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Supporting policymakers by Integrated Social Sustainability Assessments (ISSA) - case study of Furuset area in Oslo

T Akbarinejad, A. Temeljotov Salaj, A Johansen

Department of Civil and Environmental Engineering, Norwegian University of Science and Technology, Trondheim, Norway

Tahmineh.Akbarinejad@ntnu.no, alenka.temeljotov-salaj@ntnu.no, a.johansen@ntnu.no

Abstract. Aspirations to improve health equity and well-being, as well as the sustainability of the environment, are interconnected. Therefore, it is imperative that the public health system, environmental science, and other sectors work together to achieve these goals. For a city to be sustainable and to take into account the well-being of its citizens, an assessment tool is essential for evaluating and achieving sustainable objectives. One way to measure sustainability and well-being is to assess the performance of social, environmental, and economic principles. The authors proposed and developed a framework titled Integrated Social Sustainability Assessment (ISSA). The paper presents one of the results of an application of this tool in one of the Oslo neighbourhoods. This study describes how this result can support policymakers and urban authorities about pressing problems of each area/neighbourhood through the lens of citizens and allow them to make necessary environmental changes in order to improve citizens' health and well-being. By achieving the outcomes, we will be able to develop sustainable strategies toward sustainable transformation at the neighbourhood level.

1. Introduction

There were approximately 13.7 million deaths caused by modifiable environmental risk factors in 2016, which represents 24% of global deaths [1]. Thus, almost one in four of the total number of deaths worldwide is related to environmental factors. The environment plays an important role in the prevalence and inequalities associated with non-communicable diseases (NCDs) [2]. Every year, NCDs such as cardiovascular diseases, cancers, respiratory diseases, and diabetes kill 41 million people worldwide or 74% of all deaths. Over 80% of all premature NCD deaths (deaths occurring before the age of 70) are caused by these four groups of diseases combined [3]. All individuals are at risk of developing NCDs, whether they are children, adults, or the elderly. A number of factors contribute to the development of these diseases, including rapid unplanned urbanization, globalization of unhealthy lifestyles, and population aging [3].

Buildings and urban areas account for approximately 70 percent of global carbon emissions and over 60 percent of resource consumption [4]. Research is essential to understanding the role of our environment, particularly the built environment. As a result of the intense urbanization that has occurred during the past century, almost 75% of the European population lived in an urban area in 2015 [5]. Furthermore, it is expected that the urban population will continue to grow even faster in the future. Additionally, people are living longer throughout the world, and it is expected that most people will live to be at least 60 years of age [6]. The expansion of social and economic opportunities and the expanded availability of services contribute to such growth, but it adversely impacts the health and well-being of urban residents. Due to this, it is imperative to carefully evaluate and design urban spaces in order to reverse their negative effects.

Aging population: The majority of countries are facing the twin challenges of limited resources and an aging population, which will lead to a rise in the number of senior citizens seeking healthcare in the near future. There is no doubt that this is the most important health and social care policy issue facing governments throughout the world [7]. It is estimated that the healthcare sector produces more greenhouse gases than both aviation and shipping combined [8]. The healthcare industry accounts for



approximately 4.6 percent of global greenhouse gas emissions [9]. As an example, it is estimated that the Norwegian healthcare system emits 4.3% of Norway's total greenhouse gas emissions [10]. To improve health equity and well-being while ensuring environmentally sustainable lives for all, it is imperative to support and encourage public health, environmental science, and other sectors to work together.

Preventive approach: Even though preventative care can reduce healthcare costs, little investment has been made in this area. It is surprising to find that only 3% of healthcare expenditures in Europe are devoted to preventative and public health programs [11]. In this regard, preventative, and innovative healthcare solutions will help societies reach their sustainability goals by being less costly, less resource-intensive, and more environmentally friendly. Healthy lifestyles and disease prevention are key components of a sustainable health system [12]. From the perspective of user-centered inclusive design, it is necessary to explore the role of living environments in enhancing health and well-being.[13] and it is impossible to achieve sustainable built environment without comprehensive technical knowledge and an understanding of the social aspects.[14]

