JOURNAL OF DESIGN FOR RESILIENCE IN ARCHITECTURE & PLANNING

Research Article
Online: www.drarch.org
Volume 5, Issue 3, (327-341), 2024
DOI: 10.47818/DRArch.2024.v5i3135

Importance of indicators in sustainable urban transformation: The Bagcılar (Istanbul) sustainability index experience

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Abstract

Sustainable urban transformation practices play a critical role in implementing the economic, environmental, and social dimensions of sustainable development in cities. Sustainability indices are important parameters for achieving sustainable development goals. The use of these indices supports the making of strategic decisions for the future of cities, such as in urban transformation practices. Indicators and data are defined as vital tools for evaluating the success of sustainability policies and monitoring the economic, environmental, and social performance of cities. Establishing more comprehensive and accessible data collection systems at the local level and effectively sharing this data is crucial for developing policies based on these indices. This study highlights the significance of sustainable urban transformation practices within the framework of the Sustainable Development Goals (SDGs), emphasizing the methodologies and challenges encountered during the development of a Sustainability Index tailored to the Bağcılar district in Istanbul. The findings indicate that localized data collection and indicator adaptation are essential for achieving measurable and actionable sustainability targets, despite significant limitations in data accessibility. Bağcılar offers an important area of study in terms of sustainability with its dynamics such as rapid population growth, dense construction and socio-economic differences. Planning urban transformation projects within the framework of sustainability principles is a strategic necessity for Istanbul and similar metropolitan cities. By establishing a system that tracks regular, reliable, and internationally standardized data, it will be possible to create measurable, reportable, and comparable targets for sustainable urban transformation practices. However, in developing countries like Turkey, deficiencies in data collection and analysis processes make it difficult to achieve sustainability goals. This study suggests that improving data collection processes and increasing transparency are fundamental steps to ensuring sustainable urban transformation.

Keywords: Bagcılar, data, indicators, sustainable development goals, urban transformation

1. Introduction

The generally accepted definition of sustainable development is development that "meets the needs of the present without compromising the ability of future generations to meet their own needs." Sustainable development has three main pillars: economic, environmental, and social (Hemphill et al., 2004; Williams & Dair, 2007; Yıkmaz, 2011; Zheng et al., 2014; Tuğaç, 2018; Gavaldà et al., 2023).

Sustainability is a system in which the balance of economic competitiveness, improved environmental performance and social integration is observed. In this context, defining the responsible actors to achieve the determined goals and supporting this process with continuous control and monitoring is of great importance in terms of implementing sustainability. The private sector, national, regional and local actors, and civil society organizations are important actors in the process (Ulubaş Hamurcu & Aysan Buldurur, 2017). One of the organizations that conducts the most comprehensive studies on sustainable development is the United Nations (UN). The UN has set forth the Sustainable Development Goals (SDGs) targeted to be achieved by 2030 under 17

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Article history: Received 15 October 2024, Accepted 15 December 2024, Published 29 December 2024

headings. These goals aim to end poverty, protect the environment, take precautions against the climate crisis, share prosperity fairly and achieve peace (UN, 2019).

Nowadays, urban transformation has become an important element of urban policy in many countries and is closely related to sustainable development (Ulubaş Hamurcu & Aysan Buldurur, 2017; Cappai et al., 2019). Urban transformation, particularly in industrial zones, presents complex challenges that intersect economic, social, and environmental dimensions (Kazmierczak et al., 2007; Zheng et al., 2014; Cappai et al., 2019). Industrial sites can be transformed into functions such as housing, services, tourism, commerce, and knowledge and creativity-based production areas. Sustainability provides an appropriate framework for the transformation of these areas. The transformation of these sites varies depending on the conditions of the country such as legal regulations, and social and economic structures. The urban transformation process involves various planning issues and different stakeholders, and the relationship between them complicates the process. In order to achieve effective and efficient sustainable urban transformation practices, it is first necessary to understand the mechanism behind this process (Zheng et al., 2016). In recent years, many academic studies have frequently emphasized that the transformation of industrial sites should be addressed within the framework of sustainability principles (Hemphill et al., 2004; Hemphill et al., 2004; Zheng et al., 2016; Cappai et al., 2019; Williams & Dair, 2007; Spina et al., 2017). However, fragmented and market-driven redevelopment processes often undermine these objectives, as seen in various industrial case studies (Hemphill et al., 2004; Williams & Dair, 2007).

The concept of sustainable development offers a comprehensive structure with its economic, social and environmental dimensions. Therefore, the effects of changes occurring in these dimensions are quite complex and multifaceted. In addition, the fact that sustainable development has a dynamic and constantly evolving structure makes it even more difficult to understand and evaluate the subject (Yıkmaz, 2011). Therefore, in order to measure progress towards sustainable development, it is necessary to quantify the phenomena that represent this progress (Dizdaroğlu, 2017; Verma & Raghubanshi, 2018). This quantification is done through indicators. Indicators are statistical data or measurements that reflect changes in a particular situation. These indicators are selected to provide information about the functioning of a particular system or purpose and serve to support decision-making and management processes (Hiremath et al., 2013; Dizdaroğlu, 2017; Ay, 2017; Gavaldà et al., 2023). Indicators in sustainable development provide the necessary information to measure environmental, economic and social progress (Yıkmaz, 2011; Verma & Raghubanshi, 2018) (Verma & Raghubanshi, 2018). Thanks to this information, decision makers and the public can understand the status, weaknesses and strengths on the way to achieving sustainability goals. (Verma & Raghubanshi, 2018). Thanks to indicator-based sustainability assessment, it is possible to find the best policy measures for sustainable development by providing feedback (Dizdaroğlu, 2017).

