. 2010), establish long-term local ties with neighbours (Mesch and Manor 1998), and enhance inhabitants' well-being (Kafetsios and Sideridis 2006). The following measures can be identified for sense of attachment: feeling of attachment to the neighbourhood, neighbourhood pride, feeling of being at home in the neighbourhood, missing the neighbourhood while away, desirability of neighbourhood, and desire to leave the neighbourhood.

Indicator 4: Participation. Participation in neighbourhood-related activities indicates how the residents feel themselves responsible for their neighbourhood and to what extent they are interested in getting involved in dealing with problems and future plans (Michels and De Graaf 2010). Community participation improves social capital and community vibrancy (Teernstra and Pinkster 2016; Putnam 2000). High numbers of active neighbourhood-related initiatives and NGOs can indicate the will of residents to contribute towards making their community a better place for life (Boonstra and Boelens 2011; Sorensen and Sagaris 2010). The level of participation could be quantified through following measures: knowing community-based organisations, membership and active involvement in community organisations, participation in religious activities at the neighbourhood, feeling of being involved by local authorities, level of response to consultation requests from local authorities, and being aware of neighbourhood news and problems.

Indicator 5: Quality of neighbourhood. Quality of neighbourhood indicates the degree of satisfaction of the residents with their immediate environment and depends on an assessment of various attributes of the environment that meet one's needs or goals. (Walton, Murray, and Thomas 2008; Parkes, Kearns, and Atkinson 2002). Physical quality of the environment, including maintenance, architectural character, landscaping, cleanness, and quietness essentially affects residents' perception of their neighbourhood (Lee et al. 2016). Higher quality of neighbourhood is associated with satisfaction of social features of neighbourhood (Sirgy and Cornwell 2002), feeling of security (Austin, Furr, and Spine 2002), and neighbourhood satisfaction (Lovejoy, Handy, and Mokhtarian 2010). For measuring quality of neighbourhood, the following measures can be identified: residents' perception of building/housing crowding; residents' perception of population crowding; and satisfaction of inhabitants from noise pollution, their neighbours, cleanliness of neighbourhood, lighting of the streets and other public places, maintenance of public spaces, reputation of neighbourhood, and traffic congestion.

Indicator 6: Quality of home. This indicator addresses the degree of residents' satisfaction with physical and non-physical characteristics of their home. It denotes the absence of complaints and a high degree of congruence between the actual and the desirable home

conditions (Dekker et al. 2011). It shows how residents perceive their immediate environment of home and have positive mental and psychological association to it (Barreira et al. 2016). Quality of home can be categorised into the quality of interior and immediate exterior. Quality of interior points to the perception of the inhabitants from the inner characteristics of the dwelling, such as size of rooms and spatial arrangement of rooms. Relationship of the home with its immediate exterior, for example sense of privacy, noise, and green space, also plays a significant role in perception of the inhabitants from their homes (Byun and Ha 2016). Studies indicate that home satisfaction is related to the residents' social status, environmental security, and neighbourly relations (Mohit, Ibrahim, and Rashid 2010; Berkoz, Turk, and Kellekci 2009). The following measures are suggested for quantifying quality of home: satisfaction of home residents with feeling of privacy, noise, room size, room number, and parking, and the desire to move out of the present home and the reason for it.

4.3. Neighbours: indicators and measures

The third pillar of social sustainability aims to map population profile of the neighbourhood inhabitants, both as individual and family, and gain an in-depth overview of the people who are settled down in the neighbourhood space. For this pillar of social sustainability, we suggest one major indicator of 'social mix' which indicates the state of relative neighbourhood diversity according to socioeconomic status (G. C. Galster and Friedrichs 2015), and refers to the mixture of individuals and families from different strata of society in terms of social status, wealth, ethnicity, race, age, gender, education, profession, etc. In this sense, social mixing is the individual and collective (family) profile of the inhabitants of a neighbourhood. Different measures could be considered to get knowledge about the residents' social mix including: age/gender distribution, ethnicity mix, length of residency, household size, household type, house ownership, household income, employment status, accommodation type and characteristics, and education status.

