

A Model for Measuring and Assessing Social Sustainability: Ankara Dikmen Valley Case Study

Hilay Atalay

Affiliation: Istanbul Gelisim University

Department of Architecture

Environment, Urbanization And Earth Sciences Application And Research Center

Email: hatalay@gelisim.edu.tr

Nuran Zeren Gülersoy

Affiliation: Isik University

Department of Architecture

Email: zeren.gulersoy@isikun.edu.tr

Abstract

During the transformation of cities, the concept of sustainability has been incorporated into political discourse. Due to the emphasis on environmental and economic aspects of sustainability in urban interventions, issues of social inequality, insufficiency, insecurity, social exclusion, and a lack of social unity have been highlighted. Since the primary purpose of urban interventions is to improve the spatial structure, enhancing and maintaining social structure is essential in ensuring spatial sustainability. This paper focuses on measuring and assessing social sustainability before and after urban interventions. This paper presents a model that defines the key issues and criteria of social sustainability, the objectives and sub-objectives for achieving social sustainability, and the indicators to measure and evaluate them. The universal model is based on a holistic approach that can be applied to all urban areas and scales.

1. Introduction

In the ongoing process of urban transformation, the concept of sustainability has increasingly been integrated across various disciplines, primarily due to the widespread impact of human activity on all systems, including cities. As sustainability emerges as a key framework for addressing global challenges, it has gained prominence in both theoretical discourse and practical applications. Although the need to evaluate the three fundamental components of a sustainable society—environmental, economic, and social—became more widely acknowledged after the 1980s, urban renewal efforts have primarily focused on the physical and economic revitalization of existing urban areas to meet evolving urban demands (Colantonio and Dixon, 2009).

This focus has often led to the neglect of the social dimension of sustainability, resulting in increased inequality, inadequacy, and insecurity within urban spaces. As cities face limitations imposed by their physical and economic structures, a holistic approach that simultaneously considers environmental, economic, and social aspects becomes essential. Such an approach is necessary not only to achieve social sustainability but also to lay the groundwork for building resilient and sustainable cities in the face of changing conditions.

From this perspective, this research focuses on measuring and assessing social sustainability before and after urban interventions. This paper presents a model that defines the key issues and criteria of social sustainability, the objectives and sub-objectives for achieving social sustainability, and the indicators to measure and evaluate them. The universal model is based on a holistic approach that can be applied to all urban areas and scales. Ankara Dikmen Valley has been selected as a case study for implementing the model. The Dikmen Valley Housing and Environmental Development Project is the first multi-purpose urban development project in Turkey; in other words, it is an urban regeneration project for slum areas and squatter settlements. Dikmen Valley was chosen as the implementation area as it has been inhabited for more than 5 years.

2. Concept of Social Sustainability

Although there is no universally accepted definition of social sustainability, its theoretical framework varies depending on factors such as scale, spatial characteristics, subject matter, and the disciplinary perspectives of

researchers. Compared to the environmental and economic dimensions, the development of social sustainability has been relatively slow, mainly because it has historically received less attention and interest (Woodcraft, 2015). Early definitions of social sustainability primarily aimed to clarify and legitimize the concept within broader sustainability discourse. However, since the 2010s, more comprehensive explanations and in-depth analyses have emerged, reflecting a growing recognition of the importance of the social dimension in achieving truly sustainable urban development.

The fundamental key of social sustainability is described as the equitable access to resources for all residents of a region and the provision of fair opportunities for well-being (Murphy, 2012). Social sustainability is most broadly defined as the maintenance and enhancement of the well-being of current and future generations (Chiu, 2003) and the fulfilment of the fundamental social needs of all communities (Eizenberg and Jabareen, 2017). From an urban living perspective, the process of creating sustainable and prosperous places that enhance well-being involves understanding what people need from the spaces in which they live and work. Social sustainability 'integrates the design of physical space with the design of the social world' (Woodcraft, 2015).

More detailed definitions of social sustainability emphasize its nature as an integrated relationship between the physical environment, individuals, and the broader social structure.

In addition to approaches that examine the concept of social sustainability from different perspectives, there are also holistic and multi-layered approaches. The concept of social sustainability can be further expanded when considering basic needs, culture, well-being, and the continuation of the human species (Littig and Griessler, 2005). In this context, according to Cuthill (2010), social sustainability is shaped by principles such as well-being and quality of life, incorporating concepts including health, participation, needs, social capital, economy, ecology, and, more recently, happiness—all grounded in the core values of equity and democracy.

Colantonio and Dixon (2009), who argue that urban regeneration efforts can yield potential outcomes across various dimensions of social sustainability in cities, define these dimensions as follows: demographic change (ageing, migration, and mobility), education and skills, employment, health and safety, housing and environmental health, sense of belonging, place identity and culture, participation, empowerment and achievement, social capital, social mixing and cohesion, well-being, happiness, and quality of life. Underpinning all these concepts—including social exclusion, social inclusion, and social capital—is the premise that individuals in society must interact and collaborate to ensure social Sustainability (Bramley and Power, 2009).

In its broadest sense, social sustainability refers to the existence of equal, fair, and equitable living conditions in the built environment and its components for all segments of society. While equity and justice are at the heart of the concept, they must be considered in conjunction with other key issues, including population, accessibility, education and skills, health, housing, safety, belonging, participation, social capital, social cohesion, diversity, and satisfaction. Social sustainability can thus be defined as systems in which equity and justice are central values, where population distribution and economic welfare are balanced, equal access to basic services is ensured, opportunities necessary for individual and societal development are available, fundamental needs such as health, housing, and security are met, individuals feel a sense of belonging to their community and environment, public participation in governance is realized, and where social capital, cohesion, and satisfaction with quality of life are achieved (Atalay, 2023).

3. Definition of The Model For Measuring And Assessing Social Sustainability

In developing countries, particularly within urban contexts, there appears to be a lack of a comprehensive system or model capable of assessing and evaluating the extent to which the sustainability of the social structure is ensured as a component of achieving spatial sustainability. Based on this premise, the present study proposes a model specifically tailored to the Turkish context, designed to facilitate the assessment and evaluation of social sustainability within the field of urban planning. The proposed model constitutes an integrated measurement and evaluation framework that identifies the mechanisms through which the social fabric may be sustained in urban environments. The primary objective of the model is to identify the key dimensions and criteria of social sustainability, articulate the corresponding objectives necessary to ensure its realization and establish a set of

measurable indicators for evaluating these objectives. Designed to be universally applicable, the model adopts a holistic perspective and is intended for implementation across diverse urban settings and at varying spatial scales.