To shape the future of cities in particular ways to address opportunities and perceived or real problems, cities are now referred to as green, sustainable, healthy, smart, multicultural, and creative [15]. As a result, cities need to nurture health and well-being in urban environments by addressing the complex interaction between people's well-being and the built environment. It is important to consider the health and well-being of citizens when designing sustainable urban places. An individual's state of well-being is a complex combination of their physical, mental, emotional, and social well-being. The concept of well-being is a valid measure of population outcomes beyond morbidity, mortality, and economic status [16]. The age-friendly environments concept developed and launched by the World Health Organization in 2007 illustrates that health and well-being are not only determined by our genes and personal characteristics but also by our physical and social environments; thus, the concept of age-friendly buildings, neighborhoods, cities, and communities was embedded [17]. Through motivational and socio-psychological theory, neighborhoods can increase people's willingness to change their behavior by working as a collaborative community to improve livability issues [18]. The public participation is one of the key elements of "smart cities," and local governments have worked to provide opportunities for citizens to participate.[19]To achieve that two tangible strategies are co-creation and policies related to sustainable and healthy cities in the future [20].

Social sustainability-lack of assessment tools: Developing a sustainable city that considers its citizens' well-being requires a valid assessment tool that helps us evaluate and achieve our environmental, economic, and social goals. Despite recent trends in the sustainability assessment framework and tools like "Leadership in Energy and Environmental Design" (LEED) and "Building Research Establishment Environmental Assessment Method" (BREEAM) for buildings and neighborhoods to address environmental and economic factors, social sustainability has received less attention because it has been defined as a measure of human welfare that varies based on context [21]. This study addresses the problem by answering the following research questions:

Q) How this tool can support policymakers as a guideline and recommendation to determine the sustainable decision for the city/neighborhoods?

The paper is organized as follows: Section 2 introduces the case study, Section 3 describes the ISSA framework methodology; Section 4 presents the results of the ISSA framework in the case study; Section 5 discusses the results and answers the research questions; and section 6 concludes the study.

2. Case Study (Gamle Furuset)

In the Grorud valley within the Oslo city limits, the Furuset area is located northwest of the city center. There are approximately 9000 people living in Furuset, representing 140 different nationalities. Without regular users or visitors, these urban spaces soon became desolate. In the absence of activity and a sense of responsibility on the part of the residents, these spaces became unattractive and unsafe. There were

socio-economic problems in the Grorud Valley and Furuset in particular, such as segregation, low housing prices, and a bad reputation. There are large areas of detached housing, satellite towns, industrial estates, and logistics centers situated in the Grorud Valley on the Oslo outskirts. Furuset has received significant attention in various Oslo regions due to the need to improve social sustainability and the challenges associated with this. The Oslo municipality and the state have taken this initiative to improve selected services and local communities in Groruddalen [22]. The purpose of this study is to identify how policymakers can identify weaknesses in each area and how they can prioritize their future projects in order to ensure social sustainability. In this area, three zones (Stjerneblokkveien, Furuset Sentrum, and Gamle Furuset) have been identified, and a framework known as the "Integrated Social Sustainability Assessment" has been developed by the author and implemented. The results of one of the areas (Gamle Furuset) have been discussed in this study. In the Gamle area, there are detached houses built in the 1920s with gardens and vulnerable areas (see Figure 1).

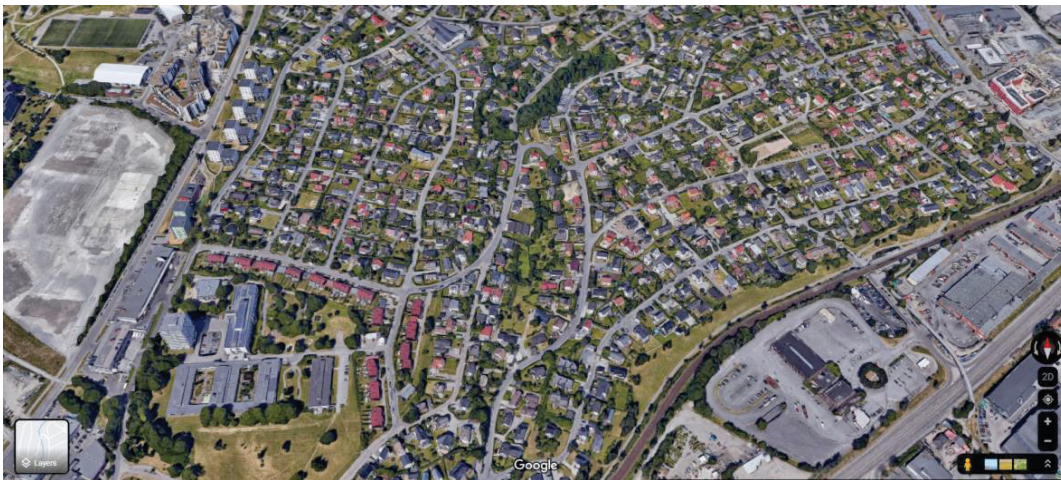


Figure 1. Gamle Furuset bird view (google map)