1.1. Aim and Objectives

1.1.1. Aim

This study aims to reveal that sustainable urban transformation practices are of critical importance for sustainable development and the necessity of using sustainability indexes in decision-making processes regarding these practices.

1.1.2. Objectives

This study aims to emphasize the critical importance of sustainable urban transformation practices in terms of sustainable development goals through the experiences gained in the process of establishing the sustainability index in Bağcılar district, one of the more densely populated urban areas of Istanbul. Bağcılar offers an important area of study in terms of sustainability with its dynamics such as rapid population growth, dense construction and socio-economic differences. In line with this purpose, the objectives of the study are as follows:

a. To emphasize the critical importance of sustainable urban transformation practices in terms of sustainable development.
b. To propose the establishment of more comprehensive and accessible data collection systems at the local level.
c. To demonstrate the significance of achieving these goals based on the experiences gained during the process of establishing a sustainability index in Bağcılar, one of Istanbul's densely populated urban areas.

1.2. Research Questions

a. What data is required for the sustainability index?
b. How and where can this data be collected?
c. Do local and central governments produce comprehensive and accurate data? If so, is it shared and accessible?

2. Literature Review

2.1. Sustainable Urban Transformation and the Role of Indicators

The importance of sustainability assessment in urban transformation practices has been recognized by many researchers (Hemphill et al., 2004; Zheng et al., 2014; Huang et al., 2015; Zheng et al., 2016; Ulubaş Hamurcu & Aysan Buldurur, 2017; Ayık et al., 2021). Indicators play a critical role in revealing in which areas a city performs better than others and how it will be evaluated according to certain targets (Hemphill et al., 2004) (Hiremath et al., 2013). Sustainability assessment based on indicators is increasingly recognized as an important tool in the planning process. Indicators have the potential to provide a basis for informing planning actions and assessing the sustainability of planning outcomes (Hemphill et al., 2004; Zheng et al., 2014; Dizdaroğlu, 2017).

In the literature on sustainability indicators, a distinction is often made between the terms data, indicator, and index. These terms form a conceptual hierarchy (or pyramid) of indicators (Figure 1). While data represents the key components of an indicator, multiple indicators form an indicator set or composite index. An indicator is an “operational representation of an attribute” of a system, while an index is a more complex composite variable in which multiple indicators are combined using various normalization and weighting methods (Huang et al., 2015).

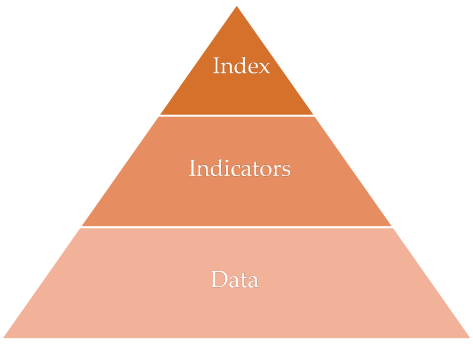

Figure 1 Pyramid of sustainability indicators (Huang et al., 2015)

While the importance of indicators for both sustainable development and sustainable urban transformation practices is emphasized in the literature, another important issue is the data at the bottom of the sustainability pyramid in Figure 1. Although all these stages and their importance are agreed upon in the literature, the importance of obtaining data in calculating sustainability indices is not emphasized enough. The availability of data is an important issue when creating indicators (Michael et al., 2014). It is observed that developing countries face various difficulties in measuring sustainable development. Among these difficulties, problems such as lack of institutional infrastructure and policy coherence, insufficient knowledge and experience regarding the environment, and limited statistical data stand out (Yıkmaz, 2011). For example, in Africa and Asia, where 90% of urban growth is expected to occur by 2050, insufficient urban data is a significant

problem in many cities (Klopp & Petretta, 2017). In some cases, even if data exists, it is inaccessible and unprocessable. It is emphasized that the proliferation of new technologies and big data is important to solve the problem of data deficiency and insufficient data collection capacities (United Nations, 2013). In recent years, big data and the effective management of this data, which have frequently come to the fore in the context of smart cities, have emerged as one of the most critical elements in urbanization processes as a result of research. The complex network structure of the city poses a significant challenge in the processes of storing, processing and managing big data. However, it is envisaged that these challenges can be overcome more effectively by supporting them with advanced technologies such as advanced remote sensing techniques. In addition to facilitating big data management, these technological solutions can also make significant contributions to making cities more sustainable, efficient and livable (Klopp & Petretta, 2017; Ayık et al., 2021). However, on the other hand, although big data and the smart cities movement offer the potential to produce new data, who collects these data, how they are used, and how these processes affect social participation and accountability are issues that need to be considered (Klopp & Petretta, 2017). Therefore, indicators should make the sustainable development of the city more visible and transparent, support comparison, evaluation and forecasting, help create and harmonize data banks, provide relevant information for decision-making processes, and increase public participation (Hiremath et al., 2013). It is envisaged that cities of the future will be able to achieve their sustainability goals more comprehensively and effectively thanks to advanced big data management (Ayık et al., 2021). These advanced data management approaches will enable cities to respond faster and more accurately to environmental, social and economic sustainability parameters, thus enabling sustainable urban transformation practices.