As part of the literature review conducted for this study, a comprehensive analysis was undertaken of publications by international organizations, academic books, peer-reviewed articles, and project reports, with a specific emphasis on methodologies and frameworks related to the measurement and evaluation of sustainability, particularly social sustainability. Each study reviewed in the literature has been systematically analyzed based on its respective criteria, and a comprehensive matrix encompassing all identified criteria and indicators has been constructed through synthesis. This matrix served as a methodological tool for selecting relevant social sustainability criteria and indicators based on their recurrence and frequency across the literature while also taking into account the spatial planning framework.

Utilizing this approach, ten principal criteria have been defined to constitute the thematic framework of the indicator system designed to assess social sustainability. These include demography and employment, accessibility, education and skills, health, housing, safety, sense of belonging, participation, social capital and social cohesion, and urban life quality, satisfaction, and adequacy of services (Figure 1).

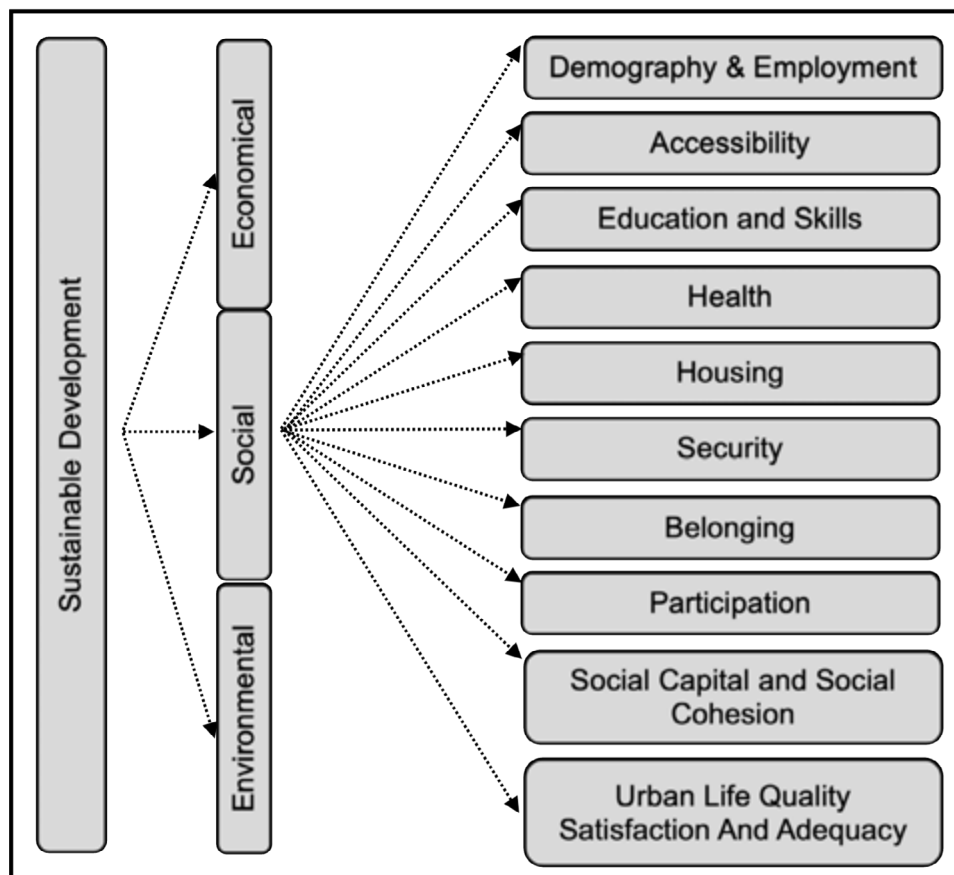


Figure 1. Criteria of the measuring and assessing social sustainability model

Within the scope of the social sustainability measurement and evaluation model, a total of 12 strategic objectives and 24 subordinate targets have been formulated concerning the ten core criteria (Table 1).

Table1. Targets and sub-targets of the social sustainability model

Criteria's	Targets	Sub-Targets
A.Demography & Employment	TA(1) Ensuring a Balanced Distribution of the Population	TA(1.1) Ensuring a Balanced Distribution of the Population by Birthplace
	TA(2) Ensuring the Balance of the Economic Well-Being of the Population	TA(2.1) Poverty Prevention
		TA(2.2) Provision of Employment Opportunities
		TA(2.3) Ensuring Productivity in Employment
		TA(2.4) Ensuring Gender Equality in Employment Opportunities
B.Accessibility	TB(1) Ensuring Equality of Access to Basic Urban Services	TB(1.1) Ensuring Equality of Access to Social Infrastructure, Open Green and Urban Working
C. Education and Skills	TC(1) Individual and Social Education, Raising and Promoting The Level of Development	TC(1.1) Raising literacy and education level
		TC(1.2) Promoting Participation in Vocational Education
		TC(1.3) Promoting Participation in Talent Development Education
D. Health	TD(1) Ensuring the Adequacy of Health Services	TD(1.1) Ensuring the Adequacy of Health Services
E. Housing	TE(1) Ensuring Housing Conditions for All	TE(1.1) Ensuring Increasing Housing Capacity
		TE(1.2) Improving the Physical Condition of Housing
F. Security	TF(1) Ensuring Individual Safety	TF(1.1) Ensuring Security in Public Spaces and Private Areas
G. Belonging	TG(1) Ensuring the Acquisition of Social, Spatial Belonging, Urban Image, and Heritage Values	TG(1.1) Ensuring Social and Spatial Belonging
		TG(1.2) Creation of Urban Image Awareness
		TG(1.3) Creating Awareness of Conservation of Heritage Values
H. Participation	TH(1) Promoting Public Participation in Management, Planning Processes, and Works Related to Municipal Services	TH(1.1) Ensuring Participation in Country and Local Government
		TH(1.2) Ensuring Public Participation in the Planning Process
		TH(1.3) Ensuring Transparency in Works Related to Municipal Services
I. Social capital and social cohesion	TI(1) Ensuring The Level of Social Development and Social Interaction	TI(1.1) Increasing Social Development
		TI(1.2) Level of Social Interaction
	TI(2) Ensuring Diversity and Cultural Integration	TI(2.1) Ensuring Cultural Diversity and Cultural Integration
L. Urban Life Quality Satisfaction And Adequacy Of Services	TL(1) Ensuring Local Residents' Satisfaction with Their Living Environment and the Adequacy of Provided Services	TL(1.1) Ensuring Satisfaction with Urban Quality of Life
		HL(1.2) Ensuring the Adequacy of Urban Services

4. Applying the Measuring And Assessing Social Sustainability Model: A Case Study of Dikmen Valley

4.1 General Overview of Dikmen Valley and Its Urban Development Project

Since the 1950s, internal migration from rural to urban areas in Turkey has led to a substantial increase in urban populations, particularly within metropolitan centres. This demographic shift has led to the proliferation of informal and unauthorized housing areas—commonly referred to as gecekondu settlements—across many cities (Gülersoy Zeren, 2003). One such area is the Dikmen Valley, located in Ankara, which was previously characterized by unregulated and illegal residential structures.