3. Methodology

A brief introduction to the methodology of the ISSA framework is provided in this section. As described in [23], this novel approach combines qualitative and quantitative methods and integrates experts' opinions and residents' level of satisfaction in terms of social sustainability. As illustrated in Figure 2, this framework includes different main levels (Figure 2), covering three main steps as the following:

- 1) Selected social sustainability variables
- 2) Weighting categories and indicators
- 3) Qualitative data collection and scoring system

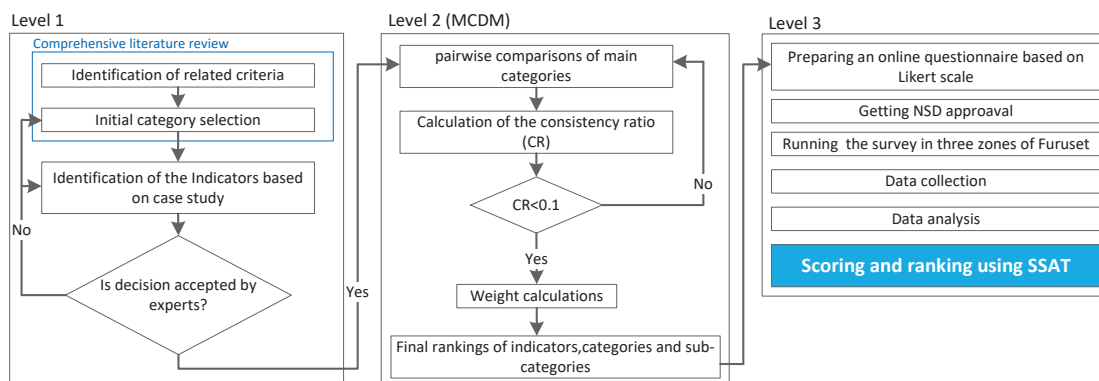


Figure 2. ISSA framework flow diagram described in [23]

4. Results

4.1. Selected social sustainability variables

The literature discussed a variety of categories and indicators reviewed by Akbarinejad et al. [21], and six main criteria, ten sub-criteria, and 33 related indicators were selected and approved by experts from academia and the municipality of Alna (see Appendix A). The main criteria are social equity, environmental awareness, social cohesion, health and safety, accessibility and satisfaction, and cultural value [23]. In social policy, social equity refers to factors that relate to impartiality, fairness, and justice for all people. A key component of environmental awareness is the ability to understand the natural environment and make choices that benefit the environment rather than harm it. A factor related to social cohesion is the willingness of people to cooperate and work together, despite differences in demeanor, culture, and beliefs. A neighborhood's health and safety are determined by various factors, including how safe and healthy it is considered by the residents. Factors related to commuting and transportation are included in Accessibility and Satisfaction and an area's cultural value is influenced by factors such as its design and its intercultural dialog.

4.2. Weighting categories and indicators

Following the geometric mean analytic hierarchy process (AHP) approach described in [23], the weights associated with each indicator (listed in Appendix A) were calculated in Table 1.

Table 1. Indicator's calculated weights [23]

| Indicator | Weight | Indicator | Weight | Indicator | Weight | Indicator | Weight |
|-----------|--------|-----------|--------|-----------|--------|-----------|--------|
| A1 | 0.0473 | B4 | 0.0138 | D3 | 0.0157 | E1 | 0.0406 |
| A2 | 0.0473 | B5 | 0.0138 | D4 | 0.0157 | E2 | 0.0406 |
| A3 | 0.0473 | B6 | 0.0138 | D5 | 0.0157 | E3 | 0.0406 |
| A4 | 0.0473 | C1 | 0.0543 | D6 | 0.0157 | F1 | 0.0305 |
| A5 | 0.0473 | C2 | 0.0543 | D7 | 0.0157 | F2 | 0.0305 |
| A6 | 0.0473 | C3 | 0.0543 | D8 | 0.0157 | F3 | 0.0305 |
| B1 | 0.0138 | C4 | 0.0543 | D9 | 0.0157 | F4 | 0.0305 |
| B2 | 0.0138 | D1 | 0.0157 | D10 | 0.0157 | | |
| B3 | 0.0138 | D2 | 0.0157 | D11 | 0.0157 | | |