It is not enough to just sign international agreements to combat climate change. In order to make the calculations required by these agreements, the necessary data must be published in an open and transparent manner. Having this data accessible in both developed and developing countries will increase the effectiveness of sustainability efforts. Therefore, the importance of data collection should be emphasized when creating sustainability indices and the necessary steps should be taken in this regard. However, especially in developing countries such as Turkey, the difficulties of data collection pose a major problem in the production and implementation of sustainability policies. The purpose of this article is to emphasize the importance of obtaining data first in order to calculate sustainability indices.

The United Nations Sustainable Development Goals (SDGs) contain roadmaps for countries worldwide to achieve their sustainability goals, and the collection, reporting and analysis of data in line with these goals is of great importance. Turkey has also adopted these SDGs and publishes its data at the national level through institutions such as TÜİK. However, there are major deficiencies and difficulties in collecting and analyzing data at the local level, on a provincial, district or neighborhood basis.

In large metropolises like Istanbul, not only structural transformation decisions but also functional transformation decisions can have major impacts in terms of sustainability. However, the lack of data required to analyze the impacts of these transformations on sustainability poses a major obstacle. When field studies are required to access data, the data collection process becomes quite laborious and complicated, as the data is located in different units of different institutions. This situation makes it difficult to analyze any region with economic, environmental and social indicators and to make strategic decisions about the future of the city. Moreover, instead of such scientific analyses, the transformation of cities in line with the investment preferences of capital groups jeopardizes the achievement of sustainability goals. In the current period, when we are faced with global crises such as climate change, not being informed about the limited resources of cities is an important problem in the context of planning and managing cities. The inability to analyze the social structure makes this situation more complicated.

Nations (UN) is an international organization founded in 1945 and currently consists of 193 Member States. The document titled "Transforming Our World: 2030 Agenda for Sustainable

Development" was signed by UN member countries, including Turkey, and entered into force in January 2016. The Sustainable Development Goals (SDGs), which focus on solving problems related to three main global issues (economic development, social justice and environmental protection) for 15 years covering the period 2016-2030, are a roadmap covering common goals and targets. The Sustainable Development Goals consist of 17 main headings such as combating climate change, ensuring gender equality, spreading quality education, responsible production and consumption all over the world. 169 goals were determined to achieve these goals, and then global indicators were selected to monitor the level of progress towards these goals and targets (UN, 2019).

When the 169 goals in question are examined, it is seen that the realization of 105 of them can be possible with the inclusion of local governments in the process. Local governments are key actors in sustainable development because they are close to the people and have a grasp of all the problems and solutions of the region. Indeed, the fact that the 11th SDG is directly related to "livable and sustainable cities and communities" is a sign of the importance of local governments. Local governments have two basic roles in this process: the first is the overlap of the local development policies of cities with global goals; the second is the contribution that local governments will make to these goals through their actions (Marmara Municipalities Union, 2022).

2.2. Sustainable Urban Transformation Approach in Turkey

The United Nations (UN) is an international organization founded in 1945 and currently consists of 193 Member States. The document titled "Transforming Our World: 2030 Agenda for Sustainable Development" was signed by UN member countries, including Turkey, and entered into force in January 2016. The Sustainable Development Goals (SDGs), which focus on solving problems related to three main global issues (economic development, social justice and environmental protection) for 15 years covering the period 2016-2030, are a roadmap covering common goals and targets. The Sustainable Development Goals consist of 17 main headings such as combating climate change, ensuring gender equality, spreading quality education, responsible production and consumption all over the world. 169 goals were determined to achieve these goals, and then global indicators were selected to monitor the level of progress towards these goals and targets (UN, 2019).

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Since 2016, various self-assessment reports have been planned to be prepared in order to monitor the targets and indicators. Turkey submitted its first Voluntary National Assessment Report (VNR) in 2016 and included a roadmap containing the steps planned to implement the SDGs. The 2nd VNR Report presented in 2019 focuses on progress in the SDGs. In addition to the VNR reports at the national level, many new steps have been taken for the implementation of the Sustainable Development Goals (SDGs) and the evaluation of indicators, especially as of 2022. The most important of these is that the "National Sustainable Development Coordination Board" was established within the Strategy and Budget Presidency by being published in the Official Gazette dated 19.07.2022 and numbered 31897. In addition, as of 24.12.2022, the "Sustainable Development Indicators Web Portal" was put into service by TUİK in order to publish sustainable development indicators more effectively.

At the same time, the Twelfth Development Plan emphasized the main objective as "Creating smart, safe, sustainable cities and settlements that are resilient to climate change and disasters, have qualified settlement areas compatible with historical and cultural heritage, provide accessible urban services for everyone, have high quality of life, and are based on green and digital

technologies" (Presidency of the Republic of Turkey, Strategy and Budget, 2024, p.206). The urban transformation projects aimed to create settlement areas that are suitable for the needs of the social structure and sustainable urbanization characteristics and are resilient to disasters. It was also stated that the information system infrastructure that will enable the relevant stakeholders to monitor project data related to urban transformation applications on a national scale will be developed (Presidency of the Republic of Turkey, Strategy and Budget, 2024, p.205-206).