5. Towards an integrative framework for measuring social sustainability of urban neighbourhoods

In the previous section, we proposed a tripartite structure for social sustainability of neighbourhoods, consisting of the three pillars of neighbourhood, neighbouring, and neighbour, and introduced appropriate indicators and related measures. In this section, we will show how these pillars and indicators can be developed into an integrated framework in order to measure social sustainability of urban neighbourhoods.

Figure 2 depicts an overview of the framework. We propose a 5-stage process. The first phase is data collection for the three elements of social sustainability. The collected data are processed using appropriate tools in the second phase. A cross-pillar analysis links knowledge gained from each pillar to construct a big picture from social sustainability in the given context. In-depth interviews with different community members and local authorities provide us with more qualitative input to the key findings of the analysis to explore the rationale behind them. At the final stage, results of the analysis are incorporated into a Social Sustainability Enhancement Index (SSI) which contains practical recommendation in order to improve social sustainability of the neighbourhood. In the following, we elaborate on the four phases of the framework.

Here: Figure 2: Social Sustainability Evaluation Framework

For the first pillar of social sustainability, namely 'neighbourhood,' we proposed six indicators of density, mixed land use, urban pattern and connectivity, building typology, quality of centre, and access to facilities. These indicators, all together, provide a deep and

broad knowledge regarding diverse aspects of the neighbourhood as a spatial unit from single building to urban layout and street patterns. As Table 1 shows, each indicator is quantified through some specific measures, as explained before. Data is collected from available sources such as national census, local surveys, GIS maps, and Ordnance Survey Maps, completed by intensive fieldwork and on-site observation. Collected data are processed using relevant tools and software such as ArcMap, AutoCAD, and Depthmap. The outcome of data collection and data processing will be a number of quantitative figures, illustrations, or visual maps, which could be subject to both quantitative and qualitative explanations and interpretations. For example, the indicator of density is quantified as a number of figures, while part of ‘mixed land use’ and ‘building typology’ indicators will be visual illustrations and maps produced by ArcMap. For this purpose, data collected from site observation regarding the land use, building height, and building typologies can be added as new features into existing GIS maps. Running different inquiries will produce different maps which demonstrate mixed land use pattern, building height structure, and building typologies. Integration maps produced by Depthmap can be also overlapped with land use maps to identify possible spatial correlations between mixed use and integrity. At the end, we gain an in-depth overview of the essential spatial qualities of neighbourhood.

Here: Table 1: Measuring ‘neighbourhood’; indicators and measures

For the second pillar of social sustainability, ‘neighbouring’, we proposed six indicators of social networking and intersection, safety and security, sense of attachment, quality of neighbourhood and quality of home. As Table 2 shows, each indicator is quantified using a set of measures. Since, as elaborated earlier, ‘neighbouring’ addresses perception of neighbourhood residents of the abovementioned indicators, suggested measures are formulated as different questions incorporated into the body of a questionnaire to be distributed in the neighbourhood as a household survey. This questionnaire consists of seven distinct sections, each addressing one indicator and its related measures. Depending on the case studies, the most appropriate administration method should be used for the distribution and collection of questionnaires, such as drop and collect method, posting, electronic, etc. To achieve reliable outcomes, a large number of questionnaires must be distributed to have enough returns with acceptable representation of the statistical population for meaningful data processing.

Data collected from the household survey can be processed using appropriate statistical software such as SPSS. Preliminary analysis (descriptive analysis and correlation analysis) provides us with insights into the status and value of ‘neighbouring’ indicators. This will enable us to know, first of all, the value of each single measure, and then the overall value of each indicator. For example, a descriptive analysis of ‘social networking and interaction’ demonstrates how residents interact with their neighbours, how often they meet and chat, how many friends on average they have, to what extent they feel comfortable to exchange help, etc. More advanced analysis such as correlation analysis shows if there is significant correlation between different measures, such as length of neighbourhood stay and sense of attachment or active involvement in neighbourhood-related activities.

Results can be scored similarly subject to common-sense interpretations and comparisons, so that at the end each indicator gets a score between, for example, 1 and 5. This will provide a general image of the ‘neighbouring’ pillar, as it shows which indicators are high, medium, or weak. The scoring will be also useful for comparison purposes: comparing final scores between different case study neighbourhoods will show the ‘neighbouring’ value of different neighbourhoods.