Dikmen Valley is situated within the Çankaya district of Ankara and encompasses the neighbourhoods of Ayrancı, İlkadım, Güzeltepe, Metin Akkuş, and İlker (Figure 2).

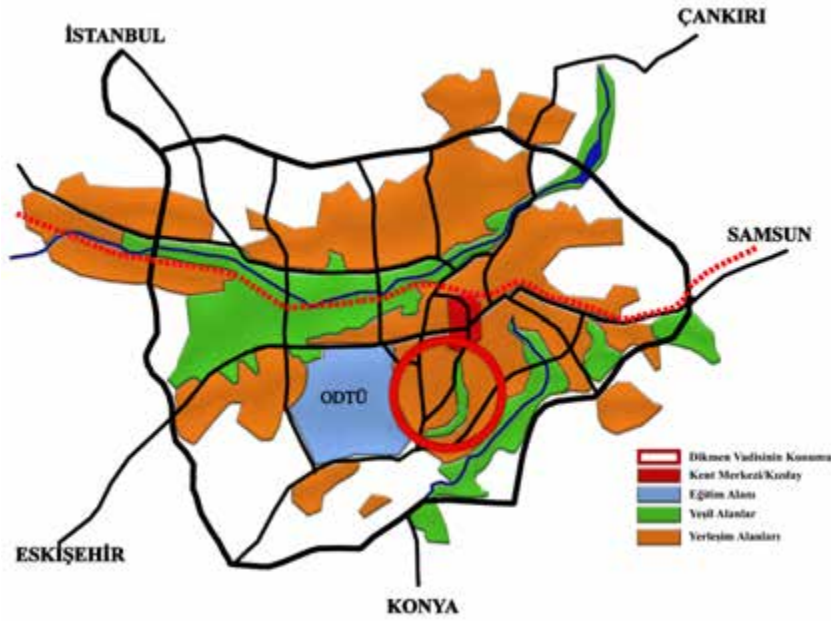


Figure 2: The Location of Dikmen Valley within Ankara (Adapted from Ankara Metropolitan Municipality et al., 1999).

In the aftermath of the 1989 local elections, the Ankara Dikmen Valley Housing and Environmental Development Project was initiated as a comprehensive intervention aimed at addressing this informal settlement. The project constitutes Turkey's first multi-functional urban development initiative, specifically an urban transformation project designed to regenerate informal housing areas. Its overarching aim was to enhance the living environment and improve the quality of life for the resident population and rightful stakeholders within the valley.

Crucially, the planning and preparatory stages of the project deviated from conventional top-down urban planning practices. Instead, a participatory planning approach was adopted, actively involving property owners and other stakeholders in the decision-making process. This inclusive and context-sensitive methodology renders the project a particularly salient case study in the field of urban regeneration.

Accordingly, the implementation of the proposed social sustainability assessment model has been spatially confined to the geographical boundaries encompassing Phases I, II, and III of the Dikmen Valley Housing and Environmental Development Project, as illustrated in Figure 3.



Figure 3: Boundaries of the Study Area

4.2. Scope and Limitations of the Study

For the implementation of the proposed model, the study area was defined as the spatial extent encompassing Phases I, II, and III of the Dikmen Valley Housing and Environmental Development Project. To conduct face-to-face household surveys within this area, separate verbal and written communications were initiated with apartment managers, site administrators, and security personnel.

Despite providing comprehensive information regarding the aim, scope, methodology, and disciplinary relevance of the study, several site and apartment administrations—particularly in Phases I and II—responded unfavourably to the survey request. However, following repeated efforts, access was granted by the management of Çankaya Evleri in Phase I, as well as Çankaya Park Evleri and select homeowner units in Phase II.

Although a formal written request was submitted following an in-person meeting with Phase III management, permission to administer the survey was ultimately denied.

The research sample is composed exclusively of homeowners and tenants residing within the defined study area. No data was collected from individuals outside the project boundary. The survey was administered in four sub-areas: Çankaya Park Evleri, Çankaya Evleri, Yeşil Vadi Street, and Zone 4, which are indicated in Table 2 and Figure 4.

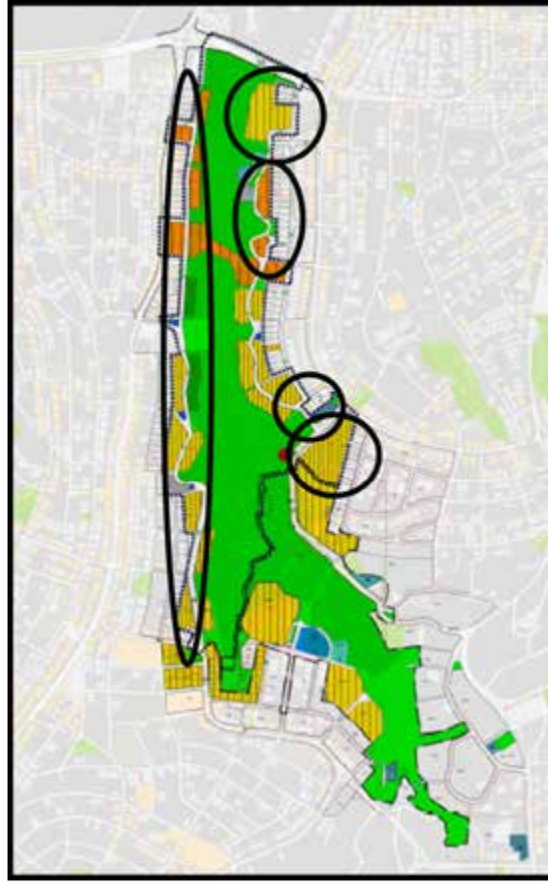


Figure 4: Distribution of Surveys by Area

Table 2: Distribution of Surveys by Area

Area	Number	Percent- age
Çankaya Evleri	23	26,7%
Çankaya Park Evleri	32	19,2%
Yeşil Vadi Sokak	41	34,2%
4. Bölge	24	20,0%
Total	120	100,0%

4.3. Methodology

Method for Measuring Social Sustainability in Dikmen Valley

Within the framework of the Social Sustainability Measurement and Evaluation Model, both quantitative and qualitative research methods were employed to assess the indicators developed to achieve the defined criteria, objectives, and sub-objectives of social sustainability. The data used to measure social Sustainability in Dikmen Valley primarily consists of primary sources. These include spatial data, responses collected through household surveys, and insights obtained from in-depth interviews. A mixed-method data collection approach was adopted in the study.