In Turkey, urban transformation projects have come to the fore as one of the tools to create disaster-resistant settlement areas, especially with the effects of the Marmara and Düzce Earthquakes (Kuyucu & Ünsal, 2010; Penpecioglu, 2013; Genç, 2014). The importance of disaster-resistant cities has been revealed once again with the Kahramanmaraş Central Earthquakes of February 6, 2023. As emphasized in the Twelfth Development Plan, in the reports prepared at the national level, urban transformation applications in our country are seen as an important tool for both disaster-resistant cities and sustainable urbanization.

However, under the influence of neoliberal policies, urban policies have been adopted since the 2000s to make Istanbul a "global city". Accordingly, when the urban transformation practices and relevant legislation are examined, it is seen that the common point of urban transformation projects is that they are disconnected from planning, do not take into account the social, economic and environmental dimensions of the city, and only include fragmented physical arrangements (Balaban, 2012; Karaman, 2013; Penpecioglu, 2013; Şen & Öktem Ünsal, 2014; Sakızlıoğlu, 2014; Kuyucu, 2018; Topala et al., 2019; Tarakçı & Türk, 2020). Rising land prices in rapidly growing cities, the demand for new functions and high-density construction for industrial areas that have lost their functions or have been moved out of the city, and the emergence of more dense construction demands for residential settlements built with or without a permit have accelerated urban transformation practices (Kocabaş, 2005). Especially with the Law No. 6306 on the Transformation of Areas at Disaster Risk, which entered into force in 2012, urban transformation has become an important policy that directs urban development. In particular, many large-scale, mixed-use, prestige projects based on redevelopment are being carried out by the private sector in Istanbul, and industrial areas are the ones most subject to transformation within the scope of the law due to their large plots of land (Tarakçı & Olcay, 2022). The socio-spatial structure and functional-sectoral dynamics of urban areas are also changing with these projects (Özcan, 2016).

It is clear that urban transformation practices carried out with this approach cannot be a solution to the expectation of sustainable development. Urban transformation practices in our country have the potential to be a tool for the creation of sustainable settlement areas. However, importance should be given to urban transformation practices being utilized within a balanced and holistic system structure that gives equal importance to the three components of sustainability. Decisions taken at the national level and the principles and policies developed in line with these decisions will play a critical role in solving the problems encountered. However, in order to ensure the effectiveness of these policies and principles, they must be measurable, therefore controllable and evaluable. Despite this, concrete indicators for measuring the performance of urban transformation policies and principles have not yet been defined, and a comprehensive study has not been initiated in this area (Ulubaş Hamurcu & Aysan Buldurur, 2017). It is seen that the Sustainable Development goals, targets and indicators put forward by the UN, adopted by institutions in Turkey and included in official documents, provide an important framework and data set that can be used in sustainable urban transformation studies (Olcay & Tarakçı, 2021).

3. Methods and Materials

This study adopts a mixed-method approach, integrating both qualitative and quantitative data to assess the sustainability dimensions of urban transformation in Bağcılar. A comprehensive review of existing studies on sustainable urban transformation, sustainability indices, and the application of these frameworks in urban areas was conducted. The review also focused on the Sustainable Development Goals (SDGs) and their relevance to urban transformation in Istanbul.

Bağcılar was selected as a case study because, while manufacturing areas have been rapidly transformed into functions such as luxury housing, offices, and hotels in recent years, the manufacturing sector still continues to exist.

The transformation of manufacturing areas such as Bağcılar, where manufacturing activities continue, within the framework of the sustainability principle, is important in terms of the correct use of the city's resources. Therefore, between August 1, 2022, and August 1, 2024, we conducted a research project titled “Sustainable Development and Transformation Model of Manufacturing Industry Zones in Cities: The Case of Bağcılar District, Istanbul.” Within the scope of this project, we aimed to examine the transformation of manufacturing areas into functions such as luxury residential, office, and hotel functions in Mahmutbey, 15 Temmuz, and Bağlar neighborhoods, which cover an area of approximately 662 hectares and are located in the Basın Ekspres Axis, where manufacturing has developed and transformed intensively in the district, within the scope of sustainability (Figure 2). This article evaluates the preparation process of the index created using sustainability indicators.

A detailed literature review was conducted to determine the sustainability index indicators. After this research, the sustainability indicators of the UN were selected. Then, the Delphi method was employed to localize and refine the sustainability indicators, and the indicators were weighted with the Analytical Hierarchy Process (AHP). The indicators were weighted by experts consisting of urban planners, academics, sector representatives and NGO representatives through structured forms. In addition, in-depth interviews were conducted with the Istanbul Chamber of Industry (ISO), the Istanbul Chamber of Commerce (ITO) and various companies in order to understand the quality and quantity of the companies in the region. In-depth analyses of the current situation were conducted to prepare the sustainability index. Then, data on the indicators were collected. For this purpose, first of all, face-to-face interviews were conducted with various public institutions and organizations such as the municipality, the Provincial Directorate of Environment and Urbanization, ISO, ITO, TUİK, and data related to the research topic were collected. Data that could not be obtained through these interviews were obtained by conducting surveys with structured forms with the companies in the region.