4.3. Qualitative data collection and scoring system

The level of satisfaction of residents in each area should be assessed through questionnaires based on the identified social sustainability categories and indicators. The questionnaire was constructed using a six-point Likert scale (strongly disagree, disagree, partly disagree, partly agree, agree, strongly agree). To obtain a final scale of 0-100, a measuring scale of 0-5 was used. The present study was conducted using the central tendency approach to quantify the results. Central tendency is a measure that seeks to pinpoint the center of a data collection in order to characterize it [24]. The ISSA social sustainability index [23] can be calculated using (1).

$$SSI = \sum_{i=1}^{34} W_i \times I_i \times 20 \quad (1)$$

where, SSI is the ISSA's social sustainability index, W_i is the calculated weight of each indicator in the AHP process, I_i is the Likert scale index which can be calculated by (2).

$$I_i = \frac{\sum_{k=0}^5 n_j \times k}{\sum_{k=0}^5 n_j} \quad (2)$$

where, n_j is the number of received responses from citizens to each Likert scale question, and k is the relative measuring scale from 0 to 5.

4.4. Case study

Furuset's oldest section is Gamle Furuset or Nordre Furuset. The Gamle area consists of detached houses built in the 1920s, many of which have gardens and vulnerable areas, such as an old pasture and a stream. As depicted in Figure 3, according to people and municipality officials interviewed, many detached houses on old Furuset have been converted into small dormitories, causing serious difficulties. This zone has considerably lower social sustainability criteria, as indicated by the SSAT tool (Figure 4.9), and requires more attention. In figure 3, The color red indicates a considerable lack and concern associated with the indicator. The colors green and yellow indicate conditions that are acceptable and moderate, respectively. As seen in Figure 3, social equity, health and safety, and cultural values are the main areas of concern in this area. As a result, residents of this area: They reported they have fewer chances and opportunities to find a decent job and take advantage of facilities than those living in other parts of the area and they do not believe that they have a voice in the local government. Also they reported feeling anxious and depressed and their home does not have adequate natural lighting, and they are uncertain about its resilience in the event of a disaster. Are not satisfied with their building and have difficulty maintaining an intercultural dialogue with their neighbours.