Secondary data were also utilized to contextualize the findings. These include general household statistics from the Turkish Statistical Institute (TURKSTAT) about Ankara Province and Çankaya District, where Dikmen Valley is located, as well as data extracted from existing literature and prior studies conducted on Dikmen Valley.

The face-to-face survey was conducted between May 2018 and October 2018. During this period, 870 individuals were contacted. Of the completed questionnaires, 120 survey forms that were fully and accurately filled out were included in the final evaluation.

Evaluation Method for Measuring Social Sustainability in Dikmen Valley

To determine the demographic characteristics of survey respondents, a nominal scale was utilized, while a five-point Likert scale was applied to assess perceptions of adequacy regarding various social sustainability indicators. The survey forms included both closed-ended and open-ended questions. Where more detailed insights were needed, open-ended questions were used to support responses to closed-ended items.

During the data collection phase, a Computer-Assisted Personal Interviewing (CAPI) technique was employed. In this approach, the questionnaire was digitized and deployed via tablet devices using specialized software to facilitate real-time data entry and minimize errors. The data obtained through the surveys were processed and analyzed using SPSS version 22.0.

All quantitative and qualitative data derived from spatial assessments and face-to-face interviews were quantified on a five-point Likert scale, assigning scores ranging from 1 to 5. These data were then incorporated into the indicator tables developed for each criterion defined in the proposed model. For each criterion, the average scores of the corresponding objectives and sub-objectives were calculated to determine the level of achievement.

The achievement levels were categorized as follows based on average scores:

- 1.00–1.49: Very Poor
- 1.50–2.49: Poor
- 2.50–2.99: Below Average
- 3.00–3.49: Average
- 3.50–3.99: Above Average
- 4.00–4.49: Good
- 4.50–5.00: Very Good

In the final stage of the model's implementation, a comprehensive synthesis was conducted. This included spatial analysis results, survey data, and findings from in-depth interviews with various stakeholders: professionals involved in the project implementation process, current residents who remained in the area following the completion of the Dikmen Valley Housing and Environmental Development Project (DVHEDP), former residents who were relocated after the project, and community activists.

The assessment of social sustainability across the application area—which encompasses Phases I, II, and III of the DVHEDP—was conducted by evaluating the extent to which the objectives and sub-objectives outlined in the Social Sustainability Measurement and Evaluation Model were achieved.

4.4. Implementation of the Social Sustainability Indicator System in the Context of Dikmen Valley

The measurement and evaluation of social sustainability within the implementation area, encompassing Phases I, II, and III of the Dikmen Valley Housing and Environmental Development Project, are conducted by assessing the extent to which the objectives and sub-objectives defined in the Social Sustainability Measurement and Evaluation Model have been achieved. Within this framework, the indicator system criteria are as follows:

- A. Demographics and Employment
- B. Accessibility
- C. Education and Skills
- D. Health
- E. Housing

- F. Safety
- G. Belonging
- H. Participation
- I. Social Capital and Social Cohesion
- L. Urban Life Quality, Satisfaction And Adequacy Of Services

4.4.1. Demographics and Employment

In addition to revealing the general population profile of Dikmen Valley, the Demographics and Employment criterion is significant in relation to other model criteria, particularly regarding population dynamics, demographic change, development trends, and employment conditions. The objectives defined for this criterion are as follows (Table 3):

- TA(1.1) Ensuring a Balanced Distribution of the Population
- TA(1.2) TA(2) Ensuring the Balance of the Economic Well-Being of the Population

Table 3: Performance Scoring Table: Demographics and Employment

TA(1.1)) Ensuring a Balanced Distribution of the Population by Birthplace			
Indicators	Indicator Definitions	Score	Mean
I(1) The level of distribution of the population by birthp- lace	The level of distance from the birthplace of the population to the ageing area	4.4	4.4
TA (1) Mean			4.4
TA(2) Ensuring the Balance of the Economic Well-Being of the Po- pulation			
TA(2.1) Poverty Prevention			
I(2) Income level distribution of the population	The proportion of the population living be- low the poverty line	2.0	3.4
	The proportion of the population with a monthly income below the minimum wage	4.7	
TA(2.2) Provision of Employment Opportunities			
I(3) The level of employment of the population	I(4) The level of employment of the popu- lation	4.9	4.6
	The proportion of the working population	4	
	The proportion of the working population over 65	5	
TA(2.3) Ensuring Productivity in Employment			
I(4) The level of productivity of employment	Duration of Employment within the Same Organization	2.3	3.2
	Professional Skill Level	4	
TA(2.4) Ensuring Gender Equality in Employment Opportunities			

I(5) Gender equality level in employment opportunities	The ratio of the number of female employees to the number of male employees	1.9	3.6
	The ratio of average women's wages to male wages	4	
	The ratio of the number of unemployed women to the number of unemployed men	5	
TA (2) Mean			3.7
General Mean			4.1

Within the social sustainability indicator system, the achievement level of these two objectives is assessed based on five sub-targets, five indicators, and one indicator definition (Table 3).