Here: Table 2: Measuring ‘neighbouring’; indicators and measures

Data for the third pillar of ‘neighbour,’ which has one main indicator of ‘social mix’ and a number of measures, is collected from two different sources (Table 3). Firstly, data are extracted from the available sources such as census data and local surveys. This will provide a general and valuable overview of the neighbourhood population profile and its socio-economic profile. In many cases, available data need to be manipulated as the study area does not exactly correspond with the census boundaries (for example with Lower Layer Super Output Areas in the UK). Secondly, the introduced measures of social mix indicator are formulated as a set of questions to be integrated as the opening section into the abovementioned questionnaire and household survey. These two sets of information are complementary; while the available data gives an overview to the entire area, data collected from household survey provides more accurate information about the population profile of the residents living in the study area. The same processing method can be applied to ‘neighbour’ pillar as was applied to ‘neighbouring’.

Here: Table 3: Measuring ‘neighbour’; social profile indicators and measures

After processing collected data for each pillar we gain a deep and broad understanding from the three angels of social sustainability: the ‘neighbour’ pillar draws a clear picture of the inhabitants, ‘neighbourhood’ pillar describes conceived and physical qualities of the area, and ‘neighbouring’ explains how the socio-spatial environment is perceived by the inhabitants. To draw the big picture from social sustainability of urban neighbourhoods, a cross-pillar analysis (stage 3: see Figure 2) should be implemented which integrates outcomes derived from single-pillar analysis and prepares a holistic image of social sustainability. Some examples can help us to know how the cross-pillar analysis can be carried out, and how this analysis carries some practical implications. Imagine that a high percentage of inhabitants (participants in the household survey) indicate that they don’t know any community-based organisation within their neighbourhoods. Data collected from the mixed use indicator of the neighbourhood pillar can show the number and distribution pattern of community-based organisations. If our inquiry confirms the lack of this facility, then this clearly indicates the need for establishing such activities. However, if it shows that there are a good number of such facilities, this implies that more awareness raising activities are needed to bring these activities into the attention of the inhabitants.

Although cross-pillar analysis helps us to draw the big picture regarding social sustainability of urban neighbourhoods, more qualitative inputs can help us to explore and explain the rationale behind the results driven from cross-pillar analysis. To achieve this, in the fourth stage in-depth semi-structured qualitative interviews are carried out to unravel the underlying logic of the quantitative results and understand the life-world experience of the neighbourhood inhabitants (Brinkmann and Kvale 2015; Brinkmann 2013). To gain a holistic and more reliable image, interviewees should be a mixture of inhabitants of different age, ethnicity, and gender (preferably those participated in the household survey), community activists, and local authorities. For each neighbourhood questions should be formulated in a way that address the key findings of the household survey.

The practical implications derived from the cross-pillar analysis and informed by interviews pave the way for developing a ‘Social Sustainability Enhancement Index’ (SSEI) which consists of a set of recommendations in the three areas of ‘neighbourhood’, ‘neighbouring’, and ‘neighbours’ in order to improve basic qualities of social sustainability (see Figure 2). This holistic index has policy, planning, and design recommendations, and thus covers a range of actions from strategic planning (e.g. policies to increase length of residency and housing turnover) to small-scale changes/interventions (e.g. turning a leftover plot into children playground).

The 5-stage evaluation framework, thus, operationalises the conceptual framework proposed for understanding social sustainability of neighbourhoods in five interrelated phases. It starts from intensive data collection, goes through interactive analysis which identifies areas of strength and weakness, is informed by qualitative inputs by the inhabitants, and ends up with a SSEI which includes practical recommendations for achieving a more socially sustainable neighbourhood.

6. Conclusion: the triad of social sustainability; research and policy implications for social sustainability discourse

We conclude the article with addressing research and policy implications of the proposed framework. As noted earlier, research on social sustainability remains the least developed pillar of sustainable development (Yoo and Lee 2016; Ročak, Hospers, and Reverda 2016; Boström 2012; Woodcraft 2012; Dillard, Dujon, and King 2009) . The need for further development, we argued, should happen in two interrelated areas: conceptualising social sustainability (definitional concerns), and operationalising social sustainability for research and policy purposes (measurement concerns). We also argued that the social sustainability discourse is of vital importance for micro scale urban settings such as urban neighbourhoods: neighbourhood is the practical scale for local authorities to develop and implement re-development schemes; these schemes deliver direct societal impacts which could be understood and evaluated under the concept of social sustainability; this concept can serve as a guideline for addressing social aspects of new community developments; and a social sustainability framework can be used for analysing social challenges of existing neighbourhoods and formulate actual improvement recommendations. In this sense, our research contributes to the abovementioned two-fold challenge: it suggests, for the first time, a *conceptual framework* for understanding social sustainability of urban neighbourhoods, and proposes a *practical holistic framework* for measuring and evaluation.