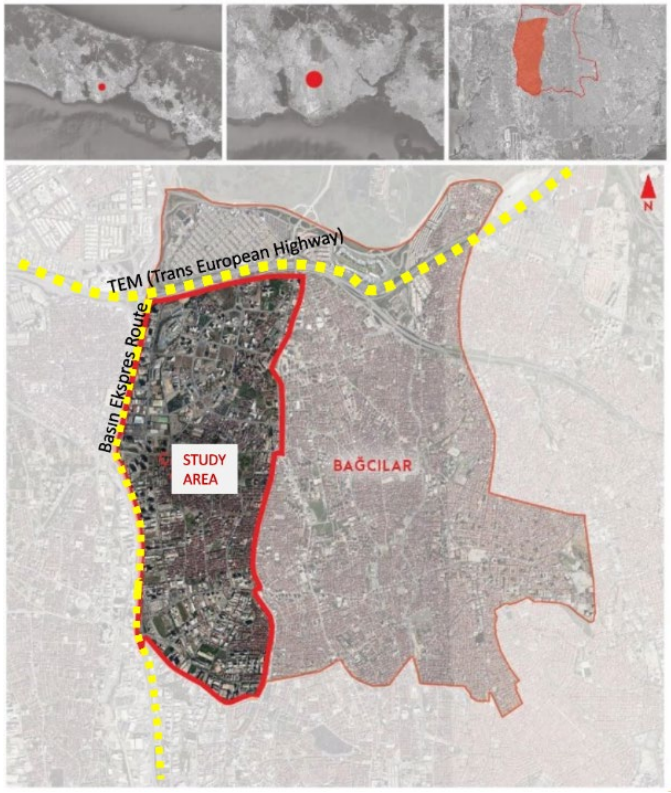

Figure 2 Location of Bagcılar district and the study area

4. Results and Findings

4.1. Transformation of Industrial Areas and Sustainability in Bagcılar

While Bağcılar district had been a village with vineyards and gardens until the 1950s, it started to become a shanty town in the 1960s and entered a rapid urbanization process (Bağcılar Municipality, 2008). The development of the region, which initially consisted of low-density villages, accelerated from the 1970s onwards. In the 1980s, the opening of the Bosporus Bridge connecting the Asian and European continents, the opening of the TEM and E-5 Highways and the Basın Ekspres Axis connecting these roads, and the provision of important transportation opportunities, led to the settlement of industrial companies in the region. After the 1980s, parallel to the opening of the economy to the outside world and the development of export-oriented industry in Turkey, industrialization accelerated in Bağcılar and production for export began. With the increase in production and job opportunities in the region, Bağcılar district became one of the regions that received the largest share of the rural-urban migration in Turkey in the 1980s. While the population of Bağcılar was 9,688 in the 1970 census, there was an extraordinary increase of approximately 5500 percent between 1970 and 2000. This high population growth has continued to the present day, and Bağcılar has become one of the most densely populated districts of Istanbul (Olcay & Tarakçı, Sustainability Index as a Tool in the Transformation of Manufacturing Areas, 2021). Today, Bağcılar district, one of the most important trade and industrial centers of Istanbul, contains small and large workshops, commercial establishments, factories and trade centers. In Bağcılar, which hosts a significant portion of the weaving, textile and clothing industry enterprises and employment in Istanbul, especially Bağlar, 15 Temmuz, Mahmutbey and Güneşli neighborhoods stand out (Olcay & Tarakçı, Sustainability Index as a Tool in the Transformation of Manufacturing Areas, 2021). As a result of the rapid migration experienced in the region along with rapidly increasing industrialization, shanty settlements have also increased.

In the 2000s, Bağcılar became a region faced with environmental pollution, and population and building density problems brought by industry. On the other hand, the neoliberal policies that the state followed in parallel with the globalization processes in the world and supported the real estate sector were reflected in the region. Accordingly, industry began to be decentralized from parts of Bağcılar with planed decisions. The existing industrial areas in Mahmutbey, 15 Temmuz and Bağlar Neighborhoods located in the west of the district were determined as Prestige Service Areas and Central Business Districts. Prestige service areas were planned as areas where international companies and media management functions, accommodation facilities, residence housing structures, business centers, offices, bureaus, shopping malls, etc. would be located (Bağcılar Municipality, 2008). Central Business Districts were planned to be divided into two and a part of them was planned to continue production in smoke-free, waste-free industrial areas that did not pollute the environment. In this way, the plans in question enable both the continuity of industrial areas in the region and their transformation into the real estate sector. Instead of providing a vision for the region, the plans allowed development to be left to market conditions and paved the way for investors to make the most profitable investment. The large plots of industrial areas attracted the attention of the real estate sector and were transformed into prestige service areas, residence housing structures, business centers, offices, bureaus and shopping centers (Sarp et al., 2019; Olcay & Nurtekin , 2020). Prestige structures are being built in place of industrial areas, especially in the Basın Ekspres Axis (Sarp et al., 2019). The increase in land values after 2010 and the attraction of large industrial parcels by investors increased transformative pressure on the axis (Olcay & Tarakçı, 2021; Tarakçı & Olcay, 2022). However, in this process, the effects of the economic, environmental and social transformation of the region on the city were ignored. This situation clearly shows that the demands of investors are prioritized in the transformation process and the factors that are critical for sustainable development are neglected. However, the development and transformation of manufacturing areas such as Bağcılar, where production activities continue within the framework of the sustainability principle, is extremely important in terms of the correct use of the city's resources. Therefore, it is important to create a sustainability index based on economic,

environmental and social indicators to examine this functional change in the region within the framework of sustainability principles. In this context, three neighborhoods (Mahmutbey, 15 Temmuz and Bağlar Neighborhoods) covering an area of approximately 662 hectares parallel to the Basın Ekspres Axis in Bağcılar district, where both manufacturing continues and urban transformation is intense, were determined as the study area.