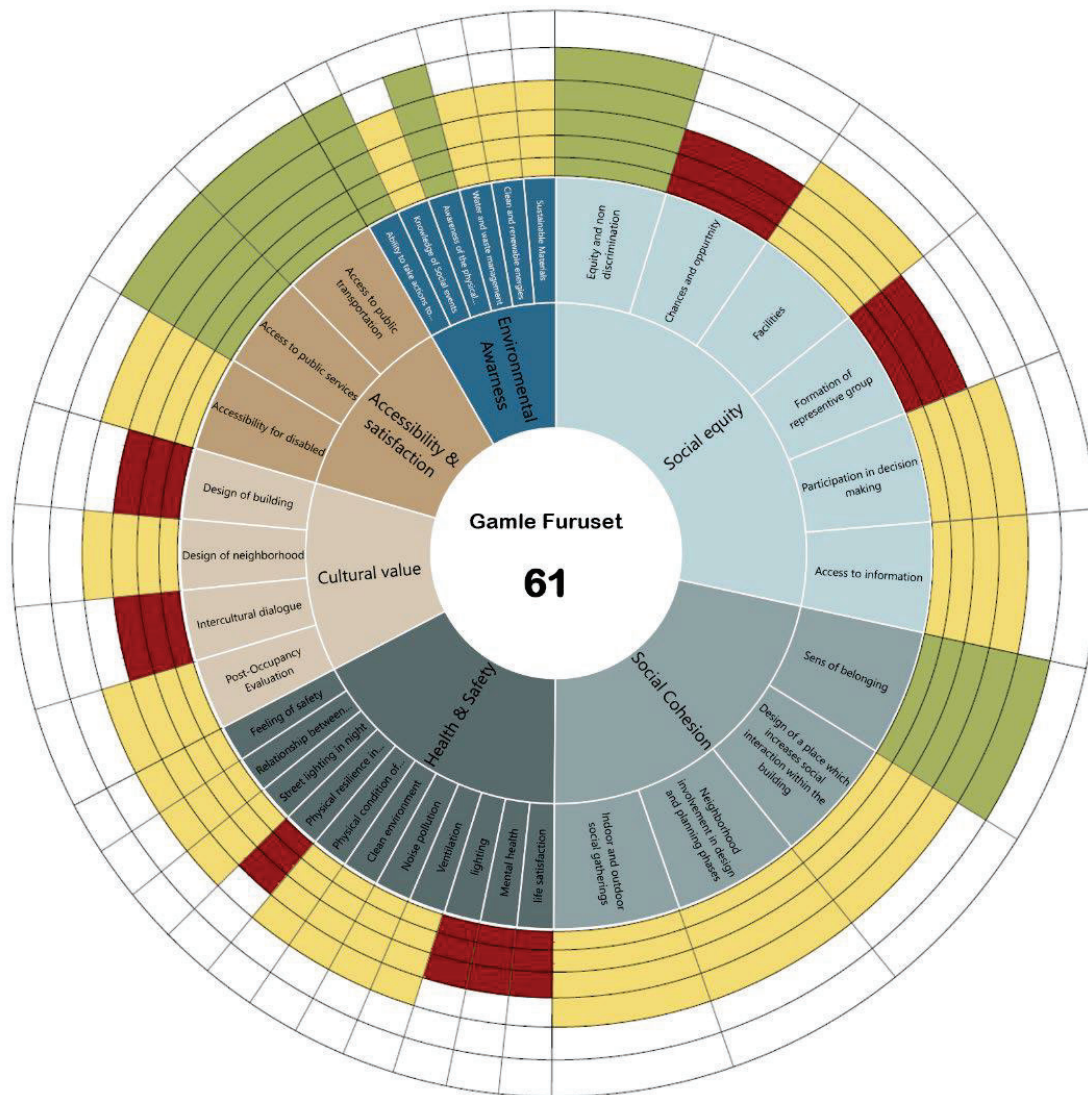


Figure 3. Gamle Furuset social sustainability result and overall social sustainability index

Despite these problems, they feel a strong sense of belonging to this area. In addition, they are satisfied with the availability of public transportation and public services and there is no feeling of discrimination among them; however, all other indicators with yellow color need to be improved.

Among the open questions, only 24 people tend to submit their suggestions and comments to Gamle Furuset. There have been some very positive responses to open questions regarding social cohesion and social equity in this area; however, there are more complaints regarding the state of old houses and public buildings. Repairing houses and roads, painting blocks and walls, and maintaining playgrounds and public buildings are necessary. It is also requested that activities and opportunities be developed in this area to prevent problems and violence among youth, in addition to prioritizing children's needs. These requests are consistent with those made in other parts of Furuset as well.

5. Discussion

This section tries to answer the research question. As discussed in Section1, there were three main research questions.

On the basis of the Gamle Furuset diagram, this information can be extracted and interpreted. Table 2 illustrates the weaknesses of this area and prioritizes them according to the opinions of experts and citizens. There are alternative solutions for each of these six indicators which can be suggested by experts in the respective fields and based on opportunities available in this area.

Table 2. Gamble Furuset's problems and their priority and suggested solutions

| Problems based on Priority | Priority | Sample Solution |
|---------------------------------------|-----------------|--|
| Formation of a representative group | 1 | Establish a housing association, using citizen engagement applications, and digital voting systems for making a decision |
| Equity in chances and opportunity | 1 | Conducting a specific survey to understand their problems in this case. Supporting local businesses, and local educational centers to empower citizens |
| Design of building | 2 | motivating the owners and residents to improve their plans through initiative strategies funding for renovation, and refurbishment of common areas and green spaces |
| Intercultural dialogue | 2 | Establish Cultural NGO, planning for international events, and local exhibitions and fest for national foods and beverage |
| Physical resilience in their building | 3 | Asking for the renovation of old houses Giving funds to improve resilience Evaluating the situation by experts to recognize problematic areas |
| Improving lighting system | 3 | Adding streetlights in dark places Switch to LED lights Adding motion sensors |
| Mental health | 3 | Having a place to let people talk Providing an opportunity to make new connections and social groups Motivating people to physical activity |
| Life satisfaction | 3 | By solving the problems, the level of life satisfaction of people can be improved |

In the next step, these solutions can be compared in terms of their environmental and economic impacts and consequences. In order to achieve sustainability, it is necessary to maximize synergies for human well-being while simultaneously reducing the costs and adverse effects on the environment. A systematic approach is needed to identify and manage trade-offs while maximizing co-benefits to ensure sustainable development which can be don't in this step.