According to the research findings, the sub-objective TA(1.1): Ensuring a Balanced Distribution of the Population by Birthplace was fulfilled at a score of 4.4, indicating a good level of achievement. Although the sub-objective TA(2.1): Poverty Prevention received an average score of 3.4 (moderate level), the specific indicator measuring the proportion of the population living below the poverty line was scored at 2.0, indicating a poor and inadequate level of performance. The sub-objective TA(2.2): Provision of Employment Opportunities was found to be fulfilled at a perfect level with a score of 4.6. While the sub-objective TA(2.3): Ensuring Productivity in Employment received an average score of 3.2, the indicator for Level of Tenure at the Same Workplace was rated at 2.3, which falls within the poor level. The sub-objective TA(2.4): Ensuring Gender Equality in Employment Opportunities was scored at 3.6, indicating a good level of achievement; however, the ratio of female to male employees was rated 1.9, corresponding to an upper-moderate level of achievement. Overall, objective TA(1), Ensuring a Balanced Distribution of the Population, was achieved at a reasonable level with a score of 4.4, while objective TA(2), Ensuring the Balance of the Economic Well-Being of the Population, was rated at 3.7, corresponding to an upper-moderate level (Table 3)

4.4.2. Accessibility

The second criterion of the Social Sustainability Measurement and Evaluation Model—Accessibility—serves not only to assess access to basic services but also to evaluate individuals' ability to meet essential needs and access relevant information. Accessibility is a crucial factor in enhancing social interaction and promoting positive social change and development. The objective defined for the Accessibility criterion is as follows:

- TB(1) Ensuring Equality of Access to Basic Urban Services

Within the social sustainability indicator system, the achievement of this objective is assessed through one sub-objective, one indicator, and five indicator definitions.

According to the research findings, the sub-objective TB(1.1) Ensuring Equality of Access to Social Infrastructure, Open Green and Urban Working, under the Accessibility criterion, was achieved with a score of 4.3, indicating a good level of fulfilment. Although the overall objective and sub-objective of the Accessibility criterion were met at a perfect level, the specific accessibility to healthcare facilities was found to be at a poor and insufficient level, with a score of 2.3 (Table 4).

Table 4: Performance Scoring Table: Accessibility

TB(1) Ensuring Equality of Access to Basic Urban Services		
TB(1.1) Ensuring Equality of Access to Social Infrastructure, Open Green and Urban Working		
Indicators	Indicator Definitions	Score
I(6) Access level to social infrastructure areas	Level of access to educational facilities	4.6
	Level of access to health facilities	2.3
	Level of access to cultural facilities	4.5
	Level of access to religious centres	4.9
	Level of access to green spaces	5
General Mean		4.3

4.4.3. Education and Skills

The third criterion of the Social Sustainability Measurement and Evaluation Model—Education and Skills—is a key factor in enhancing societal capacity by improving the overall level of education, developing knowledge and competencies, and increasing employability. The objective defined for the Education and Skills criterion is as follows:

- TC(1) Individual and Social Education, Raising and Promoting The Level of Development

Within the social sustainability indicator system, the achievement of this objective is evaluated through three sub-objectives, five indicators, and five indicator definitions (Table 5).

Table 5: Performance Scoring Table: Education and Skills

TC(1) Individual and Social Education, Raising and Promoting The Level of Development			
TC(1.1) Raising literacy and education levels			
Indicators	Indicator Definitions	Score	Mean
I(7) Literacy level	Adult literacy levels	5	4.5
I (8) Level of education	Latest graduated school levels	3.4	
I (9) Spatial adequacy level of educational facilities	The level of competence of the current situation is according to the standards of educational facilities that should be according to the population	5	
TC(1.2) Promoting Participation in Vocational Education			
I (10) Level of participation in vocational courses	Level of participation in existing vocational courses	1.0	1.0
TC(1.3) Promoting Participation in Talent Development Education			
I (11) Level of participation in talent development courses	Level of participation in existing talent development courses	1.0	1.0
General Mean			2.2

According to the research findings, the sub-objective TC (1.1)- Raising literacy and education levels, under the Education and Skills criterion - was found to be at an outstanding level, with an average score of 4.5. However, the sub-objectives HC(1.2): TC(1.2) Promoting Participation in Vocational Education and HC(1.3): Promoting Participation in Skills Development Programs were both scored at 1.0, indicating an inferior level of achievement. Accordingly, the overall objective HC(1): TC(1.3) Promoting Participation in Talent Development Educations was

found to be at a poor level, with an average score of 2.2, indicating that the objective was not achieved (Table 5).

4.4.4. Health

The fourth criterion of the Social Sustainability Measurement and Evaluation Model—Health—is a critical component for maintaining both individual and societal quality of life, as well as the continuity of community-level activities. The objective defined for the Health criterion is:

- TD(1) Ensuring the Adequacy of Health Services

Within the social sustainability indicator system, the achievement level of this objective is assessed through one sub-objective, two indicators, and three indicator definitions (Table 6).

According to the research findings, the objective TD (1), Ensuring the Adequacy of Health Services, was found to be at a poor and insufficient level, with an average score of 2.05 (Table 6).

Table 6: Performance Scoring Table: Health

TD(1) Ensuring the Adequacy of Health Services			
TD(1.1) Ensuring the Adequacy of Health Services			
Indicators	Indicator Definitions	Score	Mean
I(13) Spatial adequacy level of health facilities	The level of adequacy of the current situation is according to the standards of health facilities should be according to the population	1.3	1.3
I(14) Level of access to health-care	The level of access of local people to health services	3.8	2.8
	The distance level of the health institution to the area that the local people access when they have health problems	1.8	
General Mean			2.05

4.4.5. Housing

The fifth criterion of the Social Sustainability Measurement and Evaluation Model—Housing—is a vital component for sustaining individual and collective daily life activities, as well as for ensuring the continuity of social capacity.

The objective defined for the Housing criterion is:

- TE(1): Ensuring Adequate Housing Conditions for All

Within the social sustainability indicator system, the achievement of this objective is assessed through two sub-objectives, three indicators, and three indicator definitions (Table 7).

According to the research findings, the sub-objective TE(1.1): Increasing Housing Capacity was rated at 3.75, indicating an upper-moderate level of fulfilment.

Similarly, the sub-objective TE(1.2): Improving the Physical Condition of Housing Units received a score of 3.95, also reflecting an upper-moderate level. Accordingly, the main objective TE(1), Ensuring Adequate Housing Conditions for All, was fulfilled at an upper-moderate level with a score of 3.85, indicating that the objective was successfully achieved (Table 7).

Table 7: Performance Scoring Table: Housing

TE(1) Ensuring Housing Conditions for All			
TE(1.1) Ensuring Increasing Housing Capacity			
Indicators	Indicator Definitions	Score	Mean
I (15) Property status of the houses	The ratio of homeownership to tenancy	5	3.75
I (16) The level of affordability of rents with household income	The ratio of average housing rent to average household income	2.5	
HE(1.2) Improving the Physical Condition of Housing			
I (17) Physical condition of the houses	Building status levels of houses	3.95	3.95
General Mean			3.85

4.4.6. Safety

The sixth criterion of the Social Sustainability Measurement and Evaluation Model—Safety—is a crucial component for maintaining both individual and societal life activities, as well as for the continued and safe use of urban space.