4.2. Selection of Indicators and Data Collection Framework for Sustainability Analysis

In this study, firstly, field work was conducted between October and December 2022 and function analyses were conducted to reveal the spatial distribution of different sectors in the region. Then, data on industrial companies operating in the region were obtained from the Istanbul Chamber of Industry, and plans and company information on areas transformed into real estate sectors such as offices, luxury housing, hotels, and residences in the manufacturing sector were obtained from the Bağcılar Municipality. In order to examine the dynamics of the development of manufacturing in the region and its transformation into a service sector, face-to-face interviews were conducted with companies using semi-structured forms between January and June 2023. The companies to be interviewed were determined within a sample framework created by considering sub-sectors and workforce size. Interview questions were asked about the qualifications of the companies, location selection, reasons for coming to and staying in the region. Similarly, company qualifications, location selection, and function selection issues were examined in the interviews with real estate companies. Based on these field analyses and in-depth interviews, a SWOT analysis was conducted to reveal the strengths and weaknesses of the region, thus comprehensively analyzing the development and transformation dynamics of the region.

In order to understand the extent to which the development of a region is sustainable, it is important to prepare an index that consists of a wide range of variables and brings together performances in different dimensions (Dizdaroğlu, 2017; Klopp & Petretta, 2017; Ayık et al., 2021). In order to examine the sustainability of the region in terms of industrial and real estate sectors, it was first established which indicators would be used to make these evaluations. Since the importance of determining the indicators is frequently emphasized in the literature (Hemphill et al., 2004; Williams & Dair, 2007; Hiremath et al., 2013; Huang et al., 2015; Zheng et al., 2016; Dizdaroğlu, 2017; Verma & Raghubanshi, 2018; Cappai et al., 2019; Ayık et al., 2021; Gavaldà et al., 2023), this process was considered as one of the main stages of the study. In general, the development and selection of indicators is a long and complex process. In the literature, it is emphasized that local , economic, social and environmental characteristics of the city are important in determining the indicators, and that indicators suitable for the intended purpose should be determined (Hemphill et al., 2004; Zheng et al., 2016). One of the organizations that has conducted the most comprehensive studies on sustainable development is the United Nations (UN). The SDGs and indicators prepared by the UN, accepted universally, referred to in Turkey's national documents and whose data are collected by TUİK, provide the most up-to-date and comprehensive indicator set. It is seen that the indicators adopted by institutions in Turkey and included in official documents provide an important framework and data set that can be used in sustainable urban transformation studies.

In the study, SDGs 7-8-9-11-12-13 were selected from 17 SDGs, and the indicators that were appropriate for the study scale and subject were selected.

- Goal 7 - Ensure access to affordable, reliable, sustainable and modern energy for all.
- Goal 8 - Promote sustained, inclusive and sustainable economic growth, full and productive employment and decent work for all.
- Goal 9 - Build resilient infrastructures, support inclusive and sustainable industrialization, and strengthen innovation.
- Goal 11- Make cities and settlements inclusive, safe, resilient and sustainable.
- Goal 12- Ensuring sustainable consumption and production patterns.

- Goal 13- Take urgent measures to combat climate change and its effects.

There are a total of 61 goals and 82 indicators under these objectives. However, since this study aims to create a sustainability index for the evaluation of the transformation and development of manufacturing areas, 17 goals and 23 indicators were used. These 23 indicators were localized according to the characteristics of the study area and the boundaries of the study. In this localization process, an evaluation was made by taking into account the data obtained from the field study. As frequently emphasized in the literature, the necessity of localizing the indicators stood out as one of the most important steps of this stage, considering that the study was carried out at the neighborhood scale. In the process of making the indicators local-specific, the opinions of various experts (academics, industrialists, investors, municipal representatives and professional chambers) were consulted using the Delphi Technique. In addition, another important issue emphasized in the literature, the weighting of the indicators, was carried out by the relevant experts. In this context, 17 different experts, including urban planners working in the private sector, universities and local governments, experts in various non-governmental organizations and experts in the manufacturing sector, participated in the evaluation process to represent different stakeholders. In this process, the Analytical Hierarchy Process (AHP) method was used. AHP is one of the multi-criteria decision-making methods. With AHP, decision makers have the opportunity to model complex problems in a hierarchical structure that shows the relationship between the main goal of the problem, criteria, sub-criteria and alternatives (Samut, 2014).

After the economic, environmental and social indicators were decided and weighted, the necessary data for the indicators were requested from the relevant institutions in order to calculate the index. However, significant difficulties were experienced in this process. Although there was data for each indicator at the national level due to the fact that TÜİK shares its data with the UN and calculates the provincial level data using the sampling method, it was not possible to obtain this data at the Bağcılar district or neighborhood level, although there was data at the Turkey scale. The district level data was collected in a scattered manner in various institutions, and various interviews were held in advance to determine which data should be obtained from which institution or organization. The fact that the data is located in various units of different institutions makes this process even more difficult. For example: (a) Municipality Environment Directorate and Technical Affairs Directorate for solid waste amount, (b) İSKİ for wastewater drainage, (c) Istanbul Chamber of Industry and Istanbul Chamber of Commerce for company information, (d) Provincial Directorate of the Ministry of Environment, Urbanization and Climate Change for recycled waste (e) Social Security Institution for employee numbers (f) Different unions for employee rights (g) Information should be obtained directly from companies for economic data and production capacities. However, since many data are raw, unprocessed or scattered, it was decided to obtain data from companies through surveys.