In terms of *conceptual framework*, we approached social sustainability of neighbourhoods as localities where conceived environmental properties and perceived social qualities are highly valued and interactively practiced by the inhabitants for a considerable period of time. This conceptual framework is scale-sensitive (addresses a specific territory), context-specific (considers socio-spatial structure), and multi-dimensional and holistic (links conceived-perceived qualities). Such holistic formulation of social sustainability at the neighbourhood scale, to the best of our knowledge, is proposed here for the first time; existing definitions are either scale-less, or have not been tailored to fit the specifications of urban neighbourhoods. In this sense, this approach contributes to the first challenge of social sustainability discourse, namely insufficient conceptualisation.

In terms of *practical framework*, the conceptual framework was developed into a tripartite structure according to which social sustainability of urban neighbourhoods is the intersection of three pillars of ‘neighbourhood’, ‘neighbouring’, and ‘neighbours’. This framework reflects three elements of the conceptual framework: ‘neighbourhood’ shows the physical characteristics and addresses the conceived qualities of the environment, ‘neighbouring’ shows the social structure and looks at the perceived qualities, and finally ‘neighbours’ directs individual and family structure and the socio-economic profile of the inhabitants. Each pillar consists of a set of indicators and measures, each of them quantifiable using a number of progressive methods and tools. Social sustainability of a neighbourhood, we argued, could be understood based on a cross-pillar analysis which, informed by a set of in-depth interviews with community members and local authorities, presents an in-depth understanding of different dimensions of social sustainability. This integrated practical framework for measuring social sustainability of urban neighbourhoods has some promising

characteristics: it is holistic in the sense that it combines relevant substantial elements of a socially sustainable environment; it is content-oriented, as the defined indicators are the most appropriate ones for the neighbourhood scale; and finally it advocates a mixed methodology consisting of qualitative and quantitative methods and tools to achieve highest reliability of the analysis outcomes. Moreover, defining ‘neighbours’ as an integral component of the triad underlines the significance of the neighbourhood inhabitants as the main actors – and an essential element of analysis – which has been widely overseen in social sustainability discourse. Overall, the proposed integrative framework contributes to the second challenge of social sustainability discourse, namely the lack of holistic practical frameworks for evaluation and measurement purposes.

The contribution of proposed conceptual and evaluation framework is not limited to the social sustainability research as outlined above; it carries a number of significant *policy and design implications*. On the policy level, a social sustainability framework helps local authorities to assess social sustainability qualities of urban neighbourhoods by means of getting an in-depth knowledge of it, and thus identify areas of challenge and concern. The outcomes of a social sustainability assessment can be integrated into future development and improvement plans, and help them to make practical recommendations for addressing the identified challenges and problems. Moreover, our framework can contribute to the call for revisiting existing Neighbourhood Sustainability Assessment (NSA) tools in order to address their multiple shortcomings (Sharifi and Murayama 2014; Luederitz, Lang, and Von Wehrden 2013; Sharifi and Murayama 2013), particularly the inadequate inclusion of social criteria into the proposed evaluation framework.

A broader investigation and a comparative analysis of different neighbourhood types in different social and geographical contexts can show which neighbourhoods, in terms of socio-spatial and social mix characteristics, are socially more sustainable and demonstrate higher social sustainability qualities. This provides decision makers with some hints for directing future developments. For example, if neighbourhoods with a particular urban layout show higher ‘neighbouring’ values, this provides an indication for policy makers to suggest this urban layout to be preferable for future urban re-development projects or new developments. Similarly, as the ‘social mix’ concept has been now a tool for achieving more sustainable communities (G. C. Galster and Friedrichs 2015; Bridge, Butler, and Lees 2012; G. Galster 2007), the results of a comparative study can provide basic knowledge to decide on the extent of social mix that is more appropriate for that particular urban context.