In order to understand and evaluate how citizen co-creation and co-design can facilitate a smart and sustainable transformation of urban environments, this tool seeks to understand and evaluate how processes and innovations can empower citizens to co-create and co-design solutions. The purpose of this project is to develop a theoretical approach and model for engaging citizens in sustainable urban transformation. By combining an expert panel interview with a questionnaire completed by the residents, this model employs a multi-criteria decision-making process to evaluate the selected well-being categories and indicators.

The concept of empowerment refers to the sharing of control, the right and ability to participate, and the ability to influence resource allocation decisions. People here take charge of their lives. People receive support based on their needs. Every citizen is equal and their communities respect and trust them. emphasize commitments to access to education, better health, equity, and how open government can directly benefit the environment. On the other hand, this system leads the system to delay by reducing hierarchical levels.

It is necessary to explore the role of living environments in enhancing businesses from the perspective of user-centered inclusive design in age-friendly environments and communities. However, rather than the individual goals themselves, the interactions between them have a major impact. The outcome of a novel citizen-driven assessment model will help policymakers to create a sustainable region while minimizing costs and negative environmental impacts. The model focuses on the socioeconomic weaknesses of regions based on the citizens' opinions and helps policymakers/urban developers to be more effective, which can release the negative impact of projects in the future by preventive measures.

6. Conclusion

A good understanding of cities, and the particular city in the neighborhood, is important for policymakers, planners, urban design practitioners, and city service decision-makers who are responsible for creating policies and taking decisions to improve cities' functions. The aim of this study is to develop a framework that can empower citizens and support policymakers by recognizing the strength and weaknesses of different areas and evaluating possible solutions based on weaknesses to improve the environment and increase well being of citizens.

This framework help citizen to get empowered by participation, involvement, commitment, and de-layering of systems, Also, it helps decision makers to:

- recognize the problem of each neighborhood through the lens of citizens
- Prioritize future projects and investments based on experts' and citizens' opinions.
- Development of the smart city and transport systems based on citizen's requirements in the de-layering system
- Establish realistic goals and prepare a road map for sustainable goals
- Identify alternative solutions and evaluate economic and environmental consequences
- Validate solutions against problem statement
- Monitoring progress in terms of social sustainability

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Appendices

Appendix A. Norway's selected social sustainability criteria and indicators

| Criteria | Sub-Criteria | Indicators | |
|------------------------------------|---|---|-----|
| Social Equity (A) | Equity of process | Access to information | A1 |
| | | Participation in decision making | A2 |
| | | Formation of represent group | A3 |
| | Fair distribution | Facilities | A4 |
| | | Chances and opportunity | A5 |
| | | Equity and non-discrimination | A6 |
| Environmental Awareness (B) | Environmental awareness & sensibility | Sustainable Materials | B1 |
| | | Clean and renewable energies | B2 |
| | | Water and waste management | B3 |
| | Ecological literacy | Awareness of the physical environment | B4 |
| | | Knowledge of Social events | B5 |
| | | Ability to take action against environmental problems | B6 |
| Social Cohesion (C) | Social programs | Indoor and outdoor social gatherings | C1 |
| | | Neighbourhood involvement in design and planning phases | C2 |
| | Social interaction | Design of a place that increases social interaction | C3 |
| | | Sense of belonging | C4 |
| Health and safety (D) | Safety measures | Feeling of safety | D1 |
| | | Relationship between neighbours | D2 |
| | | Street lighting at night | D3 |
| | | Physical resilience in case of hazards | D4 |
| | Health and Indoor Environmental Quality (IEQ) | The physical condition of a building | D5 |
| | | Clean environment | D6 |
| | | Noise pollution | D7 |
| | | Ventilation | D8 |
| | | Lighting | D9 |
| | | Mental health | D10 |
| | | life satisfaction | D11 |
| Accessibility and satisfaction (E) | Ease of accessibility | Access to public transportation | E1 |
| | | Access to public services | E2 |
| | | Accessibility for disabled | E3 |
| Cultural value (F) | Satisfaction level local identity | Design of building | F1 |
| | | Design of neighbourhood | F2 |
| | | Intercultural dialogue | F3 |
| | | Post-Occupancy Evaluation | F4 |

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