The objective defined for the Safety criterion is:

- TF(1): Ensuring Individual Safety

Within the social sustainability indicator system, the achievement level of this objective is evaluated through one sub-objective, three indicators, and seven indicator definitions (Table 7). According to the research findings, the sub-objective TF (1.1): Ensuring Safety in Public and Private Areas was found to be fulfilled at a satisfactory level, with an average score of 4.1. Consequently, the main objective, TF(1): Ensuring Individual Safety, was determined to have been successfully achieved (Table 8).

Table 8: Performance Scoring Table: Safety

TF(1) Ensuring Individual Safety			
TF(1.1) Ensuring Security in Public Spaces and Private Areas			
Indicators	Indicator Definitions	Score	Mean
I (18) Level of security in housing	Level of feeling safe in residences during the day	4.45	4.4
	Level of feeling safe in residences at night	4.3	
I (19) Level of security in public spaces	Level of feeling safe walking on the road during the day	4.25	4.0
	Level of feeling safe walking on the road at night	3.7	
	Level of feeling safe in public spaces during the day	4.05	
	Level of feeling safe in public spaces at night	3.85	
I (20) Level of trust in neighbourly relationships	Level of trust in neighbours	4.1	4.1
General Mean			4.1

4.4.7. Belonging

The seventh criterion of the Social Sustainability Measurement and Evaluation Model—Belonging—is a key component that strengthens individual, spatial, and societal responsibility. It plays a crucial role in establishing and reinforcing connections between people and the places and communities they inhabit, thereby supporting social sustainability. The objective defined for the Belonging criterion is:

- TG(1): Ensuring the Acquisition of Social and Spatial Belonging, Urban Image Awareness, and Cultural Heritage Values

Within the social sustainability indicator system, the achievement of this objective is evaluated through three sub-objectives, four indicators, and six indicator definitions.

According to the research findings, the sub-objective TG(1.1): Ensuring Social and Spatial Belonging was rated at 3.5, reflecting an upper-moderate level of achievement.

The sub-objective TG(1.2): Creation Urban Image Awareness scored 3.95, also indicating an upper-moderate level. In contrast, the sub-objective TG(1.3): Creating Awareness of Conservation of Heritage Values was rated at 1.7, which reflects an inferior and insufficient level. As a result, the main objective, Ensuring the Acquisition of Social and Spatial Belonging, Urban Image Awareness, and Cultural Heritage Values (HG (1)), was found to be achieved at a moderate level, with an average score of 3.05 (Table 9).

Table 9: Performance Scoring Table: Belonging

TG(1) Ensuring the Acquisition of Social, Spatial Belonging, Urban Image, and Heritage Values			
TG(1.1) Ensuring Social and Spatial Belonging			
Indicators	Indicator Definitions	Score	Mean
I (21) The level of belonging of local people to the society they live in	The level of local people’s feeling like part of society	4.0	3.5
I(22) The level of the local people’s sense of belonging to the area where they live	The level of life expectancy in the area	2.4	
	The level of feeling of belonging to the place they live	4.0	
TG(1.2) Creation of Urban Image Awareness			
I (23) Awareness level of local people about the changing conditions of the area	The level of desire for the area to improve its urban image	3.9	3.95
	The level of thinking that the urban image of the area has improved with the project	4	
TG(1.3) Creating Awareness of Conservation of Heritage Values			
I (24) Level of activities that contribute to the conservation of heritage values	Level of awareness of activities related to the protection of natural heritage in the area of living	1.7	1.7
General Mean			3.05

4.4.8. Participation

The eighth criterion of the Social Sustainability Measurement and Evaluation Model—Participation—is a vital component of social sustainability, as it enhances individual, spatial, and societal responsibility and supports the establishment and integration of relationships between people and their living environments. The objective defined for the Participation criterion is:

- TH(1) Promoting Public Participation in Management, Planning Processes, and Works Related to Municipal Services

Within the social sustainability indicator system, the achievement of this objective is assessed through three sub-objectives, six indicators, and seven indicator definitions.

According to the research findings, the sub-objective TH(1.1) Ensuring Participation in Country and Local Government received a score of 4.8, indicating a very high level of achievement. However, the sub-objective TH(1.2) Ensuring Public Participation in the Planning Process was rated 1.0, and the sub-objective TH(1.3) Ensuring Transparency in Works Related to Municipal Services was rated 1.1, both reflecting an inferior level of performance. Consequently, the overall objective TH(1) Promoting Public Participation in Management, Planning Processes, and Works Related to Municipal Services was found to be not achieved, with an average score of 2.3, corresponding to a poor level of fulfilment (Table 10).

Table 10: Performance Scoring Table: Belonging

TH(1) Promoting Public Participation in Management, Planning Processes, and Works Related to Municipal Services			
TH(1.1) Ensuring Participation in Country and Local Government			
Indicators	Indicator Definitions	Score	Mean
I (25) Level of participation in the country's administration	Level of participation of local people in general elections	4.8	4.8
I (26) Level of participation in local government	Level of participation of local people in local elections	4.8	
TH(1.2) Ensuring Public Participation in the Planning Process			
I (27) Level of public participation in the project design process	Level of participation of local people in the project design process	1	1
I (28) Level of public participation in the completion of the final project	Level of participation of local people in the completion of projects	1	
I (29) Level of public participation in the monitoring process of the project	Level of participation of local people in monitoring of projects	1	
	The level of ability of local people to influence the decisions made in the area where they live	1	
TH(1.3) Ensuring Transparency in Works Related to Municipal Services			
I (30) Level of knowledge of local people about municipal works	Level of informing the local people about the municipal work	1.1	1.1
General Mean			2.3

4.4.9. Social capital and social cohesion

The ninth criterion of the Social Sustainability Measurement and Evaluation Model—Social Capital and Social Cohesion—is a key element of social sustainability. It reflects individuals' sense of belonging to their community, their involvement in local initiatives, participation in collective social efforts, and engagement with others in their environment. The objectives defined for the Social Capital and Social Cohesion criterion are:

- TI(1) Ensuring The Level of Social Development and Social Interaction
- TI(2) Ensuring Diversity and Cultural Integration

Within the social sustainability indicator system, the achievement of these objectives is evaluated through three

sub-objectives, five indicators, and eight indicator definitions.