4.3. Findings and Challenges in Creating the Sustainability Index for Bagcılar

There are approximately 1000 industrial companies in a total of 426 parcels in the study area, and 16 parcels have been converted from industrial areas to offices, luxury housing, residences and hotels (Figure 3). Within the framework of the sample created according to manufacturing sub-sectors and workforce sizes, surveys were conducted with companies of various sizes and from different sectors, and data on the indicators were obtained. The confidence interval of the survey in question is 95% and the margin of error is 10%. In this context, approximately 400 companies in the region were contacted with responses from 94 companies, and the experiences gained in this process revealed how the concept of sustainability is perceived in Turkey. To calculate the sustainability index of the region, data were collected under three main categories: economic, environmental, and social indicators. These data were categorized in alignment with the respective indicators. Economic data were gathered through questions regarding firms' export activities, employee qualifications, production capacities, revenues, and R&D activities. Environmental data were collected by asking questions about sustainable production methods, energy consumption,

and waste generation. Social data included information on employees' vocational and technical education, gender distribution, unionization rates, and workplace accidents.

In addition, questions related to the location preferences of the manufacturing and service sectors and their expectations from urban transformation were asked to analyze the dynamics of the region's development and transformation. While questions concerning employees' educational status and wages were answered with ease, responses to questions on workplace accidents and unionization were not obtained. Firms were found to have relatively accurate information about their production capacities and revenues; however, it was observed that environmental data were not systematically recorded. The collected data were raw and scattered, and the data maintained by local and central governments on these issues were also determined to be in a raw format, lacking the quality required for detailed analysis. The absence or fragmentation of data indicates a lack of necessary attention and sensitivity toward sustainability. Only companies that export and are obliged to prepare sustainability reports are quite open to this concept and have contributed to the urban sustainability index study by sharing their data. 68% of the companies interviewed export and 11% have sustainability reports. Since these companies also use sustainability data in their own reports, they have collected their data regularly and systematically. On the other hand, non-exporting companies were more reserved about the concept of sustainability and initially responded negatively to interviews on this issue. Since the companies that accepted the interview did not have sufficient information on sustainability, it took time for them to compile their data and answer the questions.

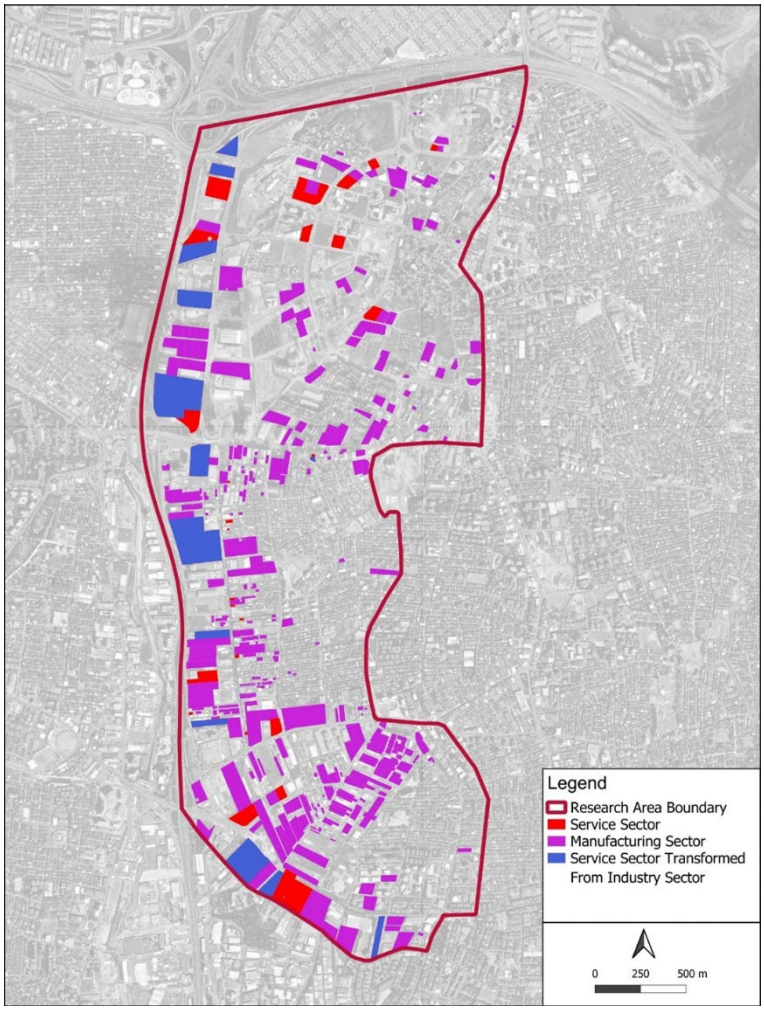

Figure 3 Analysis of manufacturing and service sector in the study area (Source: Field study)

In the interviews conducted with real estate companies, it was determined that the understanding of sustainability was limited. The approaches of these companies to sustainability

were generally limited to revising the total construction areas in order to fulfill requirements such as the use of grey water in green areas or green roofs arising from the Istanbul Zoning Regulation. These findings show that the real estate sector has not yet adopted the concept of sustainability comprehensively and that more comprehensive strategies are needed.