Overall, policy makers should note that there is a social sustainability aspect to any sustainable future plan which is less recognised but is vital and needs to be addressed. Integrating social sustainability dimension into planning processes and programmes, and formulating social sustainability as an urban agenda, appears as an urgent task. At the local level, the proposed framework provides a valuable reference; it shows what qualities are important to achieve a socially sustainable community.

More tangible and concrete implication of the proposed framework arises from its capacity in discovering the challenging and problematic aspects of neighbourhoods in terms of social sustainability. Applying the proposed framework for evaluating social sustainability of urban neighbourhoods, as discussed earlier, identifies urban qualities which are weak, have a low standard, and deserve immediate attention. This can be used as a basis to develop enhancement indices for all three pillars of social sustainability and come up with clear, practical, and tangible recommendations which can potentially improve the substantial qualities of social sustainability. For example, if evaluating the accessibility indicator of the ‘neighbouring’ pillar (see Table 2) suggests high percentage of using private cars to reach

primary school, and this is supported by our data from the land use mapping of the ‘neighbourhood’ pillar (see Table 1) which shows the lack of a primary school within walking distance and confirmed by the statements and arguments of interviewed community members, an obvious design indication would be re-thinking the location of educational facilities and planning for proper future actions to meet this local concern. Similarly, low rate of children safety on streets as a measure for neighbourhood safety and security indicator (see Table 2) confirmed by community members with children calls for necessary interventions in the form of traffic calming policies or street layout rearrangements.

This framework can be also utilised by planners and designers at the early stages of the community development, as a guideline for planning and design, and later as a control and monitoring tool after the implementation. Monitoring changes of the social sustainability indicators during the time, implementing policy and design interventions for improvement, and evaluating the success rate of interventions, could be achieved by using this framework.

Overall, applying this framework to a range of urban neighbourhoods and gaining a more comprehensive image of social sustainability helps researchers to know which neighbourhoods are socially more sustainable and why, guides policy makers to plan for moving towards sustainable communities, and enables urban designers to give practical solutions for improving the neighbourhood environment and provide space for practicing high social qualities.

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Table 1: Measuring ‘neighbourhood’; indicators and measures

Indicators	Measures	Data Collection Sources and Methods	Data Processing Tools
Density	<ul style="list-style-type: none"> • Population density • Gross residential density • Net residential density • FAR (Floor Area Ratio) • Coverage • Household density 	<ul style="list-style-type: none"> ➤ National census ➤ Local plans ➤ GIS maps ➤ On-site observation 	<ul style="list-style-type: none"> ▪ ArcMap
Mixed Land Use	<ul style="list-style-type: none"> • Gross residential/non-residential area ratio • Net residential/non-residential area ratio • Different land use types such as commercial, green space, office, etc. (size and number) • Number of mixed use buildings/plots • Pattern of mixed use • Number and distribution of services • Density of services 	<ul style="list-style-type: none"> ➤ National census ➤ Local plans ➤ GIS maps ➤ Ordnance survey maps ➤ On-site observation ➤ Site survey 	<ul style="list-style-type: none"> ▪ ArcMap
Urban Pattern and Connectivity	<ul style="list-style-type: none"> • Intersections density • T junction density • Street density • Street length (max, min, average, median) • Number of cul-de-sacs • Block size (max, min, average, median) • Lot size (max, min, average, median) • Number of public transportation stops • Length of pedestrian paths • Length of cycling paths • Integration and choice 	<ul style="list-style-type: none"> ➤ GIS maps ➤ Ordnance survey maps ➤ On-site observation 	<ul style="list-style-type: none"> ▪ AutoCAD ▪ Depthmap
Building Typology	<ul style="list-style-type: none"> • Floor area of houses • Built-up to plot area ratio • House types percentage • Building height percentage 	<ul style="list-style-type: none"> ➤ GIS maps ➤ Ordnance survey maps ➤ On-site observation ➤ Site survey 	<ul style="list-style-type: none"> ▪ ArcMap
Quality of Centre	<ul style="list-style-type: none"> • Open space size • Connectivity • Land use pattern • Urban furniture 	<ul style="list-style-type: none"> ➤ GIS maps ➤ Ordnance survey maps ➤ On-site observation ➤ Site survey 	<ul style="list-style-type: none"> ▪ AutoCAD ▪ ArcMap
Access to facilities	<ul style="list-style-type: none"> • Spatial Distribution of urban facilities such as small shops, supermarket, chemist, post office, etc. • Walkability to urban facilities • Median distance to each urban facility 	<ul style="list-style-type: none"> ➤ GIS maps ➤ Ordnance survey maps ➤ On-site observation ➤ Site survey 	<ul style="list-style-type: none"> ▪ AutoCAD ▪ ArcMap