According to the research findings, the sub-objective TI(1.1) Increasing Social Development was found to be at an inferior level, with an average score of 1.0. The sub-objective TI(1.2) Level of Social Interaction received a score of 2.8, indicating a lower-moderate level. Consequently, the main objective, TI(1) Ensuring the Level of Social Development and Social Interaction, was not achieved, with an overall average of 1.9, corresponding to a poor level.

Additionally, the sub-objective TI(2.1) Ensuring Cultural Diversity and Cultural Integration was rated at 1.4, indicating a very poor level, and the main objective TI(2) Ensuring Diversity and Cultural Integration was also found not to be achieved (Table 11).

Table 11: Social capital and social cohesion

TI(1) Ensuring The Level of Social Development and Social Interaction			
TI(1.1) Increasing Social Development			
Indicators	Indicator Definitions	Score	Mean
I(31) Level of participation in information studies	Level of participation in the information studies organized about the area of living	1	1
I (32) Level of participation in social awareness studies	Level of participation in social awareness studies	1	1
	Level of voluntary involvement in any association/non-governmental organization (NGO)	1.1	
	Level of involvement in an association related to the Dikmen Valley Housing and Environmental Development Project (DVHEDP)	1	
TI (1.1) Mean			1
TI(1.2) Level of Social Interaction			
I(33) Level of interaction in public space	Level of going to public space	1.6	2.1
	Level of communication with neighbours in public space	2.6	
I(34) Level of social interaction by gender	The ratio of men who go to the public space to women who go to the public space	3.5	3.5
TI (1.2) Mean			2.8
TI (1) Mean			1.9
TI(2) Ensuring Diversity and Cultural Integration			
TI(2.1) Ensuring Cultural Diversity and Cultural Integration			
I(35) Level of the interaction of people of different cultural structures	Level of collaboration with people of different ethnic backgrounds/identities	1.4	1.4
TI (2) Mean			1.4
General Mean			1.7

4.4.10. Urban life quality satisfaction and adequacy of services

The tenth criterion of the Social Sustainability Measurement and Evaluation Model— Urban life quality satisfaction and adequacy of services—is a critical element of social sustainability, as it contributes to individual and societal well-being, happiness, equity, and a sense of sufficiency.

Table 12: Social capital and social cohesion

TL(1) Ensuring the Satisfaction of the Local People in the area they live in and the Adequacy of the Services Provided			
TL(1.1) Ensuring Satisfaction with the Quality of Urban Life			
Indicators	Indicator Definitions	Score	Mean
I(36) Level of satisfaction with environmental quality	Level of satisfaction with the quality of the natural environment	3.8	3.8
	Level of satisfaction with the quality of the built environment	3.8	
I(37) Level of satisfaction with housing and living conditions	Level of satisfaction with the standard of housing	4.3	4.2
	Level of satisfaction with the residence	4.2	
	Level of satisfaction with living conditions	4.2	
I(38) Level of satisfaction with social areas	Level of satisfaction with open and green areas	4.1	4.0
	Level of satisfaction in sports areas	3.7	
	Level of satisfaction in the religious areas	4.0	
I(39) Level of satisfaction with economic opportunities	Level of satisfaction with employment opportunities	3.6	3.6
I(40) Level of satisfaction with safety conditions	Level of satisfaction with personal security	4.0	4.0
I(41) Satisfaction level of participation in decision-making processes related to the area of living	Level of participation in decision-making processes and planning related to the area of living	3.3	3.3
TL(1.1) Mean			3.8
TL(1.2) Ensuring the Adequacy of Urban Services			
I(42) Adequacy level of educational services	Adequacy level of educational services	3.5	3.3
	Adequacy level of cultural facilities	3.4	
	Adequacy level of library services	3.0	
I(43) Adequacy level of recreation areas	Adequacy level of entertainment areas and areas for spending time	3.6	3.6
I(44) Adequacy level of economic opportunities	Adequacy level of employment opportunities	3.4	3.4
I(45) Adequacy level of social services	Adequacy level of social services	3.5	3.5
TL(1.2) Mean			3.5
General Mean			3.6

The objective defined for this criterion is:

- TL(1) Ensuring the Satisfaction of the Local People in the area they live in and the Adequacy of the Services Provided

Within the social sustainability indicator system, the achievement of this objective is evaluated through two sub-objectives, ten indicators, and seventeen indicator definitions.

According to the research findings, the sub-objective TL(1.1), Ensuring Satisfaction with the Quality of Urban Life,

was scored 3.8, and the sub-objective TL(1.2), Ensuring the Adequacy of Urban Services, was scored 3.5, both corresponding to an upper-moderate level of achievement. Consequently, the main objective TL(1), Ensuring the Satisfaction of the Local People in the area they live in and the Adequacy of the Services Provided, was determined to be achieved, with an average score of 3.6, indicating an upper-moderate level of fulfilment (Table 12).

4.4.10. Result and Discussion

According to the research findings, within the implementation area of the Dikmen Valley Housing and Environmental Development Project (DVHEDP), the criteria of the social sustainability indicator system were evaluated based on their average scores. The criteria of Demographics and Employment (4.1 points), Accessibility (4.3 points), and Safety (4.1 points) were found to be at a reasonable level, with average scores exceeding 4.

The criteria of housing (3.85 points) and urban life quality satisfaction and adequacy of services (3.6 points) were determined to be at an upper-moderate level.

The Belonging criterion scored 3.05, corresponding to a moderate level. In contrast, the criteria of Education and Skills (2.2 points), Health (2.05 points), Participation (2.3 points), and Social Capital and Social Cohesion (1.7 points) were identified as being at a poor level of achievement (Figure 5).