This entire process has revealed that the Sustainable Development Goals (SDGs) have not yet been sufficiently internalized by both public institutions and the private sector. SDGs are generally addressed at the national level, which prevents the implementation of the goals at the local level. However, as is frequently emphasized in the literature, priority should be given to local level implementations in order for SDGs to be truly implemented. The lack of decision-making processes centered on economic, social and environmental indicators, themselves based on sustainable development in the development and transformation of cities, creates a major gap in the current situation.

The importance of this issue needs to be understood and adopted, especially and primarily by local governments. Although some municipalities have published Voluntary Local Assessment (VLR) reports, this number is quite insufficient. According to the report published by the Marmara Municipalities Union (MBB), only 1% of the municipalities in the Marmara region have published a VLR report and approximately 2% have published a Sustainability Report (Marmara Municipalities Union, 2022). This situation shows that there is a significant deficiency in the internalization of the sustainability issue at the local level and the adoption of the SDGs.

The transformation of cities is a multidimensional and public issue that cannot be left to the decisions of investors alone. While the climate crisis is on the agenda all over the world and many countries are seeking solutions to it, it is of vital importance for critical issues such as urban transformation to be planned in a metropolitan city like Istanbul on the axis of sustainability. Although the focus has been on the rapid demolition and reconstruction of housing due to earthquake risk, this process covers not only housing but also rapidly transforming industrial areas in terms of both implementation and legislation. For this reason, comprehensive policies regarding urban transformation need to be developed. Therefore, this situation is of great importance for the economic, environmental and social future of cities.

In this context, the development of sustainable urban transformation policies is a multidimensional process that requires local governments and all relevant stakeholders to act in cooperation. Addressing sustainability not only as an environmental concept, but also in its economic and social dimensions, will play a critical role in achieving cities' long-term development goals. Therefore, the effective implementation of sustainability principles in urban transformation is a strategic necessity not only for Istanbul but for all cities in Turkey.

5. Conclusion

It is not feasible to evaluate multidimensional concepts like sustainability using a single variable or within a single dimension. To assess the sustainability of a region’s development effectively, it is essential to construct an index that integrates a broad spectrum of variables, reflecting performance across multiple dimensions. One of the most comprehensive frameworks for sustainable development has been established by the United Nations (UN) through the Sustainable Development Goals (SDGs). These goals serve as roadmaps for countries worldwide, guiding them toward achieving sustainability targets. Central to this process is the systematic collection, reporting, and analysis of data. The SDG indicators, goals, and targets offer a robust framework and data set that can significantly inform sustainable urban transformation efforts.

Turkey has adopted the SDGs and regularly publishes related data at the national level through institutions such as TÜİK, while also creating national coordination mechanisms, such as the National Sustainable Development Coordination Board. However, while sustainable development is addressed comprehensively at the national level, there is a significant lack of research and implementation at local levels. Collecting and analyzing data at the provincial, district, or

neighborhood level remains a significant challenge, impeding the formulation of strategic, evidence-based policies.

Urban transformation, particularly in metropolitan cities like Istanbul, is a critical public issue that extends beyond the decisions of private investors. As the climate crisis becomes an increasingly pressing global emergency, cities worldwide are devising strategies to mitigate its impacts. In this context, planning urban transformation projects with sustainability principles is not merely desirable but imperative. In Istanbul, strategic decisions such as relocating industrial zones or converting them into residential areas have profound implications for sustainability. However, the absence of comprehensive, accurate, and accessible data hampers the ability to assess the impacts of such transformations.

The findings of this study highlight key challenges in sustainability awareness across sectors. While large export-oriented manufacturing firms demonstrate relatively higher levels of sustainability awareness, this awareness is markedly lower in service-oriented sectors, such as residential, hotel, and office developments. This discrepancy complicates efforts to analyze regions using economic, environmental, and social indicators and obstructs the development of strategic policies for urban transformation. In a period marked by global crises, such as climate change, the lack of critical information regarding the adequacy of cities' economic and environmental resources is a serious concern. Furthermore, the inability to evaluate the social structure exacerbates these challenges.

Addressing these issues requires urgent policy interventions at the legislative and implementation levels. Developing comprehensive and accessible data collection systems at the local level is a fundamental step. Such systems should facilitate effective data sharing and ensure that sustainability indicators are measurable and traceable at the local scale. This approach will enable more informed, strategic decision-making for the future of cities.

This study underscores the vital importance of sustainable urban transformation practices, with a particular focus on industrial zones. The findings emphasize the necessity of localized sustainability indices, robust data collection systems, and stakeholder collaboration. Future research should prioritize developing standardized frameworks for sustainability assessments at the local level, ensuring alignment with broader sustainability goals and facilitating effective urban transformation.

Planning urban transformation projects in line with sustainability principles is a strategic necessity for Istanbul and similar metropolitan cities. This approach will support the creation of economically, environmentally, and socially resilient cities capable of achieving their long-term development objectives. Establishing systems that ensure the collection of regular, reliable, and internationally standardized data will enable the formulation of measurable, reportable, and comparable sustainability targets. Such advancements will not only enhance cities' adaptability to global challenges but also pave the way for a more sustainable urban future.

Acknowledgement

This study was supported by the Scientific and Technological Research Council of Turkey (TÜBİTAK) under the Grant Number 221K261. We would like to thank TÜBİTAK for their support in the project.

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