Table 2: Measuring ‘neighbouring’; indicators and measures

Indicators	Measures	Data Collection Methods	Data Processing
Social networking and interaction	<ul style="list-style-type: none"> • Number of neighbours known by name • Frequency of meeting neighbours • Number of friends in the neighbourhood • Number of neighbours frequently visited • Asking help from neighbours • Exchange of help and support with neighbours 	Household survey (questionnaire)	<ul style="list-style-type: none"> ▪ Statistical analysis such as SPSS <ul style="list-style-type: none"> ▪ Rating and scoring
Safety and security	<ul style="list-style-type: none"> • Feeling of safety in daytime • Feeling of safety after dark • Safety of open spaces • Children safety on the streets • Safety of pavements and sidewalks • Being victim of crime • Presence of police at the neighbourhood 		
Sense of attachment	<ul style="list-style-type: none"> • Feeling of neighbourhood attachment • Neighbourhood proud • Feeling of being at home in the neighbourhood • Missing neighbourhood while away • Desirability of neighbourhood • Desire to leave the neighbourhood 		
Participation	<ul style="list-style-type: none"> • Knowing community-based organisations • Membership in community organisations • Participation in religious activities • Being involved by local authorities • Level of respond to local authorities • Knowing neighbourhood problems 		
Quality of neighbourhood	<ul style="list-style-type: none"> • Perception of building crowding, • Perception of population crowding • Satisfaction with noise pollution/neighbours/cleanliness of neighbourhood/street lighting/maintenance of public spaces/ neighbourhood reputation/traffic congestion 		
Quality of home	<ul style="list-style-type: none"> • Satisfaction with home in terms of privacy/noise/room size/room number/parking • Desire to move out • Reason for moving 		

Table 3: Measuring ‘neighbour’; social profile indicators and measures

Indicators	Measures	Data Collection Methods	Data Processing
Social Mix	<ul style="list-style-type: none"> • Age/Gender distribution • Ethnicity mix • Length of residency • Household size • Household type • Household ownership • Household income • Employment status • Accommodation type and characteristics • Education status 	<ul style="list-style-type: none"> ➤ National census ➤ Local authorities ➤ GIS maps ➤ Household survey 	<ul style="list-style-type: none"> ▪ Statistical analysis such as SPSS ▪ Rating and scoring

Figure 1: Triad of social sustainability of urban neighbourhoods, pillars and indicators

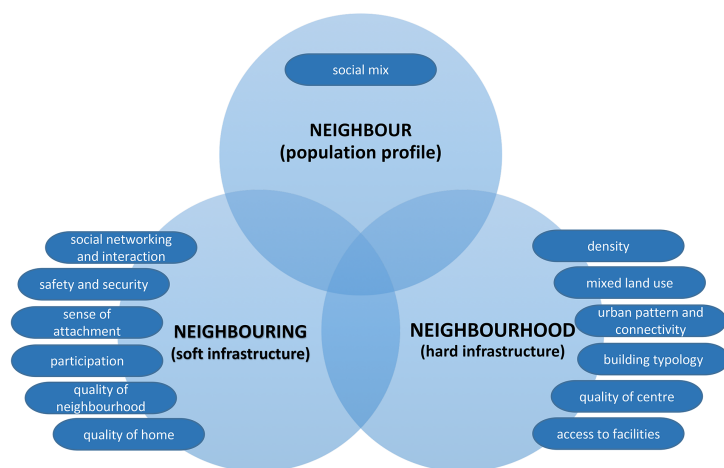


Figure 2: Social Sustainability Evaluation Framework