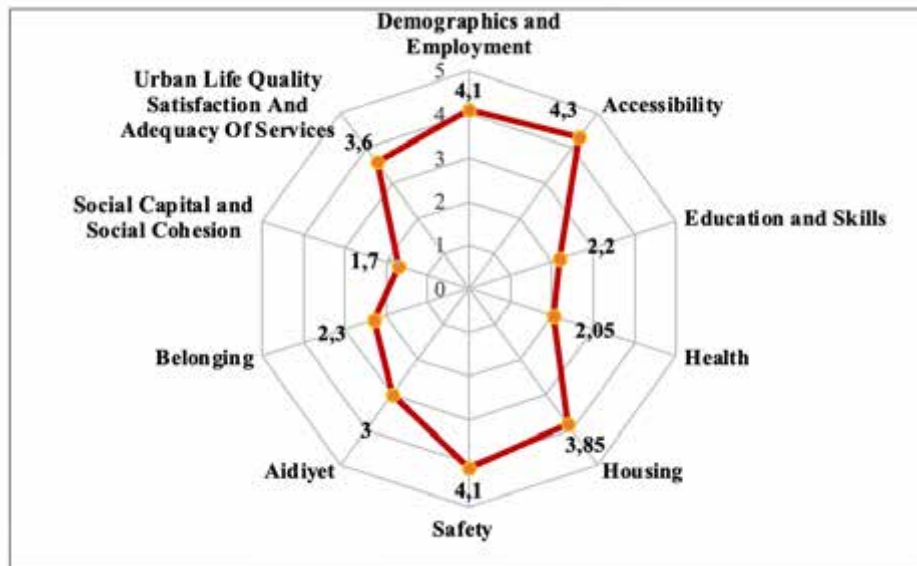


Figure 5: Assessment Scores of the Social Sustainability Indicator Framework

According to the research findings, within the implementation area of the Dikmen Valley Housing and Environmental Development Project (DVHEDP), the criteria of Demographics and Employment, Accessibility, and Safety achieved high average scores. They were determined to be at a reasonable level, indicating that the corresponding objectives and sub-objectives were successfully met.

In terms of Demographics and Employment, it was found that before the implementation of DVHEDP, the area was an informal settlement. Following the project, the original right holders began residing in planned housing, which resulted in a homogeneous population structure in terms of population balance and economic welfare, with limited heterogeneity.

For the Accessibility criterion, the integration of social infrastructure within the project's planning boundaries and surrounding areas ensured that the population's needs were met within walking distance.

The Safety criterion was also met, mainly due to the presence of security personnel in building complexes and gated areas developed under DVHEDP, as well as the restriction of unauthorized access to these zones.

Regarding Housing and Urban life quality satisfaction and adequacy of services, the criteria were found to be at an upper-moderate level. All buildings in the area were newly constructed as part of the DVHEDP, leading to an improvement in their physical condition. High homeownership rates contributed to achieving housing capacity objectives. The findings for Urban Quality of Life and Services reflect satisfaction with environmental quality, housing and living conditions, recreational areas, and safety—demonstrating the spatial benefits of the DVHEDP.

Although the Sense of Belonging criterion met its objectives and sub-objectives at a moderate level, the lack of awareness regarding the preservation of heritage values within the area was identified as a shortcoming. Given the valley's natural and ecological significance, it is necessary to increase residents' awareness and engagement in preserving the area.

The criteria that failed to achieve the defined objectives and sub-objectives in terms of social sustainability include Education and Skills, Health, Participation, and Social Capital and Social Cohesion, each scoring poorly.

For Education and Skills, despite the relatively low number of employed women in the area, participation in vocational and skill development programs was almost non-existent. This harmed the overall level of personal and community development. Promoting participation in such programs is essential to improving this criterion.

In the Health criterion, the lack of sufficient health facilities within the effective service radius and the distant location of existing health institutions from the population were the primary reasons for failing to meet health-related objectives. Although new facilities were proposed in the DVHEDP master plan, they were not implemented. Ensuring the construction of appropriately scaled facilities is essential for fulfilling the criteria's goals.

Under the Participation criterion, while residents were found to engage in national and local governance, they did not actively participate in neighbourhood-related planning processes. Therefore, the sub-objectives related to citizen involvement in planning and transparency in municipal services were not achieved. Encouraging and enabling participation in these processes is a key requirement for social sustainability.

Lastly, Social Capital and Social Cohesion were the weakest-performing criteria, with none of its sub-objectives being met. Actions aimed at enhancing social development interaction and promoting cultural diversity and integration are urgently required to strengthen this dimension.

References

Ankara Metropolitan Municipality, Çankaya Municipality, Metropol İmar Inc. (1999). Dikmen Valley Phase I, Stage III and Yıldızevler Special Project Area Phase II 1/5000 Master Development Plan Revision – Explanatory Report. Ankara Metropolitan Municipality Department of Urban Development. Atalay, 2023

Atalay, H. (2023). A Model Proposal for Measuring and Assessing Social Sustainability in Urban Regeneration Areas: The Case of Dikmen Valley. (Doctoral dissertation). İstanbul Technical University, İstanbul.

Colantonio, A. & Dixon, T. (2009). Measuring Socially Sustainable Urban Regeneration in Europe, Oxford Institute for Sustainable Development, Oxford.

Colantonio, A. & Dixon, T. (2009). Measuring Socially Sustainable Urban Regeneration in Europe, Oxford Institute for Sustainable Development, Oxford.

Chiu, R. (2003). Social sustainability, sustainable development and housing development: The experience of Hong Kong. In R. Forrest & J. Lee (eds.), *Housing and social change: East-west perspectives* (19-24), Routledge.

Cuthill, M. (2010). Strengthening the "Social" in Sustainable Development: Developing a Conceptual Framework for Social Sustainability in a Rapid Urban Growth Region in Australia. *Sustainable Development*, 18 (6), 362-373. <https://doi.org/10.1002/sd.397>

Eizenberg, E., & Jabareen, Y. (2017). Social Sustainability: A New Conceptual Framework. *Sustainability*, 9 (1), 68. <https://doi.org/10.3390/su9010068>

Gülersoy Zeren, N. (2003). Social Housing and Urban Conservation: Case Study on Istanbul Historic Peninsula-Turkey. Partnership for World Heritage Cities: Culture as a Vector for Sustainable Urban Development, UNESCO World Heritage Center, Urbino, Italy, 10-13 November 2002, World Heritage Papers, 9, pp. 54-57.

Littig, B. ve Grießler, E. (2005). Social sustainability: a catchword between political pragmatism and social theory. *International Journal of Sustainable Development*, 8, 65-79.

Woodcraft, S. (2015). Understanding and measuring social sustainability. *Journal of Urban Regeneration and Renewal*, 8 (2), 133-144. <https://doi.org/10.1016/j.sbspro.2012.12.204>

Murphy, K. (2012). The social pillar of sustainable development: A literature review and framework for policy analysis. *Sustainability Science Practice and Policy*, 8 (1), 15-29 <https://doi.org/10.1080/15487733.2012.11908